

GAS MIXING SUPPLY DEVICE, MIXING SYSTEM, AND GAS MIXING SUPPLY METHOD

BACKGROUND

5 1. Field of the Invention

The present disclosure relates to a gas mixing supply device, a mixing system, and a gas mixing supply method, and more particularly, to a gas mixing supply device, a mixing system, and a gas mixing supply method for more efficiently supplying a supply gas.

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2. Discussion of Related Art

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

15 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 processing apparatus, it is required that the concentration, the pressure, the temperature, and the like satisfy a precise error range.

20 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 includes a mixing system 1 that mixes a plurality of types of gases, a tank 2 that stores a mixed gas supplied from the mixing system 1, and a supply system 3 that supplies the gas stored in the tank to a gas-based apparatus S that is the
25 semiconductor processing apparatus.

The mixing system 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 system 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 system 1, a flow rate hunting phenomenon occurs due to the structural limitation of the mixing system 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 system 1, the tank 2, and the supply system 3 are connected and generally has a limitation in an accommodatable capacity according to an installed location and an installation
5 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
10 is refilled in the tank 2 after all the supply gas stored in the tank 2 is exhausted.

Accordingly, discussions on a gas supply device and a gas supply method for stably supplying a 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
15 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 mixing supply device, a mixing
20 system, and a gas mixing supply method for stably supplying a supply gas to a gas-based apparatus while maintaining the concentration of the supply gas to be constant.

According to an aspect of the present disclosure, there is provided a gas mixing supply device including a mixing system configured to supply a supply gas, in which a plurality of types of gases are mixed, to a tank, a supply system
25 configured to supply the supply gas stored in the tank to a gas-based apparatus, and a

controller configured to control driving of the mixing system, the tank, and the supply system.

The mixing system may include a mixing gas supply line that allows the supply gas to flow to the tank, a first vent line and a second vent line branched off from the mixing gas supply line and connected to an external unit, a mixing gas concentration analysis unit configured to measure a concentration of the supply gas flowing from the mixing gas supply line to the second vent line, and a mixing gas pressure measurement unit configured to measure a pressure of the supply gas flowing from the mixing gas supply line to the second vent line, and the controller may control the supply gas flowing through the mixing gas supply line to flow to one of the tank and the first vent line by comparing the concentration of the supply gas measured by the mixing gas concentration analysis unit with a preset reference concentration range and by comparing the pressure of the supply gas measured by the mixing gas pressure measurement unit with an internal pressure of the tank.

The mixing system may include a mixing gas supply line valve configured to open or close the mixing gas supply line, and a first vent line valve configured to open or close the first vent line, the controller may open the mixing gas supply line valve and close the first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit satisfies the reference concentration range and the pressure of the supply gas measured by the mixing gas pressure measurement unit is higher than or equal to a gas pressure inside the tank, and may close the mixing gas supply line valve and open the first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit does not satisfy the reference concentration range or when the pressure of the supply gas measured by the mixing gas pressure measurement unit is lower

than the gas pressure inside the tank.

The mixing system may include a second vent line valve configured to open or close the second vent line, and the controller may control driving of the second vent line valve to control whether to supply the supply gas to the second vent line so
5 as to control whether to measure the concentration and the pressure of the supply gas.

The second vent line may have a cross-sectional area that is smaller than that of the first vent line.

The mixing system may further include a mixing gas vent mass flow controller configured to adjust an opening degree of the first vent line to adjust a
10 discharge amount of the supply gas discharged through the first vent line.

The mixing system may further include a plurality of source gas supply lines, to which a plurality of different types of source gases are supplied, and a mixing unit 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 gas, and the mixing gas supply
15 line connects the mixing unit and the tank.

The supply system may include a tank gas supply line connecting the tank and the gas-based apparatus and a tank gas concentration analysis unit configured to measure the concentration of the supply gas flowing through the tank gas supply line, and the controller may determine whether the supply gas supplied to the gas-based
20 apparatus is appropriate by comparing the concentration of the supply gas measured by the tank gas concentration analysis unit with the preset reference concentration range.

The supply system may include a tank gas supply line valve that opens or closes the tank gas supply line, and the controller may open the tank gas supply line
25 valve when the concentration of the supply gas measured by the tank gas

concentration analysis unit satisfies the reference concentration range, and the controller may close the tank gas supply line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the reference concentration range.

5 The supply system may include a tank gas vent line branched off from the tank gas supply line and connected to an external unit and a tank gas vent line valve that opens or closes the tank gas vent line, and the controller may close the tank gas vent line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit satisfies the reference concentration range, and the
10 controller may open the tank gas vent line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the reference concentration range.

When the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the preset reference concentration range,
15 the controller may calculate a concentration correction value so that the concentration of the supply gas flowing through the tank gas supply line satisfies the reference concentration range, and then the controller may correct the concentration of the supply gas supplied to the tank through the mixing system by applying the concentration correction value to the mixing system.

20 The plurality of source gas supply lines may include at least one pressure relief valve configured to adjust supply pressures of the plurality of different types of source gases and at least one mass flow controller configured to adjust supply flow rates of the plurality of different types of source gases, and when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy
25 the preset reference concentration range, the controller may adjust the pressure relief

valve and the mass flow controller according to the concentration correction value to adjust a ratio of each of the source gases mixed in the mixing unit so as to correct the concentration of the supply gas supplied to the tank through the mixing gas supply line.

- 5 The mixing system, the tank, and the supply system may be modular devices that are formed as independent separate devices but coupled to each other.

