CLAIMS

[Claim 1]

An internal air adjustment device that adjusts a composition of internal air existing inside a storage box (1), comprising:

a first composition adjustment unit (40) that includes a first separation unit (41) that separates supply air from external air existing outside the storage box (1) by a gas separation film (85), the supply air having a composition that differs from a composition of the external air, the first composition adjustment unit (40) supplying the supply air into the storage box (1);

a second composition adjustment unit (60) that includes a second separation unit (61) that separates discharge air from the internal air existing inside the storage box (1) by a gas separation film (85), the discharge air having a composition that differs from the composition of the internal air, the second composition adjustment unit (60) discharging the discharge air to outside of the storage box (1), the second composition adjustment unit (60) being configured to be capable of supplying air whose composition has been adjusted into the storage box (1); and

an air pump (36, 37) that supplies air into the first separation unit (41) and the second separation unit (61),

wherein the internal air adjustment device includes a pressure regulator (39, 46, 66, 48, 68) that regulates a pressure of air that is supplied from the air pump (36, 37) to at least one of the first separation unit (41) and the second separation unit (61), the regulation of pressure provided to adjust a separation performance of the respective gas separation film of the at least one of the first separation unit (41) and the second separation unit (61).

[Claim 2]

The internal air adjustment device according to Claim 1, wherein the pressure

regulator (39, 46, 66, 48, 68) includes a valve mechanism (46, 66) provided on a downstream side with respect to the respective gas separation film (85) of the at least one of the first separation unit (41) and the second separation unit (61).

[Claim 3]

The internal air adjustment device according to Claim 2, wherein the pressure regulator (66) is provided on a downstream side with respect to the separation film (85) of the second composition adjustment unit (60).

[Claim 4]

The internal air adjustment device according to Claim 2, wherein the pressure regulator (46, 66) is provided respectively on a downstream side with respect to the separation film (85) of the first composition adjustment unit (40) and on a downstream side with respect to the separation film (85) of the second composition adjustment unit (60).

[Claim 5]

The internal air adjustment device according to Claim 1, wherein the pressure regulator (48, 68) is provided on an inflow side where air flows into the air pump (36, 37).

[Claim 6]

The internal air adjustment device according to Claim 1, wherein the pressure regulator (48, 68) is provided on an outflow side where air flows out from the air pump (36, 37).

[Claim 7]

The internal air adjustment device according to Claim 1, wherein the pressure regulator (39, 46, 66) includes an inverter (39) that changes a flow rate by changing a frequency of an electric current that is supplied to the air pump (36, 37).

[Claim 8]

The internal air adjustment device according to any one of Claims 1 to 7, comprising:

in place of the first composition adjustment unit (40), an adsorption unit (234, 235) that is provided with an absorbent, and that separates nitrogen and oxygen/carbon dioxide from the internal air in the storage box (1) and that is capable of producing low oxygen concentration gas and high oxygen concentration gas, the low oxygen concentration gas having a nitrogen concentration that is higher than a nitrogen concentration of the internal air and an oxygen concentration and a carbon dioxide concentration that are lower than an oxygen concentration and a carbon dioxide concentration of the internal air, the high oxygen concentration gas having a nitrogen concentration that is lower than the nitrogen concentration of the internal air and an oxygen concentration and a carbon dioxide concentration that are higher than the oxygen concentration and the carbon dioxide concentration of the internal air.

[Claim 9]

The internal air adjustment device according to any one of Claims 1 to 8, comprising:

a concentration measurement instrument (90) that measures a carbon dioxide concentration and an oxygen concentration inside the storage box (1); and

a controller (110) that controls the pressure of the air that is supplied from the air pump (36, 37) by the pressure regulator (39, 46, 66, 48, 68) so as to bring measured values of the concentration measurement instrument (90) close to a predetermined target value of the carbon dioxide concentration and a predetermined target value of the oxygen concentration, to thereby regulate a separation pressure of the gas separation film (85).

[Claim 10]

The internal air adjustment device according to Claim 9, wherein when the carbon

dioxide concentration inside the storage box (1) is higher than the target value and the oxygen concentration inside the storage box (1) is also higher than the target value, the controller (110) causes the first composition adjustment unit (40) to produce a low oxygen concentration gas having an oxygen concentration that is lower than an oxygen concentration of the external air to supply the low oxygen concentration gas into the storage box (1), and causes a separation pressure of the gas separation film (85) of the second composition adjustment unit (60) to be reduced to reduce a discharge amount of gas that is discharged to the outside of the storage box (1).

[Claim 11]

The internal air adjustment device according to Claim 9,

wherein when the carbon dioxide concentration in the storage box (1) is lower than the target value and the oxygen concentration in the storage box (1) is higher than the target value, the controller (110) causes the first composition adjustment unit (40) to produce a low oxygen concentration gas having an oxygen concentration that is lower than an oxygen concentration of the external air to supply the low oxygen concentration gas into the storage box (1), and causes a separation pressure of the gas separation film (85) of the second composition adjustment unit (60) to be increased to increase an amount of the air whose composition has been adjusted and that is returned to the storage box (1).

[Claim 12]

The internal air adjustment device according to Claim 9,

wherein when the carbon dioxide concentration in the storage box (1) is lower than the target value and the oxygen concentration in the storage box (1) is also lower than the target value, the controller (110) causes a high oxygen concentration gas having an oxygen concentration that is higher than an oxygen concentration of the external air produced by the first composition adjustment unit (40) or the external air to be supplied into the storage

box (1), and causes a separation pressure of the gas separation film (85) of the second composition adjustment unit (60) to be increased to increase an amount of the air whose composition has been adjusted and that is returned to the storage box (1).

[Claim 13]

The internal air adjustment device according to Claim 9, wherein when the carbon dioxide concentration in the storage box (1) is higher than the target value and the oxygen concentration in the storage box (1) is lower than the target value, the controller (110) performs an operation in which the external air is supplied into an internal space (1) and a carbon dioxide gas produced by increasing a separation pressure of the gas separation film (85) of the second composition adjustment unit (60) and having a carbon dioxide concentration that is higher than a carbon dioxide concentration of the internal air is discharged into an external space (1), or an operation in which a high oxygen concentration gas produced by the first composition adjustment unit (40) and having an oxygen concentration that is higher than an oxygen concentration of the external air is supplied into the internal space (1), and the separation pressure of the separation film (85) of the second composition adjustment unit (60) is reduced to reduce an amount of air whose composition has been adjusted and that is discharged to the outside of the storage box (1).