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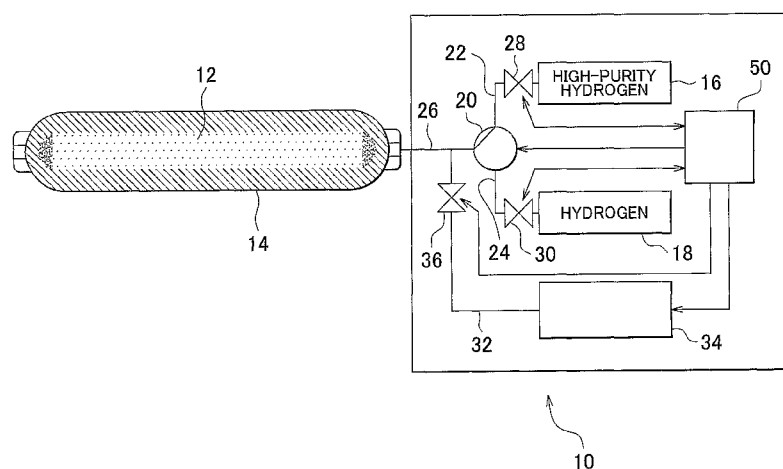
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FIG. 1



(57) Abstract: A hydrogen storage alloy activating device supplies a high-purity hydrogen gas, having a predetermined purity or above, into an accommodation casing (14) that accommodates a hydrogen storage alloy (12). When the high-purity hydrogen gas is being supplied, the hydrogen storage alloy activating device determines whether a predetermined activation condition related to the hydrogen storage alloy (12) is satisfied. When the activation condition is satisfied, the hydrogen storage alloy activating device supplies a low-purity hydrogen gas, having a purity lower than that of the high-purity hydrogen gas, into the accommodation casing (14).

HYDROGEN STORAGE ALLOY ACTIVATING DEVICE AND HYDROGEN STORAGE ALLOY ACTIVATING METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates to a hydrogen storage alloy activating device and a hydrogen storage alloy activating method and, more particularly, to a hydrogen storage alloy activating device and a hydrogen storage alloy activating method that are suitable for supplying hydrogen to a hydrogen storage alloy.

2. Description of the Related Art

[0002] A hydrogen storage alloy has a property of being capable of storing and releasing hydrogen. However, the above property is not exhibited immediately after the hydrogen storage alloy is manufactured. Therefore, it is necessary for the hydrogen storage alloy to undergo predetermined activation. Japanese Patent Publication No. 61-58545 (JP-B-61-58545), Japanese Patent Application Publication No. 2002-69502 (JP-A-2002-69502), Japanese Patent Application Publication No. 2005-105329 (JP-A-2005-105329) and Japanese Patent No. 2966570 describe activation of a hydrogen storage alloy. In regard to the above activation, for example, JP-B-61-58545 describes that, after a test sample of a hydrogen storage alloy is degassed at 160°C in a vacuum, hydrogen gas having a purity of 99.999% is supplied to the test sample at a high pressure. In this way, in the activation, it is usual that impurity gas in the alloy is removed at a high temperature in a vacuum and, after that, hydrogen gas having a high purity is supplied at a high pressure.

[0003] Incidentally, for practical use of a hydrogen storage alloy, it is desirable that the above described activation is efficiently performed at low cost. However, the activation described in JP-B-61-58545 is intended for a characteristic evaluation test on a hydrogen storage alloy and is not intended for practical use. Particularly, high-purity

hydrogen gas is supplied to the hydrogen storage alloy until storage of hydrogen is substantially completed after vacuum degassing, so the activation does not take into consideration the cost of high-purity hydrogen gas.

SUMMARY OF THE INVENTION

[0004] The invention provides a hydrogen storage alloy activating device and a hydrogen storage alloy activating method that are able to reduce cost required for activation of a hydrogen storage alloy.

[0005] A first aspect of the invention relates to a hydrogen storage alloy activating device. The hydrogen storage alloy activating device includes: a high-purity hydrogen supply unit that supplies a high-purity hydrogen gas, having a predetermined purity or above, into an accommodation casing that accommodates a hydrogen storage alloy; an activation condition determination unit that, when the high-purity hydrogen gas is being supplied, determines whether a predetermined activation condition related to the hydrogen storage alloy is satisfied; and a low-purity hydrogen supply unit that, when the activation condition is satisfied, supplies a low-purity hydrogen gas, having a purity lower than that of the high-purity hydrogen gas, into the accommodation casing.

