from the gas supply line in the gas solution supplied from the first gas-liquid separator; a first valve provided on a liquid supply line that supplies liquid as a material of the gas solution; a second valve provided on a gas solution supply line that supplies the gas solution to the use point; a third valve provided on an exhaust line from the first gas-liquid separator to an exhaust port; a fourth valve provided on a drain line branching from the exhaust line; and a control unit that performs open and close control of the first valve, the second valve, the third valve, and the fourth valve. The control unit is configured to: when the gas solution is to be supplied to the use point, perform control to open the first valve, the second valve and the third valve and close the fourth valve, and when the first gas-liquid separator and the second gas-liquid separator are to be cleaned, perform control to close the second valve and the third valve and open the first valve and the fourth valve.

[0008] In this arrangement, the pressure booster pump is provided at a stage preceding the second gas-liquid separator, so that the pressure in the second gas-liquid separator can be increased and a high concentration of gas solution is possible. In addition, providing the second gas-liquid separator at a stage subsequent to the pressure booster pump may result in damper effect, making it possible to suppress fluctuations in delivery pressure of gas solution being supplied from the second gas-liquid separator to the use point.

[0008a] With this arrangement, gas solution can be supplied to the use point by opening the first, the second and the

third valves and closing the fourth valve, while the first gas-liquid separator and the second gas-liquid separator can be cleaned by closing the second and the third valves and opening the first and the fourth valves.

[0009] In the gas solution supply device according to an embodiment of the present invention, the first gas-liquid separator may include a circulating supply line for circulating and supplying unused gas solution at the use point.

[0010] With this arrangement, unused gas solution at the use point can be recycled and usage of gas as a material of gas solution can be reduced. Since in this case the first gas-liquid separator, to which unused gas solution at the use point is supplied, is provided at a stage preceding the pressure booster pump, there is no need for a pump to increase the pressure of the unused gas solution.

[0011] In the gas solution supply device according to an embodiment of the present invention, the first gas-liquid separator may include a liquid supply line through which liquid as a material of

the gas solution is supplied, and the liquid supply line may include a second gas dissolving unit that dissolves undissolved excess gas discharged from the second gas-liquid separator in the liquid as a material of the gas solution.

[0012] With this arrangement, undissolved excess gas discharged from the second gas-liquid separator can be recycled and usage of gas as a material of gas solution can be reduced.

[0013]

[0014]

[0015] A method according to another aspect of the present invention is a method for execution in a gas solution supply device, the gas solution supply device including: a first gas-liquid separator in which gas solution is stored; a second gas-liquid separator which is provided at a stage subsequent to the first gas-liquid separator and in which gas solution to be supplied to a use point is stored; an intermediate line provided between the first gas-liquid separator and the second gas-liquid separator; and a pressure booster pump that is provided on the intermediate line and increases a pressure of gas solution being supplied from the first gas-liquid separator to the second gas-liquid separator; a first valve provided on a liquid supply line that supplies liquid as a material of the gas solution; a second valve provided on a gas solution supply line that supplies the gas solution to the use point; a third valve provided on an exhaust line from the first gas-liquid separator to an exhaust port; and a fourth valve provided on a drain line branching from the exhaust line. The method includes the steps of supplying gas as a material of the gas solution to the intermediate line, dissolving the supplied gas in the gas solution supplied from the first gas-liquid separator, when the gas solution is to be supplied to the use point, opening the first valve, the second valve and the third valve and closing the fourth valve, and when the first gas-liquid separator and the second gas-liquid separator are to be cleaned, closing the second valve and the third valve and opening the first valve and the fourth valve.

[0016] This method can also increase the pressure in the second gas-liquid separator and enable a high concentration of gas solution because the pressure

booster pump is provided at a stage preceding the second gas-liquid separator as with the device above. Further, providing the second gas-liquid separator at a stage subsequent to the pressure booster pump may result in damper effect, making it possible to suppress fluctuations in delivery pressure of gas solution being supplied from the second gas-liquid separator to the use point.

[0017]

[0018] According to this method, gas solution can be supplied to the use point by opening the first, the second and the third valves and closing the fourth valve, while the first gas-liquid separator and the second gas-liquid separator can be cleaned by closing the second and

What is claimed is:

1. A gas solution supply device comprising:

a first gas-liquid separator in which gas solution is stored;

a second gas-liquid separator which is provided at a stage subsequent to the first gas-liquid separator and in which gas solution to be supplied to a use point is stored;

an intermediate line provided between the first gas-liquid separator and the second gas-liquid separator;

a pressure booster pump that is provided on the intermediate line and increases a pressure of gas solution being supplied from the first gas-liquid separator to the second gas-liquid separator;

a gas supply line that supplies gas as a material of the gas solution;

a gas dissolving unit that is provided on the intermediate line and dissolves the gas supplied from the gas supply line in the gas solution supplied from the first gas-liquid separator;

a first valve provided on a liquid supply line that supplies liquid as a material of the gas solution;

a second valve provided on a gas solution supply line that supplies the gas solution to the use point;

a third valve provided on an exhaust line from the first gas-liquid separator to an exhaust port;

a fourth valve provided on a drain line branching from the exhaust line; and

a control unit that performs open and close control of the first valve, the second valve, the third valve, and the fourth valve,

wherein the control unit is configured to:

when the gas solution is to be supplied to the use point, perform control to open the first valve, the second valve and the third valve and close the fourth valve, and

when the first gas-liquid separator and the second gas-liquid separator are to be cleaned, perform control to close the second valve and the third valve and open the first valve and the fourth valve.

2. The gas solution supply device according to claim 1, wherein the first gas-liquid separator comprises a circulating supply line for circulating and supplying unused gas solution at the use point.

3. The gas solution supply device according to claim 1 or 2, wherein

the first gas-liquid separator comprises a liquid supply line through which liquid as a material of the gas solution is supplied; and

the liquid supply line comprises a second gas dissolving unit that dissolves undissolved excess gas

discharged from the second gas-liquid separator in the liquid as a material of the gas solution.

4. A method for execution in a gas solution supply device, the gas solution supply device comprising:

a first gas-liquid separator in which gas solution is stored;

a second gas-liquid separator which is provided at a stage subsequent to the first gas-liquid separator and in which gas solution to be supplied to a use point is stored;

an intermediate line provided between the first gas-liquid separator and the second gas-liquid separator;

a pressure booster pump that is provided on the intermediate line and increases a pressure of gas solution being supplied from the first gas-liquid separator to the second gas-liquid separator;

a first valve provided on a liquid supply line that supplies liquid as a material of the gas solution;

a second valve provided on a gas solution supply line that supplies the gas solution to the use point;

a third valve provided on an exhaust line from the first gas-liquid separator to an exhaust port; and

a fourth valve provided on a drain line branching from the exhaust line, and

the method comprising the steps of:

supplying gas as a material of the gas solution to the intermediate line;

dissolving the supplied gas in the gas solution supplied from the first gas-liquid separator;

when the gas solution is to be supplied to the use point, opening the first valve, the second valve and the third valve and closing the fourth valve; and

when the first gas-liquid separator and the second gas-liquid separator are to be cleaned, closing the second valve and the third valve and opening the first valve and the fourth valve.