

GAS SUPPLY SYSTEM

BACKGROUND

1. Field of the Invention

5 The present disclosure relates to a gas supply system, and more particularly, to a gas supply system to more stably supply a supply gas by complementarily connecting modules corresponding to each other.

2. Discussion of Related Art

10 In general, apparatuses using a gas are made to use a supply gas suitable for each purpose, and it is required to satisfy a certain concentration and pressure according to each purpose and the types of supply gases.

 In particular, in the case of a gas supply device that supplies the gas to a gas-based apparatus in which precise work is performed, such as a semiconductor
15 processing apparatus, it is required that the concentration, the pressure, the temperature, and the like satisfy a precise error range.

 FIG. 1 illustrates a gas supply device that supplies a gas to a semiconductor processing apparatus according to an embodiment of the related art.

 Referring to FIG. 1, the gas supply device according to the related art
20 includes a mixing unit 1 that mixes a plurality of types of gases, a tank 2 that stores a mixed gas supplied from the mixing unit 1, and a supply unit 3 that supplies the gas stored in the tank 2 to a gas-based apparatus S that is the semiconductor processing apparatus.

The mixing unit 1 includes a plurality of source gas supply lines 11 and 21 which are connected to a plurality of source gas supply tanks 10 and 20 in which different types of source gases are stored and to which a plurality of types of source gases are supplied, a mixing unit 30 in which the plurality of types of source gases supplied from the plurality of source gas supply lines 11 and 21 are mixed, and a mixing gas supply line 31 through which the gas mixed in the mixing unit 30 flows to the tank 2.

The plurality of source gas supply lines 11 and 21 are provided with pressure relief valves (PRVs) 12 and 22 and mass flow controllers (MFCs) 13 and 23 that control the pressure and the flow rate of the source gas supplied along respective flow paths, and source gas valves 14 and 24 that open or close the respective flow paths.

A controller (not illustrated) controls the PRVs 12 and 22, the MFCs 13 and 23, and the source gas valve 14 and 24, to adjust the pressure and the flow rate of the source gas supplied along the respective flow paths and whether the source gas is supplied, so as to adjust the concentration and the pressure of the supply gas.

The supply unit 3 includes a tank gas supply line 40 through which the gas stored in the tank 2 flows to the gas-based apparatus S and a tank gas supply line valve 41 that opens or closes the tank gas supply line 40.

When the supply gas is supplied to the gas-based apparatus S, the controller opens the tank gas supply line valve 41 to supply the gas stored in the tank 2 to the gas-based apparatus S.

In the related art as described above, in an initial step of supplying the

supply gas to the tank 2 through the mixing unit 1, a flow rate hunting phenomenon occurs due to the structural limitation of the mixing unit 1, and thus the concentration of the gas stored in the tank 2 becomes irregular.

Further, the gas supply device is one device in which the mixing unit 1, the tank 2, and the supply unit 3 are connected and generally has a limitation in an accommodatable capacity according to an installed location and an installation process, and accordingly, a problem may occur in supplying the supply gas to the gas-based apparatus.

As an example, there may be a problem in that when the supply gas is continuously supplied to the gas-based apparatus through the gas supply device, the supply gas cannot be stably provided to the gas-based apparatus until the supply gas is refilled in the tank 2 after all the supply gas stored in the tank 2 is exhausted.

Further, when abnormality occurs in any one of the mixing unit 1, the tank 2, and the supply unit 3, the supply gas cannot be stably provided to the gas-based apparatus until the abnormality is resolved.

Accordingly, discussions on a gas supply device and a gas supply method for stably supplying a supply gas satisfying a certain concentration range to the gas-based apparatus S are being actively conducted.

Korean Patent No. 10-1659200 is an example of the related art for the gas supply device described above.

SUMMARY OF THE INVENTION

The present disclosure is conceived to solve the above problems, and the

purpose of the present disclosure is to provide a gas supply system to more stably supply a supply gas to a gas-based apparatus while the concentration of the supply gas is maintained to be constant.

According to an aspect of the present disclosure, there is provided a gas supply system including a first gas mixing supply device and a second gas mixing supply device including a plurality of modules corresponding to each other, connected to a gas-based apparatus in parallel, and configured to supply supply gases, in which a plurality of types of gases are mixed, to the gas-based apparatus, at least one connection line connecting the first gas mixing supply device and the second gas mixing supply device to complementarily connect modules corresponding to each other among the plurality of modules, and a controller configured to control whether the plurality of modules and the at least one connection line are connected to each other, to selectively form supply flow paths of the supply gases.

The first gas mixing supply device and the second gas mixing supply device may each include a mixing module configured to mix and supply a plurality of types of gases, a tank module configured to store the supply gas supplied from the mixing module, and a supply module configured to supply the supply gas stored in the tank module to the gas-based apparatus,

The first gas mixing supply device and the second gas mixing supply device may each include a first connection part to which the mixing module and the tank module are connected, a second connection part to which the tank module and the supply module are connected, and a third connection part to which the supply module and the gas-based apparatus are connected.

The at least one connection line may include at least one of a first connection line connecting the first connection part of the first gas mixing supply device and the

first connection part of the second gas mixing supply device, a second connection line connecting the second connection part of the first gas mixing supply device and the second connection part of the second gas mixing supply device, and a third connection line connecting the third connection part of the first gas mixing supply device and the third connection part of the second gas mixing supply device.

The controller may select any one of the pair of mixing modules included in the first gas mixing supply device and the second gas mixing supply device and corresponding to each other, any one of the pair of tank modules included in the first gas mixing supply device and the second gas mixing supply device and corresponding to each other, and any one of the pair of supply modules included in the first gas mixing supply device and the second gas mixing supply device and corresponding to each other according to whether the plurality of modules are normally operated, and the controller may sequentially connect the selected modules.

The mixing modules may include mixing gas supply lines allowing the supply gases, in which the plurality of types of gases are mixed, to flow to the tank modules and mixing gas concentration analysis units configured to measure concentrations of the supply gases flowing through the mixing gas supply lines, and the controller may determine whether the mixing modules are normally operated by comparing the concentrations of the supply gases measured by the mixing gas concentration analysis units with a preset reference concentration range.

The mixing modules may include mixing gas supply lines allowing the supply gases, in which the plurality of types of gases are mixed, to flow to the tank modules and mixing gas pressure measurement units configured to measure pressures of the supply gases flowing through the mixing gas supply lines, and the controller may determine whether the mixing modules are normally operated by

comparing the pressures of the supply gases measured by the mixing gas pressure measurement units with pressures inside the tank modules.