[0006] In addition, a second aspect of the invention relates to a hydrogen storage alloy activating device. The hydrogen storage alloy activating device includes: a first hydrogen tank that is filled with a high-purity hydrogen gas having a predetermined purity or above; a second hydrogen tank that is filled with a low-purity hydrogen gas having a purity lower than that of the high-purity hydrogen gas; a coupling port that can be connected to or disconnected from an accommodation casing that accommodates a hydrogen storage alloy; a passage switching portion that switches between a first passage, which connects the coupling port with the first hydrogen tank, and a second passage, which connects the coupling port with the second hydrogen tank; a first control unit that, when the accommodation casing that accommodates the hydrogen storage alloy is coupled to the coupling port, controls the passage switching portion so that the high-purity hydrogen gas is supplied into the accommodation casing; an

activation condition determination unit that, after the passage switching portion is controlled and the high-purity hydrogen gas is supplied into the accommodation casing, determines whether a predetermined activation condition related to the hydrogen storage alloy is satisfied; and a second control unit that, when the activation condition is satisfied, controls the passage switching portion so that the low-purity hydrogen gas is supplied into the accommodation casing.

[0007] In addition, a third aspect of the invention relates to a hydrogen storage alloy activating method. The hydrogen storage alloy activating method includes: supplying a high-purity hydrogen gas, having a predetermined purity or above, into an accommodation casing that accommodates a hydrogen storage alloy; when the high-purity hydrogen gas is being supplied, determining whether a predetermined activation condition related to the hydrogen storage alloy is satisfied; and, when the activation condition is satisfied, supplying a low-purity hydrogen gas, having a purity lower than that of the high-purity hydrogen gas, into the accommodation casing.

[0008] According to the first, second or third aspect, it is possible to supply a high-purity hydrogen gas first, and then supply hydrogen gas having a purity lower than that of the high-purity hydrogen gas thereafter. By so doing, it is possible to almost complete activation by the high-purity hydrogen gas supplied first, and then to complete activation using a low-purity hydrogen gas by taking advantage of the chain of the activation. In addition, with the high-purity hydrogen gas, it is possible to perform activation promptly. Thus, by supplying the high-purity hydrogen gas and the low-purity hydrogen gas in this order, it is possible to reduce activation time and cost.

[0009] In addition, in the first, second or third aspect, the predetermined purity may be 99.999%.

[0010] With the above configuration, it is possible to promptly and favorably activate the hydrogen storage alloy using hydrogen gas having a purity of 99.999% or above.

[0011] In addition, in the first, second or third aspect, the low-purity hydrogen gas may have a purity of 99% or below.

[0012] As described above, with the high-purity hydrogen gas, it is possible to almost complete activation. And then, with the above configuration, hydrogen gas having a purity of 99% or below is used to make it possible to reduce the cost of hydrogen gas used during activation.

[0013] In addition, the first, second or third aspect may further include an activation completion condition determination unit that, when the low-purity hydrogen gas is being supplied, determines whether a predetermined activation completion condition related to the hydrogen storage alloy is satisfied.

[0014] With the above configuration, it is possible to appropriately determine the timing at which activation of the hydrogen storage alloy is completed.

[0015] In addition, in the first, second or third aspect, the high-purity hydrogen gas and the low-purity hydrogen gas may be supplied at a predetermined pressure or above, which is determined on the basis of the composition ratio of atoms that compose the hydrogen storage alloy.

[0016] With the above configuration, it is possible to reliably perform activation at a sufficient pressure corresponding to the hydrogen storage capacity of the hydrogen storage alloy. In addition, it is possible to favorably reduce time required for activation.

[0017] In the first, second or third aspect, when the characteristic of the hydrogen storage alloy is expressed by a PCT characteristic curve, the predetermined pressure may be a pressure corresponding to the center of a plateau region. In the first, second or third aspect, the activation condition may be that the hydrogen storage alloy is activated to a predetermined activity. In the first, second or third aspect, the activation condition may be determined on the basis of the temperature of the hydrogen storage alloy. In the first, second or third aspect, the activation condition may be determined on the basis of a pressure at which the high-purity hydrogen gas is supplied into the accommodation casing. In the first, second or third aspect, the activation condition may be determined on the basis of a period of time during which the high-purity hydrogen gas is supplied into the accommodation casing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The foregoing and further objects, features and advantages of the invention will become apparent from the following description of example embodiments with reference to the accompanying drawings, wherein like numerals are used to represent like elements and wherein:

FIG. 1 is a view that shows a state where a storage tank provided with a hydrogen storage alloy is connected to an activating device according to an embodiment of the invention;

FIG. 2 is a view for illustrating a pressure of hydrogen gas supplied according to the embodiment of the invention; and

FIG. 3 is a flowchart of an activation routine according to the embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0019] Hereinafter, an embodiment of the invention will be described with reference to the accompanying drawings. Note that in the drawings, like reference numerals denote the same or corresponding portions, and the description thereof is simplified or omitted.

Description of Hydrogen Storage Alloy Activating Device

[0020] As shown in FIG. 1, an activating device 10 according to the present embodiment is connected to a storage tank 14 provided with a hydrogen storage alloy 12 inside at room temperature to thereby perform characteristic activation. The activation will be described later.