According to another aspect of the present disclosure, there is provided a gas mixing supply method in which a plurality of types of gases are mixed in a mixing unit to form a supply gas and then the supply gas is supplied to and stored in a tank
10 through a mixing gas supply line, the method including a) measuring a concentration and a pressure of the supply gas flowing from the mixing gas supply line to a second vent line by allowing the supply gas to flow to the second vent line branched off from the mixing gas supply line, connected to an external unit, and including a mixing gas concentration analysis unit configured to measure the concentration of
15 the supply gas and a mixing gas pressure measurement unit configured to measure the pressure of the supply gas, and b) controlling, by a controller, the supply gas flowing through the mixing gas supply line to flow to the tank and the first vent line by comparing the concentration of the supply gas measured by the mixing gas concentration analysis unit with a preset reference concentration range and by
20 comparing the pressure of the supply gas measured by the mixing gas pressure measurement unit with an internal pressure of the tank.

The controller may open a mixing gas supply line valve configured to open or close the mixing gas supply line and close a first vent line valve configured to open or close the first vent line when the concentration of the supply gas measured
25 by the mixing gas concentration analysis unit satisfies the reference concentration

and the pressure of the supply gas measured by the mixing gas pressure measurement unit is larger than or equal to a gas pressure inside the tank, and the controller may close the mixing gas supply line valve and open the first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit does not satisfy the reference concentration or when the pressure of the supply gas measured by the mixing gas pressure measurement unit is smaller than the gas pressure inside the tank.

The controller may control driving of a second vent line valve configured to open or close the second vent line to control whether to supply the supply gas to the second vent line so as to control driving of the mixing gas concentration analysis unit and the mixing gas pressure measurement unit.

In b), when the mixing gas vent line valve is opened by the control unit to discharge the supply gas to the outside through the first vent line, the controller may adjust a mixing gas vent mass flow controller configured to adjust an opening degree of the mixing gas vent line to adjust a discharge amount of the supply gas discharged through the mixing gas vent line.

The gas mixing supply method may further include the steps of c) measuring the concentration of the supply gas flowing through a tank gas supply line connecting the tank and a gas-based apparatus, by a tank gas concentration analysis unit of a supply system configured to supply the supply gas stored in the tank to the gas-based apparatus, and d) determining, by the controller, whether the supply gas supplied to the gas-based apparatus is appropriate by comparing the concentration of the supply gas measured by the tank gas concentration analysis unit with the preset reference concentration range.

In d), the controller may open a tank gas supply line valve configured to

open or close the tank gas supply line when the concentration of the supply gas measured by the tank gas concentration analysis unit satisfies the reference concentration range, and may close the tank gas supply line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit
5 does not satisfy the reference concentration range.

In d), the controller may close a tank gas vent line valve configured to open or close a tank gas vent line branched off from the tank gas supply line and connected to an external unit when the concentration of the supply gas measured by the tank gas concentration analysis unit satisfies the reference concentration range,
10 and may open the tank gas vent line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the reference concentration range.

When the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the preset reference concentration range,
15 the controller may calculate a concentration correction value so that the concentration of the supply gas flowing through the tank gas supply line satisfies the reference concentration range, and then the controller may correct the concentration of the supply gas supplied to the tank through the mixing system by applying the concentration correction value to the mixing system.

20 The mixing system may further include a plurality of source gas supply lines through which a plurality of different types of source gases are supplied to the mixing unit, the plurality of source gas supply lines may include at least one pressure relief valve configured to adjust supply pressures of the plurality of different types of source gases and at least one mass flow controller configured to adjust supply flow
25 rates of the plurality of different types of the source gases, and in step d), when the

concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy a preset reference concentration range, the controller adjusts the pressure relief valve and the mass flow controller according to the concentration correction valve to adjust a ratio of each of the source gases mixed in the mixing unit
5 so as to correct the concentration of the supply gas supplied to the tank through the mixing gas supply line.

The supply system may further include a tank gas concentration analysis line branched off from the tank gas supply line and a tank gas concentration analysis line valve configured to open or close the tank gas concentration analysis line, and the
10 tank gas concentration analysis unit measures the concentration of the supply gas flowing through the tank gas concentration analysis line, and step c) is a step in which the controller opens the tank gas concentration analysis line valve, and thus the tank gas concentration analysis unit measures the concentration of the supply gas flowing from an inside of the tank via the tank gas supply line to the tank gas
15 concentration analysis line.

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
20 describing exemplary embodiments thereof in detail with reference to the accompanying drawings, in which:

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

FIG. 2 is a schematic view illustrating a gas mixing supply device and a
25 mixing system according to an embodiment of the present disclosure; and

FIG. 3 is a flowchart illustrating a gas mixing supply method according to the present disclosure.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

5 Hereinafter, configurations and operations of a gas mixing supply device and a mixing 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 and overlapping contents will be omitted, and descriptions will be made focusing on
10 components newly added to the present disclosure.

FIG. 2 illustrates a gas mixing supply device and a mixing system according to an embodiment of the present disclosure.

The gas mixing supply device according to the embodiment of the present disclosure includes a mixing system 100 that supplies a supply gas in which a
15 plurality of types of gases are mixed, a supply system 300 that supplies the supply gas stored in the tank 200 to a gas-based apparatus S, and a controller (not illustrated) that controls driving of the mixing system 100, the tank 200, and the supply system 300.

The mixing system 100 includes a mixing gas supply line 140 that allows the
20 supply gas to flow to the tank 200, a first vent line 150 and a second vent line 160 branched off from the mixing gas supply line 140 and connected to an external unit, a mixing gas concentration analysis unit 170 that measures the concentration of the supply gas flowing from the mixing gas supply line 140 to the second vent line 160, and a mixing gas pressure measurement unit 180 that measures the pressure of the
25 supply gas flowing from the mixing gas supply line 140 to the second vent line 160.

The controller controls the supply gas flowing through the mixing gas supply line 140 to flow to one of the tank 200 and the first vent line 150 by comparing the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 with a preset reference concentration range and by comparing the pressure of the supply gas measured by the mixing gas pressure measurement unit 180 with the internal pressure of the tank 200.

The mixing system 100, the tank 200, and the supply system 300 may be connected to each other to constitute the gas mixing supply device.

The mixing system 100, the tank 200, and the supply system 300 may be modular devices that are formed as independent separate devices but coupled to each other to constitute the gas mixing supply device.