The tank modules may include tank module pressure measurement units configured to measure gas pressures inside the tank modules, and the controller may
5 determine whether the tank modules are normally operated by comparing the pressures of the supply gases measured by the tank module pressure measurement units with a preset reference pressure range.

The supply modules may include tank gas supply lines allowing the supply gases stored in the tank modules to flow to the gas-based apparatus and tank gas
10 concentration analysis units configured to measure concentrations of the supply gases flowing through the tank gas supply lines, and the controller may determine whether the supply modules are normally operated by comparing the concentrations of the supply gases measured by the tank gas concentration analysis units with a preset reference concentration range.

15 The gas supply system may further include at least one connection line valve configured to open or close the at least one connection line, wherein the controller may control driving of the at least one connection line valve to control whether the first gas mixing supply device and the second gas mixing supply device communicate with each other.

20 The gas supply system may further include first valves configured to open or close mixing module side connection flow paths of the first connection parts and second valves configured to open or close tank module side connection flow paths of the first connection parts, wherein the controller may control the first valve to be opened and the second valve of the first gas mixing supply device to be closed and
25 the first valve to be closed and the second valve of the second gas mixing supply

device to be opened so that the supply gases flow from the mixing module of the first gas mixing supply device through the first connection line to the tank module of the second gas mixing supply device.

5 The controller may control the first valve and the second valve of the first gas mixing supply device to be opened and the first valve and the second valve of the second gas mixing supply device to be closed so that the supply gases flow from the mixing module of the first gas mixing supply device to the tank module of the first gas mixing supply device.

10 The gas supply system may further include third valves configured to open or close tank module side connection flow paths of the second connection parts and fourth valves configured to open or close supply module side connection flow paths of the second connection parts, wherein the controller may control the third valve to be opened and the fourth valve of the first gas mixing supply device to be closed and the third valve to be closed and the fourth valve of the second gas mixing supply
15 device to be opened so that the supply gases flow from the tank module of the first gas mixing supply device through the second connection line to the supply module of the second gas mixing supply device.

20 The controller may control the third valve and the fourth valve of the first gas mixing supply device to be opened and the third valve and the fourth valve of the second gas mixing supply device to be closed so that the supply gases flow from the tank module of the first gas mixing supply device to the supply module of the first gas mixing supply device.

25 The gas supply system may further include fifth valves configured to open or close supply module side connection flow paths of the third connection parts, wherein the controller controls the fifth valve of the first gas mixing supply device to

be opened and the fifth valve of the second gas mixing supply device to be closed, in a state in which a first gas-based apparatus connection part to which the first gas mixing supply device and the gas-based apparatus are connected is closed and a second gas-based apparatus connection part to which the second gas mixing supply device and the gas-based apparatus are connected is opened, so that the supply gases flow from the supply module of the first gas mixing supply device to the third connection line and are supplied to the gas-based apparatus through the second gas-based apparatus connection part.

The controller may control the fifth valve of the first gas mixing supply device to be opened and the fifth valve of the second gas mixing supply device to be closed, in a state in which the first gas-based apparatus connection part is opened and the second gas-based apparatus connection part is closed, so that the supply gases are supplied from the supply module of the first gas mixing supply device through the first gas-based apparatus connection part to the gas-based apparatus.

The mixing modules may include mixing gas supply line valves configured to open or close the mixing gas supply lines, mixing gas vent lines branched off from the mixing gas supply lines and connected to an external unit, and mixing gas vent line valves configured to open or close the mixing gas vent lines.

The controller may open the mixing gas supply line valves and close the mixing gas vent line valves when the concentrations of the supply gases measured by the mixing gas concentration analysis units satisfy the preset reference concentration range, and the controller may close the mixing gas supply line valves and open the mixing gas vent line valves when the concentrations of the supply gases measured by the mixing gas concentration analysis units do not satisfy the reference concentration range.

The mixing modules may include mixing gas supply line valves configured to open or close the mixing gas supply lines, mixing gas vent lines branched off from the mixing gas supply lines and connected to an external unit, and mixing gas vent line valves configured to open or close the mixing gas vent lines.

5 The controller may open the mixing gas supply line valves and close the mixing gas vent line valves when the pressures of the supply gases measured by the mixing gas pressure measurement units are larger than or equal to pressures inside the tank modules, and the controller may close the mixing gas supply line valves and open the mixing gas vent line valves when the pressures of the supply gases
10 measured by the mixing gas pressure measurement units are smaller than the pressures inside the tank modules.

The mixing modules may include mixing gas concentration analysis lines branched off from the mixing gas supply lines and connected to an external unit, and mixing gas concentration analysis line valves configured to open or close the mixing
15 gas concentration analysis lines.

The mixing gas concentration analysis units may measure the concentrations of the supply gases when the supply gases flow from the mixing gas supply lines to the mixing gas concentration analysis lines.

The controller may control driving of the mixing gas concentration analysis
20 line valves to control whether to supply the supply gases to the mixing gas concentration analysis lines so as to control whether to measure the concentrations of the supply gases through the mixing gas concentration analysis units.

The mixing modules may include mixing gas pressure measurement lines branched off from the mixing gas supply lines and connected to an external unit and
25 mixing gas pressure measurement line valves configured to open or close the mixing

gas pressure measurement lines.

The mixing gas pressure measurement units measure the pressures of the supply gases when the supply gases flow from the mixing gas supply lines to the mixing gas pressure measurement lines.

- 5 The controller may control driving of the mixing gas pressure measurement line valves to control whether to measure the pressures of the supply gases through the mixing gas pressure measurement units.

 The mixing modules may further include mixing gas vent mass flow controllers configured to adjust opening degrees of the mixing gas vent lines to
10 adjust discharge amounts of the supply gases discharged through the mixing gas vent lines.

 The mixing modules may include a plurality of source gas supply lines to which a plurality of different types of source gases are supplied, mixing units in which the plurality of different types of source gases supplied from the plurality of
15 source gas supply lines are mixed to form the supply gases, and mixing gas supply lines connecting the mixing units and the tank modules.

 The supply modules may include tank gas concentration analysis units configured to measure concentrations of the supply gases flowing through tank gas supply lines connecting the tank modules and the gas-based apparatus.

- 20 The controller may determine whether concentrations of the supply gases supplied to the gas-based apparatus are appropriate by comparing the concentrations of the supply gases measured by the tank gas concentration analysis units with a preset reference concentration range.