[0021] The activating device 10 includes two hydrogen tanks having different purities. That is, the activating device 10 includes a hydrogen tank 16 that is filled with hydrogen gas having a purity of 99.9999% (that is, a purity of 6N) and a hydrogen tank 18 that is filled with hydrogen gas having a purity of 99% (that is, a purity of 2N).

[0022] The hydrogen tank 16 is connected to a switching valve 20 via a passage 22 inside the activating device 10. The switching valve 20 is able to switch the passage.

Similarly, the hydrogen tank 18 is connected to the switching valve 20 via a passage 24. The switching valve 20 is able to provide communication between the passage 22 and the passage 26 or between the passage 24 and the passage 26 by being controlled. A coupling port that can be connected to or disconnected from the storage tank 14 is provided at one end of the passage 26. The switching valve 20 is connected to the other end of the passage 26.

[0023] A pressure regulator valve 28 is provided in the passage 22 adjacent to the hydrogen tank 16. The pressure regulator valve 28 is able to regulate the pressure of hydrogen gas flowing into the passage 22. Similarly, a pressure regulator valve 30 is provided in the passage 24 adjacent to the hydrogen tank 18. The pressure regulator valve 30 is able to regulate the pressure of hydrogen gas flowing into the passage 24. Therefore, when the storage tank 14 is connected, any one of pressure-regulated hydrogen gases having different purities may be supplied through the passages 22 and 26 or the passages 24 and 26.

[0024] The passage 26 is connected to one end of a passage 32 halfway. The other end of the passage 32 is connected to a turbo-molecular pump 34. The turbo-molecular pump 34 is a vacuum pump that exhausts gas in such a manner that an inside rotor rotates at a high speed to flick gas molecules. A vacuum valve 36 is provided in the passage 32. The vacuum valve 36 is opened or closed to provide or shut off communication between the passage 26 and the turbo-molecular pump 34 via the passage 32.

[0025] The activating device 10 according to the present embodiment includes a controller 50. The above described switching valve 20, pressure regulator valves 28 and 30, vacuum valve 36 and turbo-molecular pump 34 are connected to the controller 50.

[0026] As described above, with the configuration of the activating device 10 shown in FIG. 1, it is possible to switch between two hydrogen tanks having different purities, that is, the hydrogen tank 16 that contains hydrogen gas having a purity of 6N and the hydrogen tank 18 that contains hydrogen gas having a purity of 2N. Therefore, it is possible to perform activation using hydrogen gas having a purity of 6N and then

utilize the chain of activation to perform activation using hydrogen gas having a purity of 2N.

Activation in Present Embodiment

[0027] Next, the activation according to the present embodiment will be described. The activation according to the present embodiment is performed not only by switching between the two hydrogen tanks but also by (1) supplying hydrogen gas at a pressure higher than an equilibrium pressure and (2) determining a timing at which the two hydrogen tanks are switched on the basis of a temperature of a hydrogen storage alloy.

[0028] First, the above (1) will be described with reference to FIG. 2. FIG. 2 is the P-C-T characteristic curve of the hydrogen storage alloy, and shows the relationship between a hydrogen storage capacity (abscissa axis) and a hydrogen pressure (ordinate axis) at a constant temperature. The P-C-T characteristic curve may be obtained through JISH7201 (measuring method for pressure-composition isotherms (PCT curve) of a hydrogen storage alloy) of Japanese Industrial Standards (JIS) or a method according to JISH7201.

[0029] As shown in FIG. 2, when a supplied hydrogen pressure is varied, there is a region (plateau region) in which a hydrogen storage capacity in the hydrogen storage alloy steeply varies around a certain pressure. A pressure corresponding to the plateau region depends on the composition ratio of atoms that compose the hydrogen storage alloy. Here, the composition ratio of atoms that compose the hydrogen storage alloy may be expressed as vanadium : titanium : chromium : manganese = 1 : 1 : 1 : 1 in the case of, for example, VTiCrMn alloy. In the present embodiment, hydrogen gas having a pressure (charging pressure P_2) higher than the pressure (equilibrium pressure P_1) corresponding to the plateau region is supplied from the hydrogen tank 16 or 18. By so doing, it is possible to reliably activate the hydrogen storage alloy at a sufficient pressure. Furthermore, it is possible to reduce time required for activation. Note that, when the plateau region has a gentle gradient, the pressure corresponding to the center of the plateau region is used to obtain the equilibrium pressure P_1 to thereby make it possible to

determine the charging pressure P_2 .

[0030] The equilibrium pressure P_1 corresponding to the plateau region may be obtained in advance in such a manner that the P-C-T characteristic curve is prepared for each composition ratio of atoms that compose the hydrogen storage alloy at room temperature. Thus, it is possible to prepare a characteristic map that defines the relationship between the composition ratio of the hydrogen storage alloy 12 and the charging pressure P_2 of hydrogen gas. It is assumed that the thus prepared characteristic map is provided for the controller 50.