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 system are one connected device.

Thus, the mixing system 100, the tank 200, and the supply system 300 may have a size suitable for a required capacity, a larger amount of the supply gas may be accommodated, and accordingly, the supply gas may be more stably supplied to the gas-based apparatus.

According to the modular gas mixing supply device, the tank 200 may include a first tank valve 221 that opens or closes a connection part connected to the mixing system 100, and a second tank valve 222 that opens or closes a connection part connected to the supply system 300, and the supply system 300 may include a supply system valve 351 that opens or closes a connection part connected to the tank

200.

The tank 200 is made of a material having a predetermined thickness, high stiffness, heat resistance, and pressure resistance to store high-temperature and high-pressure gas and is made of a material having chemical resistance and corrosion
5 resistance so as not to cause a change in properties 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
10 of the materials widely used in various fields.

The tank 200 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 200 may be provided with a tank pressure measurement unit 210 that measures the internal gas pressure.

15 The mixing system 100 may further include the plurality of source gas supply lines 110 and 120 to which a plurality of different types of source gases are supplied, and a mixing unit 130 in which the plurality of different types of source gases supplied from the plurality of source gas supply lines 110 and 120 are mixed to form the supply gas, and the mixing gas supply line 140 may be a configuration
20 connecting the mixing unit 130 and the tank 200.

The source gas supply lines 110 and 120 may be respectively connected to source gas supply tanks 101 and 102 configured to supply the source gases.

The source gas supply lines 110 and 120 may include one or more pressure relief valves 111 and 121 configured to adjust the supply pressures of the plurality of
25 different types of source gases and one or more mass flow controllers 112 and 122

configured to adjust the supply flow rates of the plurality of different types of source gases and may include source gas valves 113 and 123 configured to open or close the source gas supply lines 110 and 120 so as to control whether each source gas is supplied.

5 Driving of the pressure relief valves 111 and 121, the mass flow controllers 112 and 122, and the source gas valves 113 and 123 may be controlled by the controller.

The mixing system 100 may further include a mixing gas supply line valve 141 that opens or closes the mixing gas supply line 140.

10 The controller may control driving of the mixing gas supply line valve 141 to control whether to supply the supply gas mixed and formed in the mixing unit 130 to the tank 200.

The mixing system 100 may further include a first vent line valve 151 that opens or closes the first vent line 150.

15 The controller may control driving of the first vent line valve 151 to control whether to discharge the supply gas mixed and formed in the mixing unit 130 to the outside through the first vent line 150.

Further, when the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 satisfies the reference concentration range, and
20 when the concentration of the supply gas measured by the mixing gas pressure measurement unit 180 is higher than or equal to the gas pressure inside the tank 200, the controller may control the mixing gas supply line valve 141 to be opened and the first vent line valve 151 to be closed so that the supply gas supplied from the mixing unit 130 flows to and is stored in the tank 200 along the mixing gas supply line 140
25 without being discharged to the outside.

Further, when the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 does not satisfy the preset reference concentration range or when the pressure of the supply gas measured by the mixing gas pressure measurement unit 180 is lower than the gas pressure inside the tank 200, the controller may control the mixing gas supply line valve 141 to be closed and the first vent line valve 151 to be opened so that the supply gas flowing through the mixing gas supply line 140 is discharged to the outside, and at the same time, the supply of the supply gas to the tank 200 is blocked.

Accordingly, the supply gas whose concentration and pressure do not satisfy the preset range can be prevented from being stored in the tank 200, and the supply gas having a concentration and a pressure within a certain range can be stably stored in the tank 200.

Further, whether to supply the supply gas to the tank 200 is controlled by comparing the pressure of the supply gas flowing through the mixing gas supply line 140 and the gas pressure inside the tank 200 in real time, and thus a hunting phenomenon caused by a pressure difference in an initial supply can be prevented.

The mixing system 100 may further include a second vent line valve 161 that opens or closes the second vent line 160.

The mixing gas concentration analysis unit 170 and the mixing gas pressure measurement unit 180 measure the concentration and the pressure, respectively, of the supply gas when the supply gas flowing through the mixing gas supply line 140 flows to the second vent line 160.

Thus, the controller may control driving of the second vent line valve 161 to control whether to supply the supply gas to the second vent line 160 so as to control whether to measure the concentration and the pressure of the supply gas through the

mixing gas concentration analysis unit 170 and the mixing gas pressure measurement unit 180.

The second vent line 160 may be provided to have a cross-sectional area smaller than that of the first vent line 150 and may be formed to allow the supply gas, which has a minimum flow rate required for the mixing gas concentration analysis unit 170 and the mixing gas pressure measurement unit 180 to measure the concentration and the pressure of the gas, to flow.

That is, the second vent line 160 may be configured such that the supply gas having a significantly lower flow rate than those of the mixing gas supply line 140 and the first vent line 150 flows.

Accordingly, by measuring the concentration and the pressure in a state in which the supply gas flows to the second vent line 160, 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 concentration and the pressure are measured in a state in which the supply gas flows to the mixing gas supply line 140 or the first vent line 150.

The mixing system 100 may further include a mixing gas vent mass flow controller 152 that adjusts an opening degree of the first vent line 150.

The controller may adjust the mixing gas vent mass flow controller 152 to adjust a discharge amount of the supply gas discharged through the first vent line 150 so as to efficiently adjust the pressure of the supply gas flowing to the tank 200 through the mixing gas supply line 140.

The supply system 300 includes a tank gas supply line 320 that connects the tank 200 and the gas-based apparatus S, a tank gas vent line 330 that is branched off from the tank gas supply line 320 and connected to an external unit, and a tank gas concentration analysis unit 310 that measures the concentration of the supply gas

flowing through the tank gas supply line 320.

The controller determines whether the supply gas supplied to the gas-based apparatus S is appropriate by comparing the concentration of the supply gas measured by the tank gas concentration analysis unit 310 with a preset reference
5 concentration range.