 The supply modules may include tank gas supply line valves configured to
25 open or close the tank gas supply lines, tank gas vent lines branched off from the

tank gas supply lines and connected to an external unit, and tank gas vent line valves configured to open or close the tank gas vent lines.

The controller may open the tank gas supply line valves and close the tank gas vent line valves when the concentrations of the supply gases measured by the tank gas concentration analysis units satisfy the preset reference concentration range, and the controller may close the tank gas supply line valves and open the tank gas vent line valves when the concentrations of the supply gases measured by the tank gas concentration analysis units do not satisfy the reference concentration range.

The supply modules may include tank gas concentration analysis lines branched off from the tank gas supply lines and connected to an external unit and tank gas concentration analysis line valves configured to open or close the tank gas concentration analysis lines.

The tank gas concentration analysis units may measure the concentrations of the supply gases when the supply gases flow from the tank gas supply lines to the tank gas concentration analysis lines.

The controller may control driving of the tank gas concentration analysis line valves to control whether to measure the pressures of the supply gases through the tank gas concentration analysis units.

The first gas mixing supply device and the second gas mixing supply device may be modular devices in which the mixing modules, the tank modules, and the supply modules are independently configured but coupled to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present disclosure will become more apparent to those of ordinary skill in the art by describing exemplary embodiments thereof in detail with reference to the accompanying drawings, in which:

5 FIG. 1 is a schematic view illustrating a gas supply device according to the related art; and

 FIG. 2 is a schematic view illustrating a gas supply system according to an embodiment of the present disclosure.

10 DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Hereinafter, configurations and operations of a gas supply system according to the present disclosure will be described in detail with reference to the accompanying drawings.

 Here, detailed descriptions of the contents described in the background art
15 and overlapping contents will be omitted, and descriptions will be made focusing on components newly added to the present disclosure.

 FIG. 2 illustrates a gas supply system to an embodiment of the present disclosure.

 The gas supply system according to the embodiment of the present
20 disclosure includes a first gas mixing supply device 1000 and a second gas mixing supply device 2000 that include a plurality of modules 100-1, 200-1, 300-1, 100-2, 200-2, and 300-2 corresponding to each other and are connected to a gas-based apparatus S in parallel to supply a supply gas, in which a plurality of types of gases are mixed, to the gas-based apparatus S, one or more connection lines 510, 520, and
25 530 that connect the first gas mixing supply device 1000 and the second gas mixing

supply device 2000 to complementarily connect modules corresponding to each other among the plurality of modules 100-1, 200-1, 300-1, 100-2, 200-2, and 300-2, and a controller (not illustrated) that controls whether the plurality of modules 100-1, 200-1, 300-1, 100-2, 200-2, and 300-2 are connected to each other to selectively form a supply flow path of the supply gas.

The first gas mixing supply device 1000 and the second gas mixing supply device 2000 may be modular devices including mixing modules 100-1 and 100-2 that mix and supply the plurality of types of gases, tank modules 200-1 and 200-2 that store the supply gas supplied from the mixing modules 100-1 and 100-2, and supply modules 300-1 and 300-2 that supply the supply gas stored in the tank modules 200-1 and 200-2 to the gas-based apparatus S.

The mixing modules 100-1 and 100-2, the tank modules 200-1 and 200-2, and the supply modules 300-1 and 300-2 are formed as independent separate devices and are sequentially coupled to each other to constitute the first gas mixing supply device 1000 and the second gas mixing supply device 2000.

According to the modular gas mixing supply device, restrictions depending on an installation location and an installation process may be significantly alleviated as compared to an integrated mixing gas mixing supply device according to the related art in which the mixing system, the tank, and the supply module are one connected device.

Thus, the sizes of the mixing modules 100-1 and 100-2, the tank module 200-1 and 200-2, and the supply module 300-1 and 300-2 may be configured in accordance with a required capacity, and accordingly, the supply gas can be more stably supplied to the gas-based apparatus S and a larger amount of the supply gas can be accommodated.

The supply gas supplied through the supply modules 300-1 and 300-2 may be supplied to the gas-based apparatus S through gas-based apparatus connection parts 400-1 and 400-2.

The first gas mixing supply device 1000 and the second gas mixing supply device 2000 may include first connection parts 610-1 and 610-2 to which the mixing modules 100-1 and 100-2 and the tank modules 200-1 and 200-2 are connected, second connection parts 620-1 and 620-2 to which the tank modules 200-1 and 200-2 and the supply modules 300-1 and 300-2 are connected, and third connection parts 630-1 and 630-2 to which the supply modules 300-1 and 300-2 and the gas-based apparatus connection parts 400-1 and 400-2 are connected.

The one or more connection lines 510, 520, and 530 may include at least one of a first connection line 510 connecting the first connection part 610-1 of the first gas mixing supply device 100 and the first connection part 610-02 of the second gas mixing supply device 2000, a second connection line 520 connecting the second connection part 620-1 of the first gas mixing supply device 1000 and the second connection part 620-2 of the second gas mixing supply device 2000, and a third connection line 530 connecting the third connection part 630-1 of the first gas mixing supply device 1000 and the third connection part 630-2 of the second gas mixing supply device 2000.

Further, the one or more connection lines 510, 520, and 530 may include a first connection line valve 511 configured to open or close the first connection line 510, a second connection line valve 521 configured to open or close the second connection line 520, and a third connection line valve 531 configured to open or close the third connection line 530.

Further, the one or more connection lines 510, 520, and 530 may further

include first valves 710-1 and 710-2 configured to open or close mixing module side connection flow paths of the first connection parts 610-1 and 610-2 connected from the first connection parts 610-1 and 610-2 to the mixing modules 100-1 and 100-2, and second valves 720-1 and 720-2 configured to open or close tank module side connection flow paths of the first connection parts 610-1 and 610-2 connected from the first connection parts 610-1 and 610-2 to the tank modules 200-1 and 200-2.

The first valves 710-1 and 710-2 may be replaced with mixing gas supply line valves 141 which will be described below.

Further, the one or more connection lines 510, 520, and 530 may further include third valves 730-1 and 730-2 configured to open or close tank module side connection flow paths of the second connection parts 620-1 and 620-2 connected from the second connection parts 620-1 and 620-2 to the tank modules 200-1 and 200-2, and fourth valves 740-1 and 740-2 configured to open or close supply module side connection flow paths of the second connection parts 620-1 and 620-2 connected from the second connection parts 620-1 and 620-2 to the supply modules 300-1 and 300-2.