[0031] Next, the above (2) will be described. Generally, a hydrogen storage alloy produces heat when the hydrogen storage alloy is caused to store hydrogen gas, so the temperature of the alloy also increases. Therefore, in the present embodiment, the timing at which the hydrogen tanks 16 and 18 are switched is determined on the basis of the temperature of the hydrogen storage alloy 12. Specifically, after the pressure of the pressure regulator valve 28 is adjusted to the charging pressure P_2 , as the temperature of the hydrogen storage alloy 12 increases, the pressure inside the storage tank 14 also increases. Therefore, the gauge pressure of the pressure regulator valve 28 that is in communication with the storage tank 14 decreases. That is, a pressure, at which hydrogen gas having a purity of 6N is supplied to the storage tank 14, decreases by a predetermined pressure. Thus, an increase in temperature of the hydrogen storage alloy 12 is estimated from the decrease in gauge pressure, and then the hydrogen tanks 16 and 18 are switched.

[0032] Note that, in the present embodiment, the timing at which activation is completed is also determined on the basis of the temperature of the hydrogen storage alloy 12, as in the case of determination of the timing at which the hydrogen tanks are switched. Specifically, after the pressure of the pressure regulator valve 30 is adjusted to the charging pressure P_2 , an increase in temperature of the hydrogen storage alloy 12 is estimated from a decrease in gauge pressure of the pressure regulator valve 30 and then activation is completed.

[0033] In this way, with the above (2), the timing at which the hydrogen tanks

are switched or the timing at which activation is completed may be estimated from the pressure regulator valves 28 and 30, so a device, or the like, for acquiring a temperature is not required. Thus, it is possible to simplify the device.

Specific Process in Present Embodiment

[0034] FIG. 3 is a flowchart of an activation routine executed by the controller 50 for implementing the above functions. The routine is also executed after the storage tank 14 is connected to the activating device 10. Note that the switching valve 20 provides communication between the passage 22 and the passage 26 when the routine is started.

[0035] According to the routine, first, degassing is started (step 100). Specifically, in a state where the pressure regulator valve 28 is closed, the turbo-molecular pump 34 is driven and, after that, the vacuum valve 36 is opened. By so doing, impurity gas in the storage tank 14 is exhausted outside the tank.

[0036] Subsequently, it is determined whether a period of time from when the vacuum valve 36 is opened, that is, degassing time t_{vd} , is longer than or equal to a predetermined period of time t_A (step 102). Here, the predetermined period of time t_A is set as a sufficient period of time for degassing impurity gas in the storage tank 14, and is stored in the controller 50. The predetermined period of time t_A may be, for example, determined depending on the capacity of the storage tank 14. Then, when it is determined that the degassing time t_{vd} is longer than or equal to the predetermined period of time t_A , the process proceeds to step 104. Otherwise, the process returns to step 100.

[0037] In step 104, the vacuum valve 36 is closed, and the pressure regulator valve 28 is opened. By so doing, hydrogen in the hydrogen tank 16 is supplied into the storage tank 14 at the charging pressure P_2 . Subsequently, the temperature T_{hsa} of the hydrogen storage alloy 12 is acquired (step 106). As described above, the temperature T_{hsa} is estimated from the gauge pressure of the pressure regulator valve 28.

[0038] Then, it is determined whether the temperature T_{hsa} of the hydrogen storage alloy 12 is higher than or equal to a predetermined temperature T_1 (step 108). Here, the predetermined temperature T_1 is set at a temperature at which the hydrogen

storage alloy 12 is activated by hydrogen in the hydrogen tank 16 to a predetermined activity. In the present embodiment, the predetermined temperature T_1 is set at a sufficient temperature (for example, room temperature + 1°C) or above at which it is possible to determine that the hydrogen storage alloy 12 has been almost activated by hydrogen in the hydrogen tank 16, and is stored in the controller 50. Then, when it is determined that the temperature T_{hsa} of the hydrogen storage alloy 12 is higher than or equal to the predetermined temperature T_1 , the pressure regulator valve 30 is opened (step 110), and the switching valve 20 is switched (step 112). By so doing, hydrogen in the hydrogen tank 18 is supplied into the storage tank 14 at the charging pressure P_2 . On the other hand, when it is determined that the temperature T_{hsa} of the hydrogen storage alloy 12 is not higher than or equal to the predetermined temperature T_1 , the process returns to step 106, and then the temperature T_{hsa} of the hydrogen storage alloy 12 is acquired again. Subsequent to step 112, the pressure regulator valve 28 is closed (step 114).

