Appeal decision

Appeal No. 2019-4325

Appellant Intelligent Energy Limited

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2016-511135, entitled "Fuel Cell System" (International Publication No. WO2014/177889 published on November 6, 2014, National Publication of International Patent Application No. 2016-517159 published on June 9, 2016) has resulted in the following appeal decision.

Conclusion

The appeal of the case was groundless.

Reason

1. History of the procedures

The patent application was originally filed on May 2, 2014 as an International Patent Application (priority claim under the Paris Convention: May 2, 2013, received by the foreign receiving office, United Kingdom). A notice of reasons for refusal was issued on January 15, 2018 (dispatch date: January 23, 2018), and although a written opinion and written amendment were submitted on June 19, 2018, a decision of refusal was made on November 27, 2018 (dispatch date: December 4, 2018). Against this, an appeal against the examiner's decision of refusal was made on April 3, 2019, and a written amendment was submitted at the same time.

2. Regarding the written amendment on April 3, 2019

The scope of claims before the written amendment submitted at the same time as the request for appeal against examiner's decision of refusal on April 3, 2019 is as follows, as amended by the written amendment of June 19, 2018.

"[Claim 1]

A fuel cell system, comprising:

a first fuel cell stack;

a second fuel cell stack in series with the first fuel cell stack;

a first rectifier in parallel with the first fuel cell stack; and

a controller configured to modulate air flow through the first fuel cell stack independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 2]

The fuel cell system according to Claim 1, wherein the controller is configured to modulate air flow through the first fuel cell stack on a periodic basis.

[Claim 3]

The fuel cell system according to Claim 2, wherein the controller is configured to periodically reduce the amount of air flow through the first fuel cell stack from an active value, and then after a predetermined period of time, increase the amount of air flow through the first fuel cell stack back to the active value.

[Claim 4]

The fuel cell system according to Claim 2, wherein the controller is configured to periodically reduce the amount of air flow through the first fuel cell stack to zero and then after the predetermined period of time, increase the amount of air flow through the first fuel cell stack from zero.

[Claim 5]

The fuel cell system according to Claim 1, wherein the controller is configured to modulate the air flow through the first fuel cell stack in response to measured parameters of the fuel cell system.

[Claim 6]

The fuel cell system according to any one of Claims 1 to 5, wherein the first rectifier is an active diode.

[Claim 7]

The fuel cell system according to any one of Claims 1 to 6, wherein a first terminal of the first rectifier is connected to a first terminal of the first fuel cell stack, and a second terminal of the first rectifier is connected to a second terminal of the first fuel cell stack.

[Claim 8]

The fuel cell system according to any one of Claims 1 to 7, wherein the fuel cell system further comprises a second rectifier in parallel with the second fuel cell stack, and the controller is configured to modulate air flow through the second fuel cell stack independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the second fuel cell stack.

[Claim 9]

The fuel cell system according to Claim 8, wherein the controller is configured to modulate the air flow through the first and second fuel cell stacks such that the rehydration intervals of the first and second fuel cell stacks do not overlap.

[Claim 10]

The fuel cell system according to Claim 9, wherein the controller is configured to alternately modulate the air flow through the first and second fuel cell stacks.

[Claim 11]

The fuel cell system according to any one of Claims 8 to 10, wherein a first terminal of the second rectifier is connected to a first terminal of the second fuel cell stack, and a second terminal of the second rectifier is connected to a second terminal of the second fuel cell stack.

[Claim 12]

The fuel cell system according to any one Claims 1 to 11, wherein the controller is configured to modulate the amount of air flow generated by a fan in order to modulate the air flow through the first and/or second fuel cell stacks.

[Claim 13]

The fuel cell system according to any one of Claims 1 to 12, wherein the controller is configured to modulate the position of one or more variable occluding members in order to modulate the air flow through the first and/or second fuel cell stacks.

[Claim 14]

The fuel cell system according to any one of Claims 1 to 13, further comprising a blocking rectifier in series with the first fuel cell stack.

[Claim 15]

A method of operating a fuel cell system, the fuel cell system comprising:

a first fuel cell stack;

a second fuel cell stack in series with the first fuel cell stack; and

a first rectifier in parallel with the first fuel cell stack; the method comprising:

modulating air flow through the first fuel cell stack independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 16]

The method according to Claim 15, wherein the first rectifier is an active diode, and the method further comprises: operating the active diode such that it provides a low resistance when it is forward biased and provides a high resistance when it is reverse biased.

[Claim 17]

A computer program comprising computer program code configured for loading onto a controller associated with a fuel cell system, the fuel cell system comprising:

a first fuel cell stack;

a second fuel cell stack in series with the first fuel cell stack; and

a first rectifier in parallel with the first fuel cell stack;

wherein the computer program code is configured to: modulate air flow through the first fuel cell stack independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 18]

A computer program comprising computer program code configured to perform the method of Claim 15 or Claim 16.

[Claim 19]

A computer program comprising computer program code configured for loading onto a controller to modulate air flow through a first fuel cell stack independently of current demand on an associated fuel cell system in order to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 20]

The computer program according to Claim 19, further comprising computer program code configured for loading onto a controller to operate an active diode in parallel with the first fuel cell stack such that it provides a low resistance when the active diode is forward biased and provides a high resistance when the active diode is reverse biased.

[Claim 21]

A computer program, which when run on a computer, causes the computer to: modulate air flow through a fuel cell stack independently of current demand on a fuel cell system to start a rehydration operation of the fuel cell stack in the fuel cell system when one or more of the following criteria are satisfied:

a) a fuel cell stack core temperature is greater than a minimum core temperature threshold;

b) a fuel cell stack core temperature is less than a maximum core temperature threshold;

c) an ambient air temperature is less than a maximum ambient air temperature threshold;

d) a current drawn from the fuel cell system is greater than a minimum current threshold;

e) a current drawn from the fuel cell system is less than a maximum current threshold; and

f) a signal to indicate that fan pulsing is prohibited from a load device, or an application associated with the load device, has not been received.