Further, the one or more connection lines 510, 520, and 530 may further include fifth valves 750-1 and 750-2 configured to open or close supply module side connection flow paths of the third connection parts 630-1 and 630-2 connected from the third connection parts 630-1 and 630-2 to the supply modules 300-1 and 300-2, and the fifth valves 750-1 and 750-2 may be replaced with tank gas supply line valves 321-1 and 321-2 which will be described below.

The controller may control driving of the first connection line valve 511, the second connection line valve 521, the third connection line valve 531, the first valves 710-1 and 710-2, the second valves 720-1 and 720-2, the third valves 730-1 and 730-

2, the fourth valves 740-1 and 740-2, and the fifth valves 750-1 and 750-2 to allow the first gas mixing supply device 1000 and the second gas mixing supply device 2000 to selectively communicate with each other through the one or more connection lines 510, 520, and 530.

5 As an example, the controller may open the first valve 710-1 and close the second valve 720-1 of the first gas mixing supply device 1000 and close the first valve 710-2 and open the second valve 720-2 of the second gas mixing supply device 2000 to control the supply gas to flow from the mixing module 100-1 of the first gas mixing supply device 1000 through the first connection line 510 to the tank module
10 200-2 of the second gas mixing supply device 2000.

 Further, the controller may open the first valve 710-1 and the second valve 720-1 of the first gas mixing supply device 1000 and close the first valve 710-2 and the second valve 720-2 of the second gas mixing supply device 2000 to control the supply gas to flow from the mixing module 100-1 of the first gas mixing supply
15 device 1000 to the tank module 200-1 of the first gas mixing supply device 1000.

 As another example, the controller may open the third valve 730-1 and close the fourth valve 740-1 of the first gas mixing supply device 1000 and close the third valve 730-2 and open the fourth valve 740-2 of the second gas mixing supply device 2000 to control the supply gas to flow from the tank module 200-1 of the first gas
20 mixing supply device 1000 through the second connection line 520 to the supply module 300-2 of the second gas mixing supply device 2000.

 Further, the controller may open the third valve 730-1 and the fourth valve 740-1 of the first gas mixing supply device 1000 and close the third valve 730-2 and the fourth valve 740-2 of the second gas mixing supply device 2000 to control the
25 supply gas to flow from the tank module 200-1 of the first gas mixing supply device

1000 to the supply module 300-1 of the first gas mixing supply device 1000.

As still another example, in a state in which the first gas-based apparatus connection part 400-1 to which the first gas mixing supply device 1000 and the gas-based apparatus S are connected is closed and the second gas-based apparatus connection part 400-2 to which the second gas mixing supply device 2000 and the gas-based apparatus S are connected is opened, the controller may open the fifth valve 750-1 of the first gas mixing supply device 1000 and close the fifth valve 750-2 of the second gas mixing supply device 2000 to control the supply gas to flow from the supply module 300-1 of the first gas mixing supply device 1000 to the third connection line 530 and to be supplied to the gas-based apparatus S through the second gas-based apparatus connection part 400-2.

Further, in a state in which the first gas-based apparatus connection part 400-1 is opened and the second gas-based apparatus connection part 400-2 is closed, the controller may open the fifth valve 750-1 of the first gas mixing supply device 1000 and close the fifth valve 750-2 of the second gas mixing supply device 2000 to control the supply gas to be supplied from the supply module 300-1 of the first gas mixing supply device 1000 through the first gas-based apparatus connection part 400-1 to the gas-based apparatus S.

That is, the controller may select and sequentially connect any one of the pair of modules included in the first gas mixing supply device 1000 and the second gas mixing supply device 2000 and corresponding to each other, that is, any one of the pair of mixing modules 100-1 and 100-2, any one of the pair of tank modules 200-1 and 200-2, and any one of the pair of supply modules 300-1 and 300-2, by using at least one of the first connection line 510, the second connection line 520, and the third connection line 530, and accordingly, the supply flow path through

which the supply gas is supplied to the gas-based apparatus S may be selectively formed.

In this case, the controller may select any one of the pair of modules corresponding to each other as described above according to whether each of the plurality of modules 100-1, 200-1, 300-1 and 100-2, 200-2, 300-2 is normally operated, and accordingly, the supply flow path including modules normally operated without abnormalities may be formed, and thus the supply gas can be stably supplied.

The mixing modules 100-1 and 100-2 may include a plurality of source gas supply lines 110-1, 120-1, 110-2, and 120-2 which are connected to source gas supply tanks 101-1, 102-1, 101-2, and 102-2 and to which a plurality of different types of source gas are supplied, mixing units 130-1 and 130-2 in which the plurality of types of source gases supplied from the plurality of source gas supply lines 110-1, 120-1, 110-2, and 120-2 are mixed, and mixing gas supply lines 140-1 and 140-2 that allow the supplied gas formed in the mixing units 130-1 and 130-2 to flow to the tank module 200.

The source gas supply lines 110-1, 120-1, 110-2, and 120-2 may include one or more pressure relief valves 111-1, 121-1, 111-2, and 121-2 configured to adjust the supply pressures of the plurality of different types of source gases and one or more mass flow controllers 112-1, 122-1, 112-2, and 122-2 configured to adjust the supply flow rates of the plurality of different types of source gases, and may include source gas valves 113-1, 123-1, 113-2, and 123-2 configured to respectively open or close the source gas supply lines 110-1, 120-1, 110-2, and 120-2 so as to control whether each source gas is supplied.

Driving of the pressure relief valves 111-1, 121-1, 111-2, and 121-2, the mass flow controllers 112-1, 122-1, 112-2, and 122-2, and the source gas valves 113-

1, 123-1, 113-2, and 123-2 may be controlled by the controller.

The mixing modules 100-1 and 100-2 may further include mixing gas supply line valves 141-1 and 141-2 configured to open or close the mixing gas supply lines 140-1 and 140-2.

5 The controller may control driving of the mixing gas supply line valve 141-1 and 141-2 to control whether to supply the supply gases mixed and formed in the mixing units 130-1 and 130-2 to the tank modules 200-1 and 200-2.

 The mixing modules 100-1 and 100-2 may further include mixing gas vent lines 150-1 and 150-2 branched off from the mixing gas supply lines 140-1 and 140-
10 2 and connected to an external unit, and mixing gas vent line valves 151-1 and 151-2 configured to open or close the mixing gas vent lines 150-1 and 150-2.