The supply system 300 may further include a tank gas supply line valve 321 that opens or closes the tank gas supply line 320.

The controller may control driving of the tank gas supply line valve 321 to control whether to supply the supply gas stored in the tank 200 to the gas-based
10 apparatus S.

When the concentration of the supply gas measured by the tank gas concentration analysis unit 310 satisfies the reference concentration range, the controller may control the tank gas supply line valve 321 to be opened so as to supply the supply gas stored in the tank 200 to the gas-based apparatus S.

15 Further, when the concentration of the supply gas measured by the tank gas concentration analysis unit 310 does not satisfy the reference concentration range, the controller may control the tank gas supply line valve 321 to be closed to block the supply of the supply gas to the gas-based apparatus S.

The supply system 300 may further include a tank gas vent line 330
20 branched off from the tank gas supply line 320 and connected to an external unit, and a tank gas vent line valve 331 that opens or closes the tank gas vent line 330.

The controller may control the driving of the tank gas supply line valve 321 to control whether to discharge the supply gas flowing through the tank gas supply line 320 to the outside through the tank gas vent line 330.

25 When the concentration of the supply gas measured by the tank gas

concentration analysis unit 310 satisfies the reference concentration range, the controller may control the tank gas supply line valve 321 to be opened and the tank gas vent line valve 331 to be closed to allow the supply gas supplied from the tank 200 to flow to the gas-based apparatus S along the tank gas supply line 320 without
5 being discharged to the outside.

Further, when the concentration of the supply gas measured by the tank gas concentration analysis unit 310 does not satisfy the reference concentration range, the controller may control the tank gas supply line valve 321 to be closed and the tank gas vent line valve 331 to be opened to allow the supply gas supplied from the
10 tank 200 to be discharged to the outside through the tank gas vent line 330.

The supply system 300 further includes a tank gas concentration analysis line 340 branched off from the tank gas supply line 320 and a tank gas concentration analysis line valve 341 that opens or closes the tank gas concentration analysis line 340, and the tank gas concentration analysis unit 310 may be configured to measure
15 the concentration of the gas flowing along the tank gas concentration analysis line 340.

When the supply gas flowing through the tank gas supply line 320 flows to the tank gas concentration analysis line 340, the tank gas concentration analysis unit 310 measures the concentration of the corresponding supply gas.

20 Thus, the controller may control driving of the tank gas concentration analysis line valve 341 to control whether to supply the supply gas to the tank gas concentration analysis line 340 so as to control whether to measure the concentration of the supply gas through the tank gas concentration analysis unit 310.

The tank gas concentration analysis line 340 may be provided to have a
25 smaller cross-sectional area than that of the tank gas vent line 330 and may allow the

supply gas, which has a minimum flow rate required to measure the concentration of the gas, to flow due to the tank gas concentration analysis unit 310.

That is, the tank gas concentration analysis line 340 may be configured such that the supply gas having a significantly lower flow rate than those of the tank gas supply line 320 and the tank gas vent line 330 flows.

Accordingly, by measuring the concentration and the pressure in a state in which the supply gas flows to the tank gas concentration analysis line 340, 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 concentration and the pressure are measured in a state in which the supply gas flows to the tank gas supply line 320 or the tank gas vent line 330.

Further, when the concentration of the supply gas measured by the tank gas concentration analysis unit 310 does not satisfy the preset reference concentration range, the controller may calculate a concentration correction value so that the concentration of the supply gas flowing through the tank gas supply line 320 satisfies the reference concentration range.

The concentration correction value may be formed by the amount, the concentration, the pressure or the like of at least one source gas of the plurality of source gases supplied through the plurality of source gas supply lines 110 and 120 and mixed in the mixing unit 130 and may be formed by an increase value or a decrease value based on a setting value of the amount, the concentration, the pressure or the like of each source gas, which is preset in the mixing system 100.

The controller may apply the calculated concentration correction value to the mixing system 100 and correct the concentration of the supply gas supplied to the tank 200 through the mixing system 100 according to the concentration correction

value to perform control so that the concentration of the supply gas supplied to the gas-based apparatus S from the tank 200 satisfies an appropriate range.

In this case, when the concentration of the supply gas measured by the tank gas concentration analysis unit 310 does not satisfy the preset reference concentration range, the controller may control the driving of the pressure relief valves 111 and 121, the mass flow controllers 112 and 122, and the source gas valves 113 and 123 to adjust the ratios of the source gases introduced into and mixed in the mixing unit 130 so as to correct the concentration of the supply gas supplied from the mixing unit 130 to the tank 200.

Hereinafter, a gas mixing supply method using the gas mixing supply device and the mixing system of the present disclosure will be described with reference to FIG. 3.

Steps S10 to S40 are steps of supplying the supply gas to the tank 200 through the mixing system 100.

Step S10 is a step of mixing the plurality of source gases supplied through at least one source gas supply line 110 and 120 in the mixing unit 130 to form the supply gas.

The controller opens the source gas valves 113 and 123 to allow the source gas to flow from the source gas supply tanks 101 and 102 to the source gas supply lines 110 and 120 and, at the same time, adjusts the pressure relief valves 111 and 121 and the mass flow controllers 112 and 122 to adjust the pressure and the flow rate of the source gas so as to adjust the concentration of the supply gas mixed in the mixing unit 130.

Step S20 is a step of measuring the concentration and the pressure of the supply gas supplied from the mixing unit 130 to the mixing gas supply line 140 (S20-

1) and determining whether to store the supply gas supplied from the mixing unit 130 to the mixing gas supply line 140 in the tank 200 by the controller (S20-2).

The controller may open the second vent line valve 161 to allow the supply gas to flow to the second vent line 160 so as to respectively measure the concentration and the pressure by the mixing gas concentration analysis unit 170 and the mixing gas pressure measurement unit 180.

