DESCRIPTION

Title of Invention: INTERNAL AIR ADJUSTMENT DEVICE

Technical Field

[0001]

The present disclosure relates to an internal air adjustment device.

Background Art

[0002]

Hitherto, by controlling an internal environment (specifically, for example, the temperature of internal air or the composition of internal air) of a storage, the freshness of perishables stored in the storage has been maintained. For example, a refrigeration apparatus disclosed in Patent Literature 1 is used for a container that is used for, for example, transportation by sea, and controls the temperature and the composition (specifically, the oxygen concentration and the carbon dioxide concentration) of internal air of the container.

Citation List

Patent Literature

[0003]

PTL 1: Japanese Unexamined Patent Application Publication No. 2017-190935

Summary of Invention

Technical Problem

[0069]

The oxygen-concentration restoration control unit (53) calculates the speed of increase in the oxygen concentration of the internal air based on temporal change in the measured value of the oxygen concentration sensor (47), and regulates the flow rate of the external air that is supplied to the load room (5) so that the calculated speed of increase in the oxygen concentration is less than or equal to the maximum speed. When the calculated speed of increase in the oxygen concentration exceeds the maximum speed, the oxygen-concentration restoration control unit (53) reduces the flow rate of the external air that is supplied to the load room (5). When the calculated speed of increase in the oxygen concentration is less than the maximum speed, the oxygen-concentration restoration control unit (53) increases the flow rate of the external air that is supplied to the load room (5).

[0070]

When Et_2/Et_1 is greater than or equal to the upper reference value (Rv_2), it can be inferred that the amount of increase in the ethylene concentration of the internal air during the transport is relatively large, and the freshness of the perishables (7) is low. Therefore, in this case, the oxygen-concentration restoration control unit (53) sets the maximum speed to a relatively low value, and keeps

Operations of the oxygen-concentration restoration control unit (53) of the present embodiment are described with reference to the flowchart of Fig. 6. The operations shown in Fig. 6 are such that Step ST1, Step ST5, Step ST6, and Step ST8 differ from those shown in the flowchart of Fig. 4. Here, regarding the operations that are performed by the oxygen-concentration restoration control unit (53) of the present embodiment, differences from those shown in the flowchart of Fig. 4 are described.

[0098]

<Step ST1>

In the operation of Step ST1, the oxygen-concentration restoration control unit (53) reads measured values (in the present embodiment, measured values of the sugar contents of the perishables (7)) of the state indicator sensors (15). The oxygen-concentration restoration control unit (53) of the present embodiment reads the measured values of the three state indicator sensors (15), and causes a memory unit (54) to store the arithmetic mean of the three measured values that have been read as initial sugar contents (Sc_1).

[0099]

<Step ST5>

In the operation of Step ST5, the oxygen-concentration restoration control unit (53) reads measured values (in the present embodiment, measured values of the sugar contents of

near-infrared spectrometer that irradiates an object with near-infrared rays and that measures the acidity of the object based on the wavelength of the near-infrared rays that are absorbed by the object can be used. Similarly to the second embodiment, the state indicator sensors (15) of the present embodiment are each provided for a plurality of (in the present embodiment, three) cargoes (6) disposed at different positions.

[0108]

- Oxygen-Concentration Restoration Control Unit of Controller -

The oxygen-concentration restoration control unit (53) of the controller (50) of the present embodiment is constituted to regulate the speed of increase in the oxygen concentration of internal air based on the acidity of the perishables (7).

[0109]

Operations of the oxygen-concentration restoration control unit (53) of the present embodiment are described with reference to the flowchart of Fig. 7. The operations shown in Fig. 7 are such that Step ST1, Step ST5, Step ST6, and Step ST8 differ from those shown in the flowchart of Fig. 6. Here, regarding the operations that are performed by the oxygen-concentration restoration control unit (53) of the present embodiment, differences from those shown in

the flowchart of Fig. 6 are described.

[0110]

<Step ST1>

In the operation of Step ST1, the oxygen-concentration restoration control unit (53) reads measured values (in the present embodiment, measured values of the acidities of the perishables (7)) of the state indicator sensors (15). The oxygen-concentration restoration control unit (53) of the present embodiment reads the measured values of the three state indicator sensors (15), and causes a memory unit (54) to store the arithmetic mean of the three measured values that have been read as initial acidities (Ac_1).

[0111]

<Step ST5>

In the operation of Step ST5, the oxygen-concentration restoration control unit (53) reads measured values (in the present embodiment, measured values of the acidities of the perishables (7)) of the state indicator sensors (15). The oxygen-concentration restoration control unit (53) of the present embodiment reads the measured values of the three state indicator sensors (15), and causes the memory unit (54) to store the arithmetic mean of the three measured values that have been read as current acidities (Ac_2).

[0112]

<Step ST6>

In the operation of Step ST6, the oxygen-concentration restoration control unit (53) compares values (Ac_1/Ac_2) obtained by dividing the initial acidities (Ac_1) by the corresponding current acidities (Ac_2) with a predetermined upper reference value (Rv_2).

[0113]

The acidity of perishables (7), such as fruits, decreases as the freshness is reduced. Therefore, it is possible to infer that, the larger the amount of reduction in the acidity of the perishables (7) is, the lower the freshness of the perishables (7) is. That is, it is possible to infer that, the larger the value of Ac_1/Ac_2 is, the larger the degree of reduction in the freshness.

[0114]

Therefore, when Ac_1/Ac_2 is greater than or equal to the upper reference value (Rv_2), that is, $Rv_2 \leq Ac_1/Ac_2$, the oxygen-concentration restoration control unit (53) performs the operation of Step ST7. On the other hand, when Ac_1/Ac_2 is less than the upper reference value (Rv_2), that is, $(Ac_1/Ac_2 < Rv_2)$, the oxygen-concentration restoration control unit (53) performs the operation of Step ST8. Note that the upper reference value (Rv_2) of the present embodiment differs from the upper reference value (Rv_2) of the second embodiment.

[0115]

<Step ST8>

In the operation of Step ST8, the oxygen-concentration restoration control unit (53) compares the values (Ac_1/Ac_2) obtained by dividing the initial acidities (Ac_1) by the corresponding current acidities (Ac_2) with a predetermined lower reference value (Rv_1) and the predetermined upper reference value (Rv_2).

[0116]

Therefore, as in the description about Step ST6, it is possible to infer that, the larger the amount of reduction in the acidity of the perishables (7) is, the lower the freshness of the perishables (7) is. That is, it is possible to infer that, the smaller the value of Ac_1/Ac_2 is, the smaller the degree of reduction in the freshness.

[0117]

Therefore, when Ac_1/Ac_2 is greater than the lower reference value (Rv_1) and less than the upper reference value (Rv_2), that is, $Rv_1<Ac_1/Ac_2<Rv_2$, the oxygen-concentration restoration control unit (53) performs the operation of Step ST9. On the other hand, when Ac_1/Ac_2 is less than or equal to the lower reference value (Rv_1), that is, $Ac_1/Ac_2 \leq Rv_1$, the oxygen-concentration restoration control unit (53) performs the operation of Step ST10. Note that the lower reference value (Rv_1) of the present embodiment differs from the lower reference value (Rv_1) of