1. A container refrigeration apparatus which includes a refrigerant circuit (20) performing a refrigeration cycle, and which is attached to a container (11) that stores breathing plants (15) to cool air in the interior of the container (11), the container refrigeration apparatus comprising:

first and second adsorbers (34) and (35) each provided with an adsorbent adsorbing nitrogen in the air;

a pressurization portion (31a) which pressurizes one of the first and second adsorbers (34) and (35) by supplying the one adsorber with the air to perform an adsorption operation of adsorbing nitrogen in the air onto the associated adsorbent;

a depressurization portion (31b) which depressurizes the other of the first and second adsorbers (34) and (35) by sucking the air from the other adsorber to perform a desorption operation of desorbing nitrogen from the associated adsorbent;

switchers (32, 33) which alternately switch between a first operation state where the depressurization portion (31b) sucks the air from the second adsorber (35) while the pressurization portion (31a) supplies the air to the first adsorber (34), and a second operation state where the depressurization portion (31b) sucks the air from the first adsorber (34) while the pressurization portion (31a) supplies the air to the second adsorber (35); and

a supplier (44) which supplies the interior of the container (11) with a gas mixture including nitrogen desorbed from the adsorbent.

2. The container refrigeration apparatus of claim 1, further comprising

a casing (12) forming an internal storage space (S2) connected to the interior of the container (11), and an external storage space (S1) connected to the exterior of the container

(11), wherein

the first and second adsorbers (34) and (35), the pressurization portion (31a), and the depressurization portion (31b) are disposed in the external storage space (S1).

3. The container refrigeration apparatus of claim 2, further comprising

a unit case (70) housing the first and second adsorbers (34) and (35), the pressurization portion (31a), and the depressurization portion (31b).

4. The container refrigeration apparatus of claim 3, further comprising:

a pump mechanism (31P) functioning as the pressurization portion (31a) and the depressurization portion (31b); and

a motor (31M) driving the pump mechanism (31P), wherein

at least part of the motor (31M) is disposed outside the unit case (70).

5. The container refrigeration apparatus of claim 1, further comprising:

a casing (12) forming an internal storage space (S2) connected to the interior of the container (11), and an external storage space (S1) connected to the exterior of the container (11), wherein

the pressurization portion (31a) is configured as an air compressor sucking and compressing air, and is disposed in the external storage space (S1), and

the first and second adsorbers (34) and (35) are disposed in the internal storage space (S2).

6. The container refrigeration apparatus of claim 1, further comprising:

a casing (12) forming an internal storage space (S2) connected to the interior of the

container (11), and an external storage space (S1) connected to the exterior of the container (11), wherein

the refrigerant circuit (20) includes an evaporator (24) exchanging heat between the air in the interior of the container (11) and a refrigerant to cool the air, and

the first and second adsorbers (34) and (35) are disposed near the evaporator (24) in the internal storage space (S2).

7. The container refrigeration apparatus of any one of claims 1–6, wherein

the adsorbent has the property of adsorbing both moisture and nitrogen in air, and

the depressurization portion (31b) is configured to suck the air from the first and second adsorbers (34) and (35) to desorb both nitrogen and moisture from the respective adsorbents of the first and second adsorbers (34) and (35).

8. The container refrigeration apparatus of any one of claims 1–7, wherein

the pressurization portion (31a) and the depressurization portion (31b) are configured as oil-less pumps.

9. The container refrigeration apparatus of claim 1 or 2, further comprising:

a unit case (70) housing at least the pressurization portion (31a);

an intra-case temperature sensor (95) detecting a temperature in the unit case (70); and

a controller (55) adjusting a time interval at which the switchers (32, 33) switch between the first and second operation states in accordance with a measured valve of the intra-case temperature sensor (95).

CLAIMS

1. A container refrigeration apparatus which includes a refrigerant circuit (20) performing a refrigeration cycle, and which is attached to a container (11) that stores breathing plants (15) to cool air in the interior of the container (11), the container refrigeration apparatus comprising:

first and second adsorbers (34) and (35) each provided with an adsorbent adsorbing nitrogen in the air;

a pressurization portion (31a) which pressurizes one of the first and second adsorbers (34) and (35) by supplying the one adsorber with the air to perform an adsorption operation of adsorbing nitrogen in the air onto the associated adsorbent;

a depressurization portion (31b) which depressurizes the other of the first and second adsorbers (34) and (35) by sucking the air from the other adsorber to perform a desorption operation of desorbing nitrogen from the associated adsorbent;

switchers (32, 33) which alternately switch between a first operation state where the depressurization portion (31b) sucks the air from the second adsorber (35) while the pressurization portion (31a) supplies the air to the first adsorber (34), and a second operation state where the depressurization portion (31b) sucks the air from the first adsorber (34) while the pressurization portion (31a) supplies the air to the second adsorber (35);

a supplier (44) which supplies the interior of the container (11) with a gas mixture including nitrogen desorbed from the adsorbent; and

a casing (12) forming an internal storage space (S2) connected to the interior of the container (11), and an external storage space (S1) connected to the exterior of the container (11), wherein

in the external storage space (S1), a condenser (22) of the refrigerant circuit (20) and an exterior fan (25) sending the condenser (22) air in the exterior of the container (11) are formed, and

the first and second adsorbers (34) and (35), the pressurization portion (31a), and the depressurization portion (31b) are disposed upstream of the condenser (22) in the external storage space (S1).

2. The container refrigeration apparatus of claim 1, further comprising

a unit case (70) housing the first and second adsorbers (34) and (35), the pressurization portion (31a), and the depressurization portion (31b).