 The controller may control driving of the mixing gas vent line valves 151-1 and 151-2 to control whether to discharge the supply gases mixed and formed in the mixing units 130-1 and 130-2 to the outside through the mixing gas vent lines 150-1
15 and 150-2.

 The mixing modules 100-1 and 100-2 may include at least one of mixing gas concentration analysis units 170-1 and 170-2 configured to measure the concentrations of the supply gases flowing through the mixing gas supply lines 140-1 and 140-2 and mixing gas pressure measurement units 180-1 and 180-2 configured to
20 measure the pressures of the supply gases flowing through the mixing gas supply lines 140-1 and 140-2.

 The controller may determine whether the mixing modules 100-1 and 100-2 are normally operated by comparing the concentrations of the supply gases measured by the mixing gas concentration analysis units 170-1 and 170-2 with a preset
25 reference concentration range and by comparing the pressures of the supply gases

measured by the mixing gas pressure measurement units 180-1 and 180-2 with the internal pressures of the tank modules 200-1 and 200-2.

The controller may determine that the mixing modules 100-1 and 100-2 are normally operated when the concentrations of the supply gases measured by the mixing gas concentration analysis units 170-1 and 170-2 satisfy the preset reference concentration range and the pressures of the supply gases measured by the mixing gas pressure measurement units 180-1 and 180-2 are larger than or equal to the internal pressures of the tanks 200-1 and 200-2.

Further, the controller may determine that the mixing modules 100-1 and 100-2 are not normally operated when the concentrations of the supply gases measured by the mixing gas concentration analysis units 170-1 and 170-2 do not satisfy the preset reference concentration range and the pressures of the supply gases measured by the mixing gas pressure measurement units 180-1 and 180-2 are smaller than the internal pressures of the tank modules 200-1 and 200-2.

The controller may select any one of the pair of mixing modules 100-1 and 100-2 corresponding to each other according to whether the mixing modules 100-1 and 100-2 are normally operated as determined above to form the supply flow path so as to stably supply the supply gas.

Further, when the concentrations of the supply gases measured by the mixing gas concentration analysis units 170-1 and 170-2 satisfy the reference concentration range and the pressures of the supply gases measured by the mixing gas pressure measurement units 180-1 and 180-2 are larger than or equal to gas pressures inside the tanks 200-1 and 200-2, the controller controls the mixing gas supply line valves 141-1 and 141-2 to be opened and the mixing gas vent line valves 151-1 and 151-2 to be closed so that the supply gases supplied from the mixing units 130-1 and 130-2

flow to and are stored in the tanks 200-1 and 200-2 along the mixing gas supply lines 140-1 and 140-2 without being discharged to the outside.

Further, when the concentrations of the supply gases measured by the mixing gas concentration analysis units 170-1 and 170-2 do not satisfy the preset reference concentration range or when the pressures of the supply gases measured by the mixing gas pressure measurement units 180-1 and 180-2 are lower than the gas pressures inside the tanks 200-1 and 200-2, the controller may control the mixing gas supply line valves 141-1 and 141-2 to be closed and the mixing gas vent line valves 151-1 and 151-2 to be opened so that the supply gases flowing through the mixing gas supply lines 140-1 and 140-2 are discharged to the outside and, at the same time, the supply of the supply gases to the tanks 200-1 and 200-2 is blocked.

Accordingly, the supply gases whose concentrations and pressures do not satisfy the preset range can be prevented from being stored in the tanks 200-1 and 200-2, and the supply gases having concentrations and pressures within a certain range can be stably stored.

The mixing modules 100-1 and 100-2 may further include detection measurement lines 160-1 and 160-2 branched off from the mixing gas supply lines 140-1 and 140-2 and connected to an external unit and detection measurement line valves 161-1 and 161-2 configured to open or close the detection measurement lines 160-1 and 160-2.

The mixing gas concentration analysis units 170-1 and 170-2 and the mixing gas pressure measurement units 180-1 and 180-2 measure the concentrations and the pressures, respectively, of the supply gases when the supply gases flowing through the mixing gas supply lines 140-1 and 140-2 flow to the detection measurement lines 160-1 and 160-2.

Thus, the controller may control driving of the detection measurement line valves 161-1 and 161-2 to control whether to supply the supply gases to the detection measurement lines 160-1 and 160-2 so as to control whether to measure the concentrations and the pressures of the supply gases through the mixing gas concentration analysis units 170-1 and 170-2 and the mixing gas pressure measurement units 180-1 and 180-2.

The detection measurement lines 160-1 and 160-2 may be provided to have a cross-sectional area smaller than that of the mixing gas vent line 150-1 and 150-2 and may be formed to flow the supply gas having a minimum flow rate required for the mixing gas concentration analysis units 170-1 and 170-2 and the mixing gas pressure measurement units 180-1 and 180-2 to measure the concentrations and the pressures of the gases.

That is, the detection measurement lines 160-1 and 160-2 may be configured such that the supply gases having a significantly lower flow rate than those of the mixing gas supply lines 140-1 and 140-2 and the mixing gas vent lines 150-1 and 150-2 flow therethrough.

Accordingly, by measuring the concentrations and the pressures in a state in which the supply gases flow to the detection measurement lines 160-1 and 160-2, the amount of consumed supply gas can be reduced and efficiency of the device can be increased, as compared to a case in which the concentrations and the pressures are measured in a state in which the supply gases flow to the mixing gas supply lines 140-1 and 140-2 or the mixing gas vent lines 150-1 and 150-2.

The mixing modules 100-1 and 100-2 may further include mixing gas vent mass flow controllers 152-1 and 152-2 configured to adjust opening degrees of the mixing gas vent lines 150-1 and 150-2.

The controller may adjust the mixing gas vent mass flow controllers 152-1 and 152-2 to adjust discharge amounts of the supply gases discharged through the mixing gas vent lines 150-1 and 150-2 so as to efficiently adjust the pressures of the supply gases flowing to the tanks 200-1 and 200-2 through the mixing gas supply
5 lines 140-1 and 140-2.

The tank modules 200-1 and 200-2 are made of a material having a predetermined thickness, high stiffness, heat resistance, and pressure resistance to store high-temperature and high-pressure gas, and are made of a material having chemical resistance and corrosion resistance so as not to cause a change in properties
10 of the stored gas due to degeneration or corrosion in reaction to the gas.