[0039] After that, the temperature T_{hsa} of the hydrogen storage alloy 12 is acquired again (step 116). As described above, the temperature T_{hsa} is estimated from the gauge pressure of the pressure regulator valve 30. Then, it is determined whether the temperature T_{hsa} of the hydrogen storage alloy 12 is higher than or equal to the predetermined temperature T_2 (step 118). Here, the predetermined temperature T_2 is set at a sufficient temperature (for example, the predetermined temperature $T_1 + 0.1^\circ\text{C}$) or below at which it is possible to determine that activation of the hydrogen storage alloy 12 has been completed by hydrogen in the hydrogen tank 18, and is stored in the controller 50. Then, when it is determined that the temperature T_{hsa} of the hydrogen storage alloy 12 is higher than or equal to the predetermined temperature T_2 , the pressure regulator valve 30 is closed (step 120). By so doing, the activation routine is ended. On the other hand, when it is determined that the temperature T_{hsa} of the hydrogen storage alloy 12 is not higher than or equal to the predetermined temperature T_2 , the process returns to step 116, and then the temperature T_{hsa} of the hydrogen storage alloy 12 is acquired again.

[0040] According to the above described routine shown in FIG. 3, it is possible

to switch between the hydrogen tank 16 and the hydrogen tank 18 at an appropriate timing. Thus, it is possible to almost complete activation by supplying hydrogen gas in the hydrogen tank 16 first, and then to supplementarily complete activation using hydrogen gas in the hydrogen tank 18. Hence, it is possible to reduce activation time. In addition, according to the routine shown in FIG. 3, it is possible to appropriately determine the timing at which activation of the hydrogen storage alloy 12 is completed.

[0041] Note that, in the above described embodiment, both high-purity hydrogen gas having a purity of 6N and low-purity hydrogen gas having a purity of 2N are used; instead, the high-purity hydrogen gas may have a purity of 5N or above, and the low-purity hydrogen gas may have a purity lower than 5N. As long as a purity combination of high-purity hydrogen gas and low-purity hydrogen gas includes purities with a purity of 5N as a boundary, a hydrogen storage alloy may be sufficiently activated, and cost required for activation may be reduced.

[0042] In addition, in the above described embodiment, the temperature of the hydrogen storage alloy 12 is estimated from the gauge pressures of the pressure regulator valves 28 and 30; instead, the temperature of the hydrogen storage alloy 12 may be, for example, estimated from a period of time during which hydrogen gas is supplied. In addition, a thermocouple or a temperature sensor may be used to directly measure the temperature of the hydrogen storage alloy 12.

[0043] Note that in the above described embodiment, the controller 50 executes the process of step 104 shown in FIG. 3 to implement "high-purity hydrogen supply unit" and "first control unit" according to the aspect of the invention, the controller 50 executes the process of step 108 to implement "activation condition determination unit" according to the aspect of the invention, the controller 50 executed the process of step 110 to implement "low-purity hydrogen supply unit" and "second control unit" according to the aspect of the invention, and the controller 50 executes the process of step 118 to implement "activation completion condition determination unit" according to the aspect of the invention.

[0044] In addition, in the above described embodiment, the switching valve 20

functions as "passage switching portion" according to the aspect of the invention.

CLAIMS:

1. A hydrogen storage alloy activating device comprising:

a high-purity hydrogen supply unit that supplies a high-purity hydrogen gas, having a predetermined purity or above, into an accommodation casing that accommodates a hydrogen storage alloy;

an activation condition determination unit that, when the high-purity hydrogen gas is being supplied, determines whether a predetermined activation condition related to the hydrogen storage alloy is satisfied; and

a low-purity hydrogen supply unit that, when the activation condition is satisfied, supplies a low-purity hydrogen gas, having a purity lower than that of the high-purity hydrogen gas, into the accommodation casing.

2. The hydrogen storage alloy activating device comprising:

a first hydrogen tank that is filled with a high-purity hydrogen gas having a predetermined purity or above;

a second hydrogen tank that is filled with a low-purity hydrogen gas having a purity lower than that of the high-purity hydrogen gas;

a coupling port that can be connected to or disconnected from an accommodation casing that accommodates a hydrogen storage alloy;

a passage switching portion that switches between a first passage, which connects the coupling port with the first hydrogen tank, and a second passage, which connects the coupling port with the second hydrogen tank;

a first control unit that, when the accommodation casing that accommodates the hydrogen storage alloy is coupled to the coupling port, controls the passage switching portion so that the high-purity hydrogen gas is supplied into the accommodation casing;

an activation condition determination unit that, after the passage switching portion is controlled and the high-purity hydrogen gas is supplied into the accommodation casing, determines whether a predetermined activation condition related to the hydrogen storage

alloy is satisfied; and

a second control unit that, when the activation condition is satisfied, controls the passage switching portion so that the low-purity hydrogen gas is supplied into the accommodation casing.