3. A container refrigeration apparatus which includes a refrigerant circuit (20) performing a refrigeration cycle, and which is attached to a container (11) that stores breathing plants (15) to cool air in the interior of the container (11), the container refrigeration apparatus comprising:

first and second adsorbers (34) and (35) each provided with an adsorbent adsorbing nitrogen in the air;

a pressurization portion (31a) which pressurizes one of the first and second adsorbers (34) and (35) by supplying the one adsorber with the air to perform an adsorption operation of adsorbing nitrogen in the air onto the associated adsorbent;

a depressurization portion (31b) which depressurizes the other of the first and second adsorbers (34) and (35) by sucking the air from the other adsorber to perform a desorption operation of desorbing nitrogen from the associated adsorbent;

switchers (32, 33) which alternately switch between a first operation state where the depressurization portion (31b) sucks the air from the second adsorber (35) while the pressurization portion (31a) supplies the air to the first adsorber (34), and a second operation state where the depressurization portion (31b) sucks the air from the first adsorber (34) while the pressurization portion (31a) supplies the air to the second adsorber (35);

a supplier (44) which supplies the interior of the container (11) with a gas mixture including nitrogen desorbed from the adsorbent; and

a casing (12) forming an internal storage space (S2) connected to the interior of the container (11), and an external storage space (S1) connected to the exterior of the container (11), wherein

the first and second adsorbers (34) and (35), the pressurization portion (31a), and the depressurization portion (31b) are disposed in the external storage space (S1),

the container refrigeration apparatus of claim 1 further comprises:

a unit case (70) housing the first and second adsorbers (34) and (35), the pressurization portion (31a), and the depressurization portion (31b),

a pump mechanism (31P) functioning as the pressurization portion (31a) and the depressurization portion (31b); and

a motor (31M) driving the pump mechanism (31P), and

at least part of the motor (31M) is disposed outside the unit case (70).

4. A container refrigeration apparatus which includes a refrigerant circuit (20)

performing a refrigeration cycle, and which is attached to a container (11) that stores breathing plants (15) to cool air in the interior of the container (11), the container refrigeration apparatus comprising:

first and second adsorbers (34) and (35) each provided with an adsorbent adsorbing nitrogen in the air;

a pressurization portion (31a) which pressurizes one of the first and second adsorbers (34) and (35) by supplying the one adsorber with the air to perform an adsorption operation of adsorbing nitrogen in the air onto the associated adsorbent;

a depressurization portion (31b) which depressurizes the other of the first and second adsorbers (34) and (35) by sucking the air from the other adsorber to perform a desorption operation of desorbing nitrogen from the associated adsorbent;

switchers (32, 33) which alternately switch between a first operation state where the depressurization portion (31b) sucks the air from the second adsorber (35) while the pressurization portion (31a) supplies the air to the first adsorber (34), and a second operation state where the depressurization portion (31b) sucks the air from the first adsorber (34) while the pressurization portion (31a) supplies the air to the second adsorber (35);

a supplier (44) which supplies the interior of the container (11) with a gas mixture including nitrogen desorbed from the adsorbent; and

a casing (12) forming an internal storage space (S2) connected to the interior of the container (11), and an external storage space (S1) connected to the exterior of the container (11), wherein

the pressurization portion (31a) is configured as an air compressor sucking and compressing air, and is disposed in the external storage space (S1), and

the first and second adsorbers (34) and (35) are disposed in the internal storage space (S2).

5. A container refrigeration apparatus which includes a refrigerant circuit (20) performing a refrigeration cycle, and which is attached to a container (11) that stores breathing plants (15) to cool air in the interior of the container (11), the container refrigeration apparatus comprising:

first and second adsorbers (34) and (35) each provided with an adsorbent adsorbing nitrogen in the air;

a pressurization portion (31a) which pressurizes one of the first and second adsorbers (34) and (35) by supplying the one adsorber with the air to perform an adsorption operation of

adsorbing nitrogen in the air onto the associated adsorbent;

a depressurization portion (31b) which depressurizes the other of the first and second adsorbers (34) and (35) by sucking the air from the other adsorber to perform a desorption operation of desorbing nitrogen from the associated adsorbent;

switchers (32, 33) which alternately switch between a first operation state where the depressurization portion (31b) sucks the air from the second adsorber (35) while the pressurization portion (31a) supplies the air to the first adsorber (34), and a second operation state where the depressurization portion (31b) sucks the air from the first adsorber (34) while the pressurization portion (31a) supplies the air to the second adsorber (35);

a supplier (44) which supplies the interior of the container (11) with a gas mixture including nitrogen desorbed from the adsorbent; and

a casing (12) forming an internal storage space (S2) connected to the interior of the container (11), and an external storage space (S1) connected to the exterior of the container (11), wherein

the refrigerant circuit (20) includes an evaporator (24) exchanging heat between the air in the interior of the container (11) and a refrigerant to cool the air, and

the first and second adsorbers (34) and (35) are disposed near the evaporator (24) in the internal storage space (S2).

6. The container refrigeration apparatus of any one of claims 1–5, wherein

the adsorbent has the property of adsorbing both moisture and nitrogen in air, and

the depressurization portion (31b) is configured to suck the air from the first and second adsorbers (34) and (35) to desorb both nitrogen and moisture from the respective adsorbents of the first and second adsorbers (34) and (35).

7. The container refrigeration apparatus of any one of claims 1–6, wherein

the pressurization portion (31a) and the depressurization portion (31b) are configured as oil-less pumps.

8. The container refrigeration apparatus of claim 1, further comprising:

a unit case (70) housing at least the pressurization portion (31a);

an intra-case temperature sensor (95) detecting a temperature in the unit case (70); and

a controller (55) adjusting a time interval at which the switchers (32, 33) switch

between the first and second operation states in accordance with a measured valve of the intra-case temperature sensor (95).