A material satisfying the conditions is stainless steel (SUS). The SUS has high rigidity, excellent heat resistance, excellent corrosion resistance, excellent chemical resistance, good accessibility, and economical advantages, and thus is one of the materials widely used in various fields.

15 The tank modules 200-1 and 200-2 may be a batch type tank in which an internal pressure is formed between an upper pressure limit and a lower pressure limit.

The tank modules 200-1 and 200-2 may be provided with tank pressure measurement units 210-1 and 210-2 that measure the internal gas pressures.

20 The controller may determine whether the tank modules 200-1 and 200-2 are normally operated by comparing the pressures of the supply gases measured by the tank pressure measurement units 210-1 and 210-2 with a preset reference pressure range.

The controller may determine that the corresponding tank modules 200-1
25 and 200-2 are normally operated when the pressures of the supply gases measured by

the tank pressure measurement units 210-1 and 210-2 satisfy the reference pressure range and may determine that the corresponding tank modules 200-1 and 200-2 are not normally operated when the measured pressures of the supply gases do not satisfy the reference pressure range.

5 The controller may select any one of the pair of tank modules 200-1 and 200-2 corresponding to each other according to whether the tank modules 200-1 and 200-2 are normally operated as determined above to form the supply flow path so as to stably supply the supply gas.

 The supply modules 300-1 and 300-2 may include tank gas supply lines 320-
10 1 and 320-2 that connect the tanks 200-1 and 200-2 and the gas-based apparatus S, tank gas vent lines 330-1 and 330-2 that are branched off from the tank gas supply lines 320-1 and 320-2 and connected to an external unit, and tank gas concentration analysis units 310-1 and 310-2 that measure the concentrations of the supply gases flowing through the tank gas supply lines 320-1 and 320-2.

15 The controller determines whether the supply gas supplied to the gas-based apparatus S is appropriate by comparing the concentrations of the supply gases measured by the tank gas concentration analysis units 310-1 and 310-2 with a preset reference concentration range.

 The supply modules 300-1 and 300-2 may further include tank gas supply
20 line valves 321-1 and 321-2 configured to open or close the tank gas supply lines 320-1 and 320-2.

 The controller may control driving of the tank gas supply line valves 321-1 and 321-2 to control whether to supply the supply gases stored in the tanks 200-1 and 200-2 to the gas-based apparatus S.

25 When the concentrations of the supply gases measured by the tank gas

concentration analysis unit 310-1 and 310-2 satisfy the reference concentration range, the controller may control the tank gas supply line valves 321-1 and 321-2 to be opened to supply the supply gases stored in the tanks 200-1 and 200-2 to the gas-based apparatus S.

5 Further, when the concentrations of the supply gases measured by the tank gas concentration analysis unit 310-1 and 310-2 do not satisfy the reference concentration range, the controller may control the tank gas supply line valves 321-1 and 321-2 to be closed to block the supply of the supply gases to the gas-based apparatus S.

10 The supply modules 300-1 and 300-2 may further include tank gas vent lines 330-1 and 330-2 branched off from the tank gas supply lines 320-1 and 320-2 and connected to an external unit and tank gas vent lines valves 331-1 and 331-2 configured to open or close the tank gas vent lines 330-1 and 330-2.

 The controller may control the driving of the tank gas vent line valves 331-1
15 and 331-2 to control whether to discharge the supply gases flowing through the tank gas supply lines 320-1 and 320-2 to the outside through the tank gas vent lines 330-1 and 330-2.

 When the concentrations of the supply gases measured by the tank gas concentration analysis units 310-1 and 310-2 satisfy the reference concentration
20 range, the controller may determine that the corresponding supply modules 300-1 and 300-2 are normally operated.

 Further, when the concentrations of the supply gases measured by the tank gas concentration analysis units 310-1 and 310-2 do not satisfy the reference concentration range, the controller may determine that the corresponding supply
25 modules 300-1 and 300-2 are not normally operated.

The controller may select any one of the pair of supply modules 300-1 and 300-2 corresponding to each other according to whether the supply modules 300-1 and 300-2 are normally operated as determined above to form the supply flow path so as to stably supply the supply gases.

5 Further, when the concentrations of the supply gases measured by the tank gas concentration analysis units 310-1 and 310-2 satisfy the reference concentration range, the controller may control the tank gas supply line valves 321-1 and 321-2 to be opened and the tank gas vent line valves 331-1 and 331-2 to be closed to allow the supply gases supplied from the tanks 200-1 and 200-2 to flow to the gas-based
10 apparatus S along the tank gas supply lines 320-1 and 320-2 without being discharged to the outside.

Further, when the concentrations of the supply gases measured by the tank gas concentration analysis units 310-1 and 310-2 do not satisfy the reference concentration range, the controller may control the tank gas supply line valves 321-1
15 and 321-2 to be closed and the tank gas vent line valves 331-1 and 331-2 to be opened to allow the supply gases supplied from the tanks 200-1 and 200-2 to be discharged to the outside through the tank gas vent lines 330-1 and 330-2.

The supply modules 300-1 and 300-2 may further include tank gas concentration analysis lines 340-1 and 340-2 branched off from the tank gas supply
20 lines 320-1 and 320-2 and tank gas concentration analysis line valves 341-1 and 341-2 configured to open or close the tank gas concentration analysis lines 340-1 and 340-2, wherein the tank gas concentration analysis units 310-1 and 310-2 may measure the concentrations of the gases flowing along the tank gas concentration analysis lines 340-1 and 340-2.

25 When the supply gases flowing through the tank gas supply lines 320-1 and

320-2 flow to the tank gas concentration analysis lines 340-1 and 340-2, the tank gas concentration analysis units 310- 1 and 310-2 measure the concentrations of the corresponding supply gases.

Thus, the controller may control driving of the tank gas concentration line valves 341-1 and 341-2 to control whether to supply the supply gases to the tank gas concentration analysis lines 340-1 and 340-2 so as to control whether to measure the concentrations of the supply gases through the tank gas concentration analysis units 310-1 and 310-2.

The tank gas concentration analysis lines 340-1 and 340-2 may be provided to have a cross-sectional area smaller than that of the tank gas vent lines 330-1 and 330-2 and may allow the supply gases, which have minimum flow rates required for the tank gas concentration analysis units 310-1 and 310-2 to measure the concentrations of the gases, to flow.

That is, the tank gas concentration analysis lines 340-1 and 340-2 may be configured such that the supply gases having flow rates significantly less than those of the tank gas supply lines 320-1 and 320-2 and the tank gas vent lines 330-1 and 330-2 flow therethrough.