The controller determines whether to store the supply gas supplied from the mixing unit 130 to the mixing gas supply line 140 in the tank 200 by comparing the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 with the preset reference concentration range and comparing the pressure of the supply gas measured by the mixing gas pressure measurement unit 180 with the gas pressure inside the tank 200 measured by the tank pressure measurement unit 210.

To this end, the controller may open the second vent line valve 161 to allow the supply gas supplied from the mixing unit 130 to the mixing gas supply line 140 to flow to the second vent line 160.

When the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 does not satisfy the preset reference concentration range or the pressure measured by the mixing gas pressure measurement unit 180 is lower than the pressure inside the tank 200, the controller determines that the supply gas is not stored in the tank 200, and performs step S30 which will be described below.

Further, when the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 satisfies the preset reference concentration range or the pressure measured by the mixing gas pressure measurement unit 180 is higher than or equal to the pressure inside the tank 200, the controller determines that the

supply gas is stored in the tank 200, and performs step S40 which will be described below.

Step S30 is a step of discharging the supply gas flowing through the mixing gas supply line 140 to the outside.

5 The controller closes the mixing gas supply line valve 141 and opens the first vent line valve 151 to control the supply gas supplied from the mixing unit 130 to be discharged to the outside through the first vent line 150 without flowing to the tank 200.

 Accordingly, the supply gas that does not satisfy an appropriate
10 concentration range can be prevented from being stored in the tank 200, and as the supply gas having a pressure lower than the pressure inside the tank 200 flows through the mixing gas supply line 140, occurrence of a gas back flow and a hunting phenomenon can be prevented.

 In this case, the mixing gas vent mass flow controller 152 may be provided
15 to maintain a state adjusted to a predetermined opening degree.

 Further, the controller may control the mixing gas vent mass flow controller 152 to adjust the opening degree of the first vent line 150 so as to adjust the pressure of the supply gas flowing through the mixing gas supply line 140.

 Further, the mixing gas vent mass flow controller 152 may be provided to
20 enable manual adjustment.

 The controller performs step S30 until the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 satisfies the preset reference concentration range, and at the same time, the pressure of the supply gas measured by the mixing gas pressure measurement unit 180 satisfies a storage
25 condition that satisfies the pressure inside the tank 200 measured by the tank pressure

measurement unit 210, and performs step S40 when the storage condition is satisfied.

Step S40 is a step of introducing and storing the supply gas flowing through the mixing gas supply line 140 in the tank 200.

The controller controls the mixing gas supply line valve 141 to be opened
5 and the first vent line valve 151 to be closed so that the supply gas supplied from the mixing unit 130 flows to and is stored in the tank 200 through the mixing gas supply line 140 without being discharged to the outside through the first vent line 150.

Further, the controller maintains the tank gas supply line valve 321 in a closed state while the supply gas is stored in the tank 200.

10 Further, while step S40 is performed, the controller may check whether the supply gas having an appropriate concentration and an appropriate pressure is stored in the tank 200 by receiving the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 and the pressure of the supply gas measured by the mixing gas pressure measurement unit 180 in real time or at regular
15 time intervals.

Further, while step S40 is performed, the controller may perform step S30 when the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 does not satisfy the preset reference concentration range or the pressure measured by the mixing gas pressure measurement unit 180 is lower than
20 the pressure inside the tank 200.

That is, the controller may control the first vent line valve 151 and the mixing gas supply line valve 141 in real time according to the concentration of the supply gas measured by the mixing gas concentration analysis unit 170 and the pressure of the supply gas measured by the mixing gas pressure measurement unit
25 180, to store the supply gas having an appropriate concentration and an appropriate

pressure in the tank 200.

Step S40 may be performed until the pressure inside the tank 200 reaches a preset pressure upper limit value.

Steps S50 and S60 are steps of supplying the supply gas stored in the tank
5 200 to the gas-based apparatus S through the supply system 300.

Step S50 is a step in which the controller determines whether to supply the supply gas stored in the tank 200 to the gas-based apparatus S.

The controller determines whether to supply the supply gas supplied from the tank 200 to the tank gas supply line 320 to the gas-based apparatus S by
10 comparing the concentration of the supply gas measured by the tank gas concentration analysis unit 310 with the preset reference concentration range.

To this end, the controller may open the tank gas concentration analysis line valve 341 to allow the supply gas supplied from the tank 200 to the tank gas supply line 320 to flow to the tank gas concentration analysis line 340.

15 When the concentration of the supply gas supplied from the tank 200 satisfies the preset reference concentration range, the controller determines that the supply gas is supplied to the gas-based apparatus S, and performs step S60 which will be described below.

Further, when the concentration of the supply gas supplied from the tank 200
20 does not satisfy the preset reference concentration range, the controller determines that the supply gas is not supplied to the gas-based apparatus S, and performs step S70 which will be described below.

Step S60 is a step of allowing the supply gas to flow and be supplied through the tank gas supply line 320 in the gas-based apparatus S.

25 The controller controls the tank gas supply line valve 321 to be opened and

the tank gas vent line valve 331 to be closed so that the supply gas supplied from the tank 200 flows to and is consumed in the gas-based apparatus S through the tank gas supply line 320 without being discharged to the outside through the tank gas vent line 330.

- 5 Further, while step S60 is performed, the controller may check whether the supply gas having an appropriate concentration is supplied to the gas-based apparatus S by receiving the concentration of the supply gas measured by the tank gas concentration analysis unit 310 in real time or at regular time intervals.

 Further, while step S60 is performed, the controller may perform step S70,
10 which will be described below, when the concentration of the supply gas measured by the tank gas concentration analysis unit 310 does not satisfy the preset reference concentration range.

 That is, the controller may control the tank gas vent line valve 331 and the tank gas supply line valve 321 in real time according to the concentration of the
15 supply gas measured by the tank gas concentration analysis unit 310 so that the supply gas having an appropriate concentration is supplied to the gas-based apparatus S.