3. The hydrogen storage alloy activating device according to claim 1 or 2, wherein the predetermined purity is 99.999%.

4. The hydrogen storage alloy activating device according to any one of claims 1 to 3, wherein

the low-purity hydrogen gas has a purity of 99% or below.

5. The hydrogen storage alloy activating device according to any one of claims 1 to 4, further comprising:

an activation completion condition determination unit that, when the low-purity hydrogen gas is being supplied, determines whether a predetermined activation completion condition related to the hydrogen storage alloy is satisfied.

6. The hydrogen storage alloy activating device according to any one of claims 1 to 5, wherein

the high-purity hydrogen gas and the low-purity hydrogen gas are supplied at a predetermined pressure or above, which is determined on the basis of the composition ratio of atoms that compose the hydrogen storage alloy.

7. The hydrogen storage alloy activating device according to claim 6, wherein

when the characteristic of the hydrogen storage alloy is expressed by a PCT characteristic curve, the predetermined pressure is a pressure corresponding to the center of a plateau region.

8. The hydrogen storage alloy activating device according to any one of claims 1 to 7, wherein

the activation condition is that the hydrogen storage alloy is activated to a predetermined activity.

9. The hydrogen storage alloy activating device according to any one of claims 1 to 7, wherein

the activation condition is determined on the basis of the temperature of the hydrogen storage alloy.

10. The hydrogen storage alloy activating device according to any one of claims 1 to 7, wherein

the activation condition is determined on the basis of a pressure at which the high-purity hydrogen gas is supplied into the accommodation casing.

11. The hydrogen storage alloy activating device according to any one of claims 1 to 7, wherein

the activation condition is determined on the basis of a period of time during which the high-purity hydrogen gas is supplied into the accommodation casing.

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12. A hydrogen storage alloy activating method comprising:

supplying a high-purity hydrogen gas, having a predetermined purity or above, into an accommodation casing that accommodates a hydrogen storage alloy;

when the high-purity hydrogen gas is being supplied, determining whether a predetermined activation condition related to the hydrogen storage alloy is satisfied; and

when the activation condition is satisfied, supplying a low-purity hydrogen gas, having a purity lower than that of the high-purity hydrogen gas, into the accommodation casing.

13. The hydrogen storage alloy activating method according to claim 12, wherein the predetermined purity is 99.999%.

14. The hydrogen storage alloy activating method according to claim 12 or 13, wherein
the low-purity hydrogen gas has a purity of 99% or below.

15. The hydrogen storage alloy activating method according to any one of claims 12 to 14, further comprising:

when the low-purity hydrogen gas is being supplied, determining whether a predetermined activation completion condition related to the hydrogen storage alloy is satisfied.

16. The hydrogen storage alloy activating method according to any one of claims 12 to 15, wherein

the high-purity hydrogen gas and the low-purity hydrogen gas are supplied at a predetermined pressure or above, which is determined on the basis of the composition ratio of atoms that compose the hydrogen storage alloy.

17. The hydrogen storage alloy activating method according to claim 16, wherein

when the characteristic of the hydrogen storage alloy is expressed by a PCT characteristic curve, the predetermined pressure is a pressure corresponding to the center of a plateau region.

18. The hydrogen storage alloy activating method according to any one of claims 12 to 17, wherein

the activation condition is that the hydrogen storage alloy is activated to a predetermined activity.

19. The hydrogen storage alloy activating method according to any one of claims 12 to 17, wherein

the activation condition is determined on the basis of the temperature of the hydrogen storage alloy.

20. The hydrogen storage alloy activating method according to any one of claims 12 to 17, wherein

the activation condition is determined on the basis of a pressure at which the high-purity hydrogen gas is supplied into the accommodation casing.

21. The hydrogen storage alloy activating method according to any one of claims 12 to 17, wherein

the activation condition is determined on the basis of a period of time during which the high-purity hydrogen gas is supplied into the accommodation casing.