Accordingly, by measuring the concentrations and the pressures in a state in which the supply gases flow to the tank gas concentration analysis lines 340-1 and 340-2, the amount of consumed supply gas can be reduced and efficiency of the device can be increased as compared to a case in which the concentrations and the pressures are measured in a state in which the supply gases flow to the tank gas vent lines 330-1 and 330-2.

As described above, according to the gas supply system according to the present disclosure, the plurality of gas mixing supply devices 1000 and 2000 are

connected to the gas-based apparatus S in parallel and are operated complementarily, and thus the supply gases can be more stably supplied.

Further, in the plurality of gas mixing supply devices 1000 and 2000 connected in parallel, modules corresponding to each other are complementarily
5 connected and selectively communicate with each other, and thus the supply gases can be more stably supplied.

Further, the mixing modules 100-1 and 100-2, the tank modules 200-1 and 200-2, and the supply modules 300-1 and 300-2 are formed as independent configurations, and thus a larger amount of the supply gases can be accommodated
10 and stably supplied.

According to a gas supply system according to the present disclosure, a plurality of gas mixing supply devices are connected to a gas-based apparatus in parallel and are operated complementarily, and thus a supply gas can be more stably supplied.

15 Further, in the plurality of gas mixing supply devices connected in parallel, modules corresponding to each other are complementarily connected and selectively communicate with each other, and thus the supply gases can be more stably supplied.

Further, since a mixing module, a tank module, and a supply module are formed as independent configurations, a larger amount of the supply gas can be
20 accommodated and stably supplied.

The present disclosure is not limited to the above-described embodiments, obvious modifications could be made by those skilled in the art to which the present disclosure pertains without departing from the technical spirit of the present disclosure claimed by the appended claims, and the obvious modifications belong to
25 the scope of the present disclosure.

CLAIMS:

1. A gas supply system comprising:

a first gas mixing supply device and a second gas mixing supply device including a plurality of modules corresponding to each other, connected to a gas-based apparatus in parallel, and configured to supply supply gases, in which a plurality of types of gases are mixed, to the gas-based apparatus;

at least one connection line connecting the first gas mixing supply device and the second gas mixing supply device to complementarily connect modules corresponding to each other among the plurality of modules;

at least one connection line valve configured to open or close the at least one connection line; and

a controller configured to control driving of the at least one connection line valve to control whether the first gas mixing supply device and the second gas mixing supply device communicate with each other, to selectively form supply flow paths of the supply gases.

2. The gas supply system of claim 1, wherein the first gas mixing supply device and the second gas mixing supply device each include a mixing module configured to mix and supply a plurality of types of gases, a tank module configured to store the supply gas supplied from the mixing module, and a supply module configured to supply the supply gas stored in the tank module to the gas-based apparatus,

wherein the first gas mixing supply device and the second gas mixing supply device each include a first connection part to which the mixing module and the tank module are connected, a second connection part to which the tank module and the

supply module are connected, and a third connection part to which the supply module and the gas-based apparatus are connected, and

wherein the at least one connection line includes at least one of a first connection line connecting the first connection part of the first gas mixing supply device and the first connection part of the second gas mixing supply device, a second connection line connecting the second connection part of the first gas mixing supply device and the second connection part of the second gas mixing supply device, and a third connection line connecting the third connection part of the first gas mixing supply device and the third connection part of the second gas mixing supply device.

10

3. The gas supply system of claim 2, wherein the controller selects any one of the pair of mixing modules included in the first gas mixing supply device and the second gas mixing supply device and corresponding to each other, any one of the pair of tank modules included in the first gas mixing supply device and the second gas mixing supply device and corresponding to each other, and any one of the pair of supply modules included in the first gas mixing supply device and the second gas mixing supply device and corresponding to each other according to whether the plurality of modules are normally operated, and the controller sequentially connects the selected modules.

20

4. The gas supply system of claim 3, wherein the mixing modules include mixing gas supply lines allowing the supply gases, in which the plurality of types of gases are mixed, to flow to the tank modules and mixing gas concentration analysis units configured to measure concentrations of the supply gases flowing through the mixing gas supply lines, and

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wherein the controller determines whether the mixing modules are normally operated by comparing the concentrations of the supply gases measured by the mixing gas concentration analysis units with a preset reference concentration range.

5 5. The gas supply system of claim 3, wherein the mixing modules include mixing gas supply lines allowing the supply gases, in which the plurality of types of gases are mixed, to flow to the tank modules and mixing gas pressure measurement units configured to measure pressures of the supply gases flowing through the mixing gas supply lines, and

10 wherein the controller determines whether the mixing modules are normally operated by comparing the pressures of the supply gases measured by the mixing gas pressure measurement units with pressures inside the tank modules.

 6. The gas supply system of claim 3, wherein the tank modules include
15 tank module pressure measurement units configured to measure gas pressures inside the tank modules, and

 wherein the controller determines whether the tank modules are normally operated by comparing the pressures of the supply gases measured by the tank module pressure measurement units with a preset reference pressure range.

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 7. The gas supply system of claim 3, wherein the supply modules include tank gas supply lines allowing the supply gases stored in the tank modules to flow to the gas-based apparatus and tank gas concentration analysis units configured to measure concentrations of the supply gases flowing through the tank gas supply
25 lines, and

wherein the controller determines whether the supply modules are normally operated by comparing the concentrations of the supply gases measured by the tank gas concentration analysis units with a preset reference concentration range.

5 8. The gas supply system of claim 2, further comprising first valves configured to open or close mixing module side connection flow paths of the first connection parts and second valves configured to open or close tank module side connection flow paths of the first connection parts,

 wherein the controller controls the first valve to be opened and the second
10 valve of the first gas mixing supply device to be closed and the first valve to be closed and the second valve of the second gas mixing supply device to be opened so that the supply gases flow from the mixing module of the first gas mixing supply device through the first connection line to the tank module of the second gas mixing supply device, and the controller controls the first valve and the second valve of the
15 first gas mixing supply device to be opened and the first valve and the second valve of the second gas mixing supply device to be closed so that the supply gases flow from the mixing module of the first gas mixing supply device to the tank module of the first gas mixing supply device.