 Further, when the pressure inside the tank 200 reaches a lower pressure limit value as the supply gas stored in the tank 200 is supplied to the gas-based apparatus
20 S, the controller may perform steps S10 to S40 again to fill the tank 200 with the supply gas.

 In this case, while a state in which step S60 of supplying the supply gas to the gas-based apparatus S is performed is maintained, the controller may continuously supply the supply gas to the gas-based apparatus S by performing steps
25 S10 to S40.

Steps S70 and S80 are steps of correcting the concentration of the supply gas stored in the tank 200.

Step S70 is a step of discharging the supply gas flowing through the tank gas supply line 320 to the outside.

5 The controller controls the tank gas supply line valve 321 to be closed and the tank gas vent line valve 331 to be opened so that the supply gas supplied from the tank 200 is discharged to the outside through the tank gas vent line 330 without being supplied to the gas-based apparatus S through the tank gas supply line 320.

10 Accordingly, a function can be prevented from not being performed smoothly as the supply gas that does not satisfy an appropriate concentration range is supplied to the gas-based apparatus S.

Further, the controller maintains the mixing gas supply line valve 141 in a closed state while the supply gas stored in the tank 200 is discharged.

15 The controller performs step S70 until all of the supply gas stored in the tank 200 is discharged to the outside through the tank gas vent line 330, performs steps S10 to S40 again to store the supply gas in the tank 200, and then performs step S50 again to correct the concentration of the supply gas stored in the tank 200 to an appropriate concentration.

20 Further, the controller may correct the concentration of the supply gas stored in the tank 200 to an appropriate concentration by performing steps S10 to S50 again after performing step S80 which will be described below.

Step S80 is a step of correcting the concentration of the supply gas stored in the tank 200 by using a correction value calculated according to the concentration of the supply gas measured by the tank gas concentration analysis unit 310.

25 The controller may calculate the concentration correction value so that the

concentration of the supply gas flowing through the tank gas supply line 320 measured by the tank gas concentration analysis unit 310 satisfies the reference concentration range, and then may apply the concentration correction value to the mixing system 100.

- 5 Thereafter, as described above, by performing steps S10 to S50 again through the mixing system 100 to which the concentration correction value is applied, the concentration of the supply gas stored in the tank 200 may be corrected to an appropriate concentration.

 Accordingly, a function can be prevented from not being performed
10 smoothly as the supply gas that does not satisfy an appropriate concentration range is supplied to the gas-based apparatus S.

 As described above, according to the gas mixing supply method, the mixing system, and the gas mixing supply method, the first vent line 150 branched off from the mixing gas supply line 140 and connected to an external unit may be provided to
15 prevent the supply gas whose concentration and pressure do not satisfy preset error ranges from being stored in the tank 200 and to stably store the supply gas having a concentration and a pressure within a certain range in the tank 200.

 Further, the second vent line 160 branched off from the mixing gas supply line 140 and connected to an external unit may be provided, may be configured to
20 measure the pressure and the concentration of the supply gas flowing through the mixing gas supply line 140 using the supply gas flowing through the second vent line 160, and thus can more efficiently measure the pressure and the concentration of the supply gas by allowing a minimum amount of the mixing gas to flow.

 Further, a modular gas mixing supply device in which the mixing system 100,
25 the tank 200, and the supply system 300 are configured independently is configured,

and thus a larger amount of the supply gas can be accommodated and supplied stably.

According to a gas mixing supply device, a mixing system, and a gas mixing supply method according to the present disclosure, since a first vent line branched off from a mixing gas supply line and connected to an external unit is provided, a supply
5 gas whose concentration and pressure do not satisfy a preset error range can be prevented from being stored in a tank, and the supply gas having a concentration and a pressure within certain ranges can be stably stored in the tank.

Further, since a second vent line branched off from the mixing gas supply line is provided, and the pressure and the concentration of the supply gas flowing
10 through the mixing gas supply line are measured using the supply gas flowing through the second vent line, the pressure and the concentration of the supply gas can be more efficiently measured by allowing a minimum amount of the mixing gas to flow.

Further, since the mixing system, the tank, and the supply system are formed
15 as independent configurations, a larger amount of the supply gas can be 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
20 disclosure claimed by the appended claims, and the obvious modifications belong to the scope of the present disclosure.

CLAIMS:

1. A gas mixing supply device comprising:

a mixing system configured to supply a supply gas, in which a plurality of
5 types of gases are mixed, to a tank;

a supply system configured to supply the supply gas stored in the tank to a
gas-based apparatus; and

a controller configured to control driving of the mixing system, the tank, and
the supply system,

10 wherein the mixing system includes a mixing gas supply line that allows the
supply gas to flow to the tank, a first vent line and a second vent line branched off
from the mixing gas supply line and connected to an external unit, a mixing gas
concentration analysis unit configured to measure a concentration of the supply gas
flowing from the mixing gas supply line to the second vent line, and a mixing gas
15 pressure measurement unit configured to measure a pressure of the supply gas
flowing from the mixing gas supply line to the second vent line, and

wherein the controller controls the supply gas flowing through the mixing
gas supply line to flow to one of the tank and the first vent line by comparing the
concentration of the supply gas measured by the mixing gas concentration analysis
20 unit with a preset reference concentration range and by comparing the pressure of the
supply gas measured by the mixing gas pressure measurement unit with an internal
pressure of the tank.

2. The gas mixing supply device of claim 1, wherein the mixing system
25 includes a mixing gas supply line valve configured to open or close the mixing gas

supply line, and a first vent line valve configured to open or close the first vent line,

wherein the controller opens the mixing gas supply line valve and closes the first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit satisfies the reference concentration range and the pressure of the supply gas measured by the mixing gas pressure measurement unit is higher than or equal to a gas pressure inside the tank, and

wherein the controller closes the mixing gas supply line valve and opens the first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit does not satisfy the reference concentration range or when the pressure of the supply gas measured by the mixing gas pressure measurement unit is lower than the gas pressure inside the tank.