FIG. 1

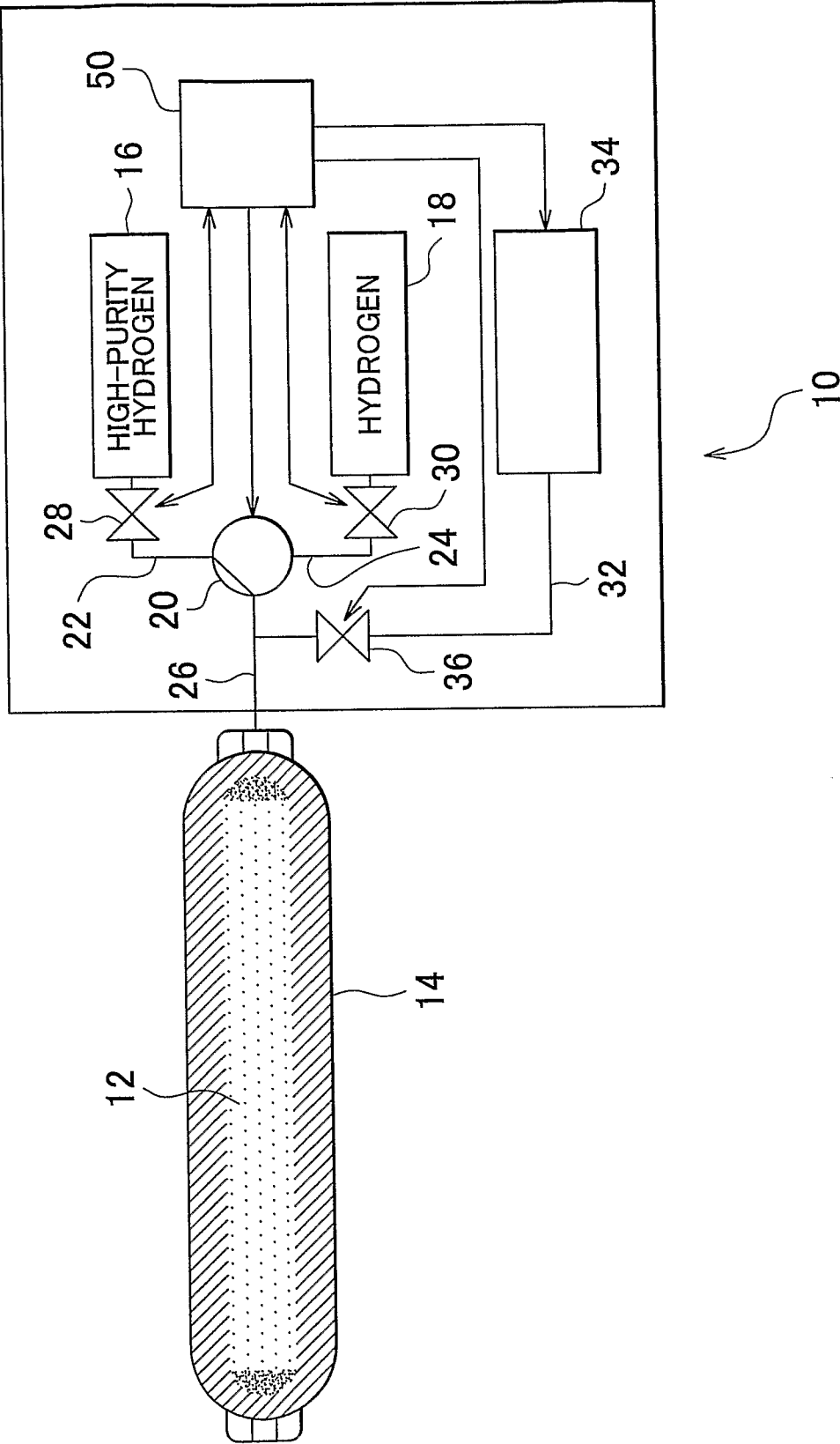


FIG. 2

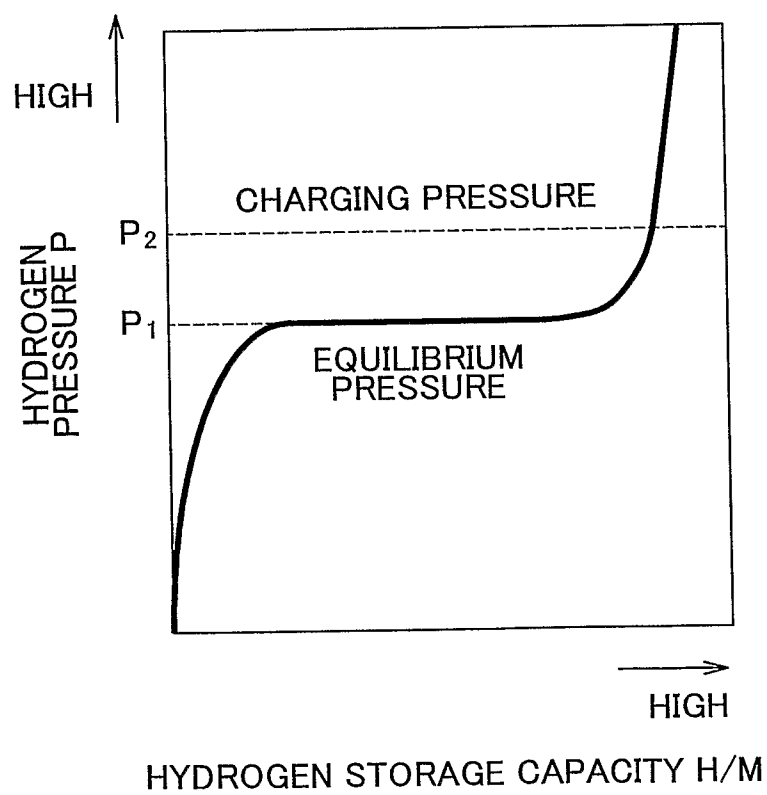
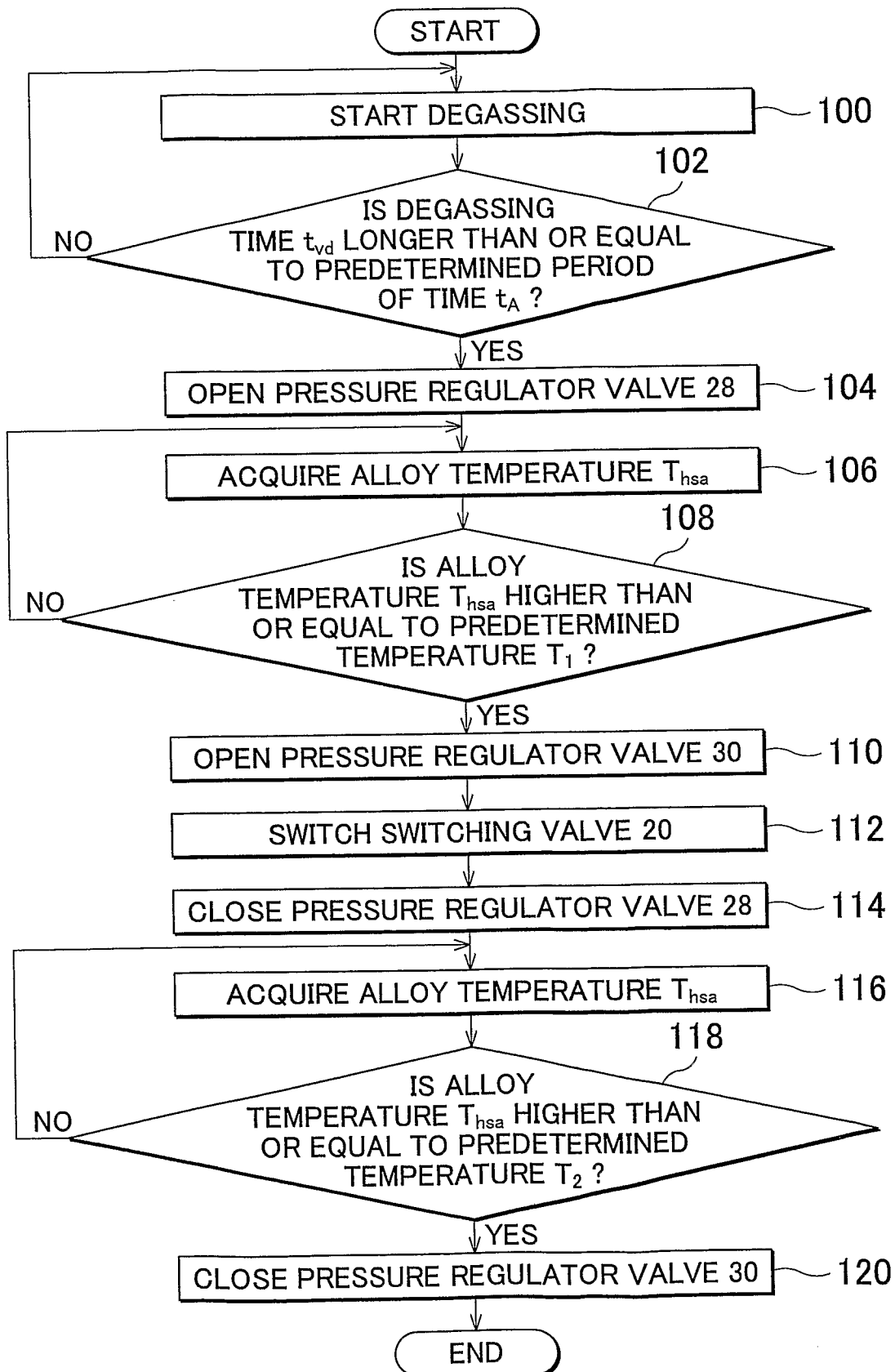


FIG. 3



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/000629

A. CLASSIFICATION OF SUBJECT MATTER

INV. C01B3/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2002 160901 A (TOYOTA CENTRAL RES & DEV; TOYOTA IND CORP) 4 June 2002 (2002-06-04) paragraph [0007] - paragraph [0064]; claims 1-6; figures 1-7 -----	1-11
X	US 2002/028176 A1 (NAKAMURA KENJI [JP]) 7 March 2002 (2002-03-07) paragraph [0013] - paragraph [0036]; figures 1,2 -----	1-11
X	US 4 147 536 A (OSUMI YASUAKI ET AL) 3 April 1979 (1979-04-03) column 9, line 1 - line 5; examples 1-3; tables 1,3 ----- -/--	12-21

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

11 August 2010

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/000629

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