20 9. The gas supply system of claim 2, further comprising third valves configured to open or close tank module side connection flow paths of the second connection parts and fourth valves configured to open or close supply module side connection flow paths of the second connection parts,

 wherein the controller controls the third valve to be opened and the fourth
25 valve of the first gas mixing supply device to be closed and the third valve to be

closed and the fourth valve of the second gas mixing supply device to be opened so that the supply gases flow from the tank module of the first gas mixing supply device through the second connection line to the supply module of the second gas mixing supply device, and the controller controls the third valve and the fourth valve of the first gas mixing supply device to be opened and the third valve and the fourth valve of the second gas mixing supply device to be closed so that the supply gases flow from the tank module of the first gas mixing supply device to the supply module of the first gas mixing supply device.

10. The gas supply system of claim 2, further comprising fifth valves configured to open or close supply module side connection flow paths of the third connection parts,

wherein the controller controls the fifth valve of the first gas mixing supply device to be opened and the fifth valve of the second gas mixing supply device to be closed, in a state in which a first gas-based apparatus connection part to which the first gas mixing supply device and the gas-based apparatus are connected is closed and a second gas-based apparatus connection part to which the second gas mixing supply device and the gas-based apparatus are connected is opened so that the supply gases flow from the supply module of the first gas mixing supply device to the third connection line and are supplied to the gas-based apparatus through the second gas-based apparatus connection part, and the controller controls the fifth valve of the first gas mixing supply device to be opened and the fifth valve of the second gas mixing supply device to be closed, in a state in which the first gas-based apparatus connection part is opened and the second gas-based apparatus connection part is closed so that the supply gases are supplied from the supply module of the first gas

mixing supply device through the first gas-based apparatus connection part to the gas-based apparatus.

11. The gas supply system of claim 4, wherein the mixing modules include
5 mixing gas supply line valves configured to open or close the mixing gas supply lines, mixing gas vent lines branched off from the mixing gas supply lines and connected to an external unit, and mixing gas vent line valves configured to open or close the mixing gas vent lines, and

wherein the controller opens the mixing gas supply line valves and closes the
10 mixing gas vent line valves when the concentrations of the supply gases measured by the mixing gas concentration analysis units satisfy the preset reference concentration range, and the controller closes the mixing gas supply line valves and opens the mixing gas vent line valves when the concentrations of the supply gases measured by the mixing gas concentration analysis units do not satisfy the reference concentration
15 range.

12. The gas supply system of claim 5, wherein the mixing modules include mixing gas supply line valves configured to open or close the mixing gas supply lines, mixing gas vent lines branched off from the mixing gas supply lines and
20 connected to an external unit, and mixing gas vent line valves configured to open or close the mixing gas vent lines, and

wherein the controller opens the mixing gas supply line valves and closes the mixing gas vent line valves when the pressures of the supply gases measured by the mixing gas pressure measurement units are larger than or equal to pressures inside
25 the tank modules, and the controller closes the mixing gas supply line valves and

opens the mixing gas vent line valves when the pressures of the supply gases measured by the mixing gas pressure measurement units are smaller than the pressures inside the tank modules.

5 13. The gas supply system of claim 4 or 11, wherein the mixing modules include mixing gas concentration analysis lines branched off from the mixing gas supply lines and connected to an external unit, and mixing gas concentration analysis line valves configured to open or close the mixing gas concentration analysis lines, wherein the mixing gas concentration analysis units measure the
10 concentrations of the supply gases when the supply gases flow from the mixing gas supply lines to the mixing gas concentration analysis lines, and wherein the controller controls driving of the mixing gas concentration analysis line valves to control whether to supply the supply gases to the mixing gas concentration analysis lines so as to control whether to measure the concentrations of
15 the supply gases through the mixing gas concentration analysis units.

 14. The gas supply system of claim 5 or 12, wherein the mixing modules include mixing gas pressure measurement lines branched off from the mixing gas supply lines and connected to an external unit and mixing gas pressure measurement
20 line valves configured to open or close the mixing gas pressure measurement lines, wherein the mixing gas pressure measurement units measure the pressures of the supply gases when the supply gases flow from the mixing gas supply lines to the mixing gas pressure measurement lines, and wherein the controller controls driving of the mixing gas pressure
25 measurement line valves to control whether to measure the pressures of the supply

gases through the mixing gas pressure measurement units.

15. The gas supply system of claim 11 or 12, wherein the mixing modules further include mixing gas vent mass flow controllers configured to adjust opening
5 degrees of the mixing gas vent lines to adjust discharge amounts of the supply gases discharged through the mixing gas vent lines.

16. The gas supply system of claim 2, wherein the mixing modules include a plurality of source gas supply lines to which a plurality of different types of source
10 gases are supplied, mixing units in which the plurality of different types of source gases supplied from the plurality of source gas supply lines are mixed to form the supply gases, and mixing gas supply lines connecting the mixing units and the tank modules.

15 17. The gas supply system of claim 2, wherein the supply modules include tank gas concentration analysis units configured to measure concentrations of the supply gases flowing through tank gas supply lines connecting the tank modules and the gas-based apparatus, and

wherein the controller determines whether concentrations of the supply gases
20 supplied to the gas-based apparatus are appropriate by comparing the concentrations of the supply gases measured by the tank gas concentration analysis units with a preset reference concentration range.

18. The gas supply system of claim 7, wherein the supply modules include
25 tank gas supply line valves configured to open or close the tank gas supply lines,

tank gas vent lines branched off from the tank gas supply lines and connected to an external unit, and tank gas vent line valves configured to open or close the tank gas vent lines, and

wherein the controller opens the tank gas supply line valves and closes the tank gas vent line valves when the concentrations of the supply gases measured by the tank gas concentration analysis units satisfy the preset reference concentration range, and the controller closes the tank gas supply line valves and opens the tank gas vent line valves when the concentrations of the supply gases measured by the tank gas concentration analysis units do not satisfy the reference concentration range.

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19. The gas supply system of claim 7 or 18, wherein the supply modules include tank gas concentration analysis lines branched off from the tank gas supply lines and connected to an external unit and tank gas concentration analysis line valves configured to open or close the tank gas concentration analysis lines,

15 wherein the tank gas concentration analysis units measure the concentrations of the supply gases when the supply gases flow from the tank gas supply lines to the tank gas concentration analysis lines, and

wherein the controller controls driving of the tank gas concentration analysis line valves to control whether to measure the concentrations of the supply gases through the tank gas concentration analysis units.

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20. The gas supply system of claim 2, wherein the first gas mixing supply device and the second gas mixing supply device are modular devices in which the mixing modules, the tank modules, and the supply modules are independently configured but coupled to each other.

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