3. The gas mixing supply device of claim 1, wherein the mixing system includes a second vent line valve configured to open or close the second vent line, and

wherein the controller controls driving of the second vent line valve to control whether to supply the supply gas to the second vent line so as to control whether to measure the concentration and the pressure of the supply gas.

4. The gas mixing supply device of claim 1, wherein the second vent line has a cross-sectional area that is smaller than that of the first vent line.

5. The gas mixing supply device of claim 1, wherein the mixing system further includes a mixing gas vent mass flow controller configured to adjust an opening degree of the first vent line to adjust a discharge amount of the supply gas

discharged through the first vent line.

6. The gas mixing supply device of claim 1, wherein the mixing system further includes a plurality of source gas supply lines and a mixing unit in which a
5 plurality of different types of source gases supplied from the plurality of source gas supply lines are mixed to form the supply gas, wherein the plurality of different types of source gases are each supplied to one of the plurality of source gas supply lines, and

wherein the mixing gas supply line connects the mixing unit and the tank.
10

7. The gas mixing supply device of claim 1, wherein the supply system includes a tank gas supply line connecting the tank and the gas-based apparatus and a tank gas concentration analysis unit configured to measure the concentration of the supply gas flowing through the tank gas supply line, and

15 wherein the controller determines whether the supply gas supplied to the gas-based apparatus is appropriate by comparing the concentration of the supply gas measured by the tank gas concentration analysis unit with the preset reference concentration range.

20 8. The gas mixing supply device of claim 1, wherein the supply system includes a tank gas supply line valve configured to open or close the tank gas supply line, and

wherein the controller opens the tank gas supply line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit
25 satisfies the reference concentration range, and the controller closes the tank gas

supply line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the reference concentration range.

9. The gas mixing supply device of claim 1, wherein the supply system
5 includes a tank gas vent line branched off from the tank gas supply line and connected to an external unit and a tank gas vent line valve configured to open or close the tank gas vent line, and

wherein the controller closes the tank gas vent line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit
10 satisfies the reference concentration range, and the controller opens the tank gas vent line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the reference concentration range.

10. The gas mixing supply device of claim 6, wherein, when the
15 concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the preset reference concentration range, the controller calculates a concentration correction value so that the concentration of the supply gas flowing through the tank gas supply line satisfies the reference concentration range, and then the controller corrects the concentration of the supply gas supplied to the tank
20 through the mixing system by applying the concentration correction value to the mixing system.

11. The gas mixing supply device of claim 10, wherein the plurality of source gas supply lines include at least one pressure relief valve configured to adjust
25 supply pressures of the plurality of different types of source gases and at least one

mass flow controller configured to adjust supply flow rates of the plurality of different types of source gases, and

wherein, when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the preset reference concentration range,
5 the controller adjusts the pressure relief valve and the mass flow controller according to the concentration correction value to adjust a ratio of each of the source gases mixed in the mixing unit so as to correct the concentration of the supply gas supplied to the tank through the mixing gas supply line.

10 12. The gas mixing supply device of claim 1, wherein the mixing system, the tank, and the supply system are modular devices that are formed as independent separate devices but coupled to each other.

13. A mixing system comprising:
15 a plurality of source gas supply lines and a mixing unit in which a plurality of different types of source gases supplied from the plurality of source gas supply lines are mixed to form a supply gas, wherein the plurality of different types of source gases are each supplied to one of the plurality of source gas supply lines,

a mixing gas supply line allowing the supply gas to flow to a tank;
20 a first vent line branched off from the mixing gas supply line and connected to an external unit;

a second vent line branched off from the mixing gas supply line and connected to an external unit;

a mixing gas concentration analysis unit configured to measure a
25 concentration of the supply gas flowing from the mixing gas supply line to the

second vent line;

a mixing gas pressure measurement unit configured to measure a pressure of the supply gas flowing from the mixing gas supply line to the second vent line; and

a controller configured to control the supply gas flowing through the mixing
5 gas supply line to flow to one of the tank and the first vent line by comparing the concentration of the supply gas measured by the mixing gas concentration analysis unit with a preset reference concentration range and by comparing the pressure of the supply gas measured by the mixing gas pressure measurement unit with an internal pressure of the tank.

10

14. The mixing system of claim 13, further comprising a mixing gas supply line valve configured to open or close the mixing gas supply line and a first vent line valve configured to open or close the first vent line,

wherein the controller opens the mixing gas supply line valve and closes the
15 first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit satisfies the reference concentration range, and the controller closes the mixing gas supply line valve and opens the first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit does not satisfy the reference concentration range.

20

15. The mixing system of claim 13, further comprising a mixing gas valve configured to open or close the mixing gas supply line and a first vent line valve configured to open or close the first vent line,

wherein the controller opens the mixing gas supply line valve and closes the
25 first vent line valve when the pressure of the supply gas measured by the mixing gas

pressure measurement unit is larger than or equal to a gas pressure inside the tank, and the controller closes the mixing gas supply line valve and opens the first vent line valve when the pressure of the supply gas measured by the mixing gas pressure measurement unit is smaller than the gas pressure inside the tank.

5

16. The mixing system of claim 15, further comprising a second vent line valve configured to open or close the second vent line,

wherein the controller controls driving of the second vent line valve to control whether to measure the concentration and the pressure of the supply gas through the mixing gas concentration analysis unit and the mixing gas pressure measurement unit.

10

17. The mixing system of claim 15, wherein the second vent line has a cross-sectional area that is smaller than that of the first vent line.

15

18. The mixing system of claim 15, further comprising a mixing gas vent mass flow controller configured to adjust an opening degree of the first vent line so as to adjust a discharge amount of the supply gas discharged through the first vent line.

20

19. The mixing system of claim 15, further comprising a plurality of source gas supply lines and a mixing unit in which a plurality of different types of source gases supplied from the plurality of source gas supply lines are mixed to form the supply gas, wherein the plurality of different types of source gases are each supplied to one of the plurality of source gas supply lines,

25

wherein the mixing gas supply line is configured to connect the mixing unit and the tank.

20. The mixing system of claim 19, wherein the supply gas stored in the tank is supplied to a gas-based apparatus through a supply system, and the supply system includes a tank gas concentration analysis unit configured to measure the concentration of the supply gas flowing from the tank to the gas-based apparatus,

wherein, when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the preset reference concentration range, a concentration correction value calculated so that the concentration of the supply gas flowing through the tank gas supply line satisfies the reference concentration range is transferred from the supply system to the controller, and

wherein the controller adjusts the pressure relief valve and the mass flow controller according to the concentration correction value to adjust a ratio of each of the source gases mixed in the mixing unit so as to correct the concentration of the supply gas supplied to the tank through the mixing gas supply line.

21. A gas mixing supply method using a mixing system in which a plurality of types of gases are mixed in a mixing unit to form a supply gas and then the supply gas is supplied to and stored in a tank through a mixing gas supply line, the method comprising the steps of:

a) measuring a concentration and a pressure of the supply gas flowing from the mixing gas supply line to a second vent line by allowing the supply gas to flow to the second vent line branched off from the mixing gas supply line, connected to an external unit, and including a mixing gas concentration analysis unit configured to

measure the concentration of the supply gas and a mixing gas pressure measurement unit configured to measure the pressure of the supply gas; and

b) controlling, by a controller, the supply gas flowing through the mixing gas supply line to flow to the tank and the first vent line by comparing the concentration of the supply gas measured by the mixing gas concentration analysis unit with a
5 preset reference concentration range and by comparing the pressure of the supply gas measured by the mixing gas pressure measurement unit with an internal pressure of the tank.

10 22. The gas mixing supply method of claim 21, wherein in step b), the controller opens a mixing gas supply line valve configured to open or close the mixing gas supply line and closes a first vent line valve configured to open or close the first vent line when the concentration of the supply gas measured by the mixing gas concentration analysis unit satisfies the reference concentration and the pressure
15 of the supply gas measured by the mixing gas pressure measurement unit is larger than or equal to a gas pressure inside the tank, and the controller closes the mixing gas supply line valve and opens the first vent line valve when the concentration of the supply gas measured by the mixing gas concentration analysis unit does not
20 satisfy the reference concentration or when the pressure of the supply gas measured by the mixing gas pressure measurement unit is smaller than the gas pressure inside the tank.

23. The gas mixing supply method of claim 21, wherein in step b), the controller controls driving of a second vent line valve configured to open or close the
25 second vent line to control whether to supply the supply gas to the second vent line

so as to control driving of the mixing gas concentration analysis unit and the mixing gas pressure measurement unit.

24. The gas mixing supply method of claim 21, wherein in step b), when a
5 first vent line valve for opening and closing the first vent line is opened by the control unit to discharge the supply gas to the outside through the first vent line, the controller adjusts a mixing gas vent mass flow controller configured to adjust an opening degree of the first vent line to adjust a discharge amount of the supply gas discharged through the first vent line.

10

25. The gas mixing supply method of claim 21, further comprising the steps of:

c) measuring the concentration of the supply gas flowing through a tank gas supply line connecting the tank and a gas-based apparatus, by a tank gas
15 concentration analysis unit of a supply system configured to supply the supply gas stored in the tank to the gas-based apparatus; and

d) determining, by the controller, whether the supply gas supplied to the gas-based apparatus is appropriate by comparing the concentration of the supply gas measured by the tank gas concentration analysis unit with the preset reference
20 concentration range.

26. The gas mixing supply method of claim 25, wherein in step d), the controller opens a tank gas supply line valve configured to open or close the tank gas supply line when the concentration of the supply gas measured by the tank gas
25 concentration analysis unit satisfies the reference concentration range, and the

controller closes the tank gas supply line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the reference concentration range.

5 27. The gas mixing supply method of claim 25, wherein in step d), the controller closes a tank gas vent line valve configured to open or close a tank gas vent line branched off from the tank gas supply line and connected to an external unit when the concentration of the supply gas measured by the tank gas concentration analysis unit satisfies the reference concentration range, and the controller opens the
10 tank gas vent line valve when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the reference concentration range.

 28. The gas mixing supply method of claim 25, wherein in step d), when
15 the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy the preset reference concentration range, the controller calculates a concentration correction value so that the concentration of the supply gas flowing through the tank gas supply line satisfies the reference concentration range, and then the controller corrects the concentration of the supply gas supplied to the
20 tank through the mixing system by applying the concentration correction value to the mixing system.

 29. The gas mixing supply method of claim 28, wherein the mixing system further includes a plurality of source gas supply lines through which a plurality of
25 different types of source gases are supplied to the mixing unit,

wherein the plurality of source gas supply lines include at least one pressure relief valve configured to adjust supply pressures of the plurality of different types of source gases and at least one mass flow controller configured to adjust supply flow rates of the plurality of different types of the source gases, and

5 wherein in step d), when the concentration of the supply gas measured by the tank gas concentration analysis unit does not satisfy a preset reference concentration range, the controller adjusts the pressure relief valve and the mass flow controller according to the concentration correction valve to adjust a ratio of each of the source gases mixed in the mixing unit so as to correct the concentration of the supply gas
10 supplied to the tank through the mixing gas supply line.

30. The gas mixing supply method of claim 25, wherein the supply system further includes a tank gas concentration analysis line branched off from the tank gas supply line and a tank gas concentration analysis line valve configured to open or
15 close the tank gas concentration analysis line,

wherein the tank gas concentration analysis unit measures the concentration of the supply gas flowing through the tank gas concentration analysis line, and

wherein step c) is a step in which the controller opens the tank gas concentration analysis line valve, and thus the tank gas concentration analysis unit
20 measures the concentration of the supply gas flowing from an inside of the tank via the tank gas supply line to the tank gas concentration analysis line.