[Claim 22]

The computer program according to Claim 21, which when run on a computer, further causes the computer to:

periodically check whether or not one or more of criteria a) to f) are satisfied, and start the rehydration operation only when the one or more of criteria a) to f) are satisfied.

[Claim 23]

A computer program, which when run on a computer, causes the computer to: modulate air flow through the fuel cell stack independently of current demand on a fuel cell system to stop a rehydration operation of the fuel cell stack in the fuel cell system when one or more of the following criteria are satisfied:

i. a stack voltage has not dropped by a voltage drop threshold amount within a first threshold period of time during the rehydration operation;

ii. a core temperature is greater than a maximum core temperature threshold during the rehydration operation;

iii. a current drawn from the fuel cell stack to an external load falls below a minimum current threshold during the rehydration operation;

iv. a current drawn from the fuel cell stack to an external load is greater than a maximum current threshold during the rehydration operation;

v. a signal from a load device, or an application associated with the load device, to indicate that an immediate delivery of power is required has been received.

[Claim 24]

The computer program according to Claim 23, which when run on a computer, further causes the computer to:

periodically check whether or not one or more of criteria i) to v) are satisfied, and stop the rehydration operation only when the one or more of criteria i) to v) are satisfied".

The scope of claims was amended as follows by the written amendment on April 3, 2019.

(The underlines indicate the amended parts.)

"[Claim 1]

A fuel cell system, comprising:

a first fuel cell stack;

a second fuel cell stack in series with the first fuel cell stack;

a first rectifier in parallel with the first fuel cell stack; and

a controller configured to modulate air flow through the first fuel cell stack <u>periodically and</u> independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 2]

The fuel cell system according to Claim <u>1</u>, wherein the controller is configured to periodically reduce the amount of air flow through the first fuel cell stack from an active value, and then after a predetermined period of time, increase the amount of air flow through the first fuel cell stack back to the active value.

[Claim 3]

The fuel cell system according to Claim <u>1</u>, wherein the controller is configured to periodically reduce the amount of air flow through the first fuel cell stack to zero and then after the predetermined period of time, increase the amount of air flow through the first fuel cell stack from zero.

[Claim 4]

The fuel cell system according to Claim 1, wherein the controller is configured to modulate the air flow through the first fuel cell stack in response to measured parameters of the fuel cell system.

[Claim 5]

The fuel cell system according to any one of Claims 1 to <u>4</u>, wherein the first rectifier is an active diode.

[Claim 6]

The fuel cell system according to any one of Claims 1 to <u>5</u>, wherein a first terminal of the first rectifier is connected to a first terminal of the first fuel cell stack, and a second terminal of the first rectifier is connected to a second terminal of the first fuel cell stack.

[Claim 7]

The fuel cell system according to any one of Claims 1 to <u>6</u>, wherein the fuel cell system further comprises a second rectifier in parallel with the second fuel cell stack, and the controller is configured to modulate air flow through the second fuel cell stack independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the second fuel cell stack.

[Claim 8]

The fuel cell system according to Claim 7, wherein the controller is configured to modulate the air flow through the first and second fuel cell stacks such that the rehydration intervals of the first and second fuel cell stacks do not overlap.

[Claim 9]

The fuel cell system according to Claim 8, wherein the controller is configured to alternately modulate the air flow through the first and second fuel cell stacks.

[Claim 10]

The fuel cell system according to any one of Claims 7 to 9, wherein a first terminal of the second rectifier is connected to a first terminal of the second fuel cell stack, and a second terminal of the second rectifier is connected to a second terminal of the second fuel cell stack.

[Claim 11]

The fuel cell system according to any one Claims 1 to 10, wherein the controller is configured to modulate the amount of air flow generated by a fan in order to modulate the air flow through the first and/or second fuel cell stacks.

[Claim 12]

The fuel cell system according to any one of Claims 1 to 11, wherein the controller is configured to modulate the position of one or more variable occluding members in order to modulate the air flow through the first and/or second fuel cell stacks.

[Claim 13]

The fuel cell system according to any one of Claims 1 to 12, further comprising a blocking rectifier in series with the first fuel cell stack.

[Claim 14]

A method of operating a fuel cell system, the fuel cell system, comprising:

a first fuel cell stack;

a second fuel cell stack in series with the first fuel cell stack; and

a first rectifier in parallel with the first fuel cell stack; the method comprising:

modulating air flow through the first fuel cell stack periodically and independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 15]

The method according to Claims 14, wherein the first rectifier is an active diode, and the method further comprises: operating the active diode such that it provides a low resistance when it is forward biased and provides a high resistance when it is reverse biased.

[Claim 16]

A computer program comprising computer program code configured for loading onto a controller associated with a fuel cell system, the fuel cell system comprising:

a first fuel cell stack;

a second fuel cell stack in series with the first fuel cell stack; and

a first rectifier in parallel with the first fuel cell stack;

wherein the computer program code is configured to: modulate air flow through the first fuel cell stack periodically and independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 17]

A computer program comprising computer program code configured to perform the method of Claim 14 or Claim 15.

[Claim 18]

A computer program comprising computer program code configured for loading onto a controller to modulate air flow through a first fuel cell stack periodically and independently of current demand on an associated fuel cell system in order to provide rehydration intervals that increase the hydration levels of the first fuel cell stack.

[Claim 19]

The computer program according to Claim 18, further comprising computer program code configured for loading onto a controller to operate an active diode in parallel with the first fuel cell stack such that it provides a low resistance when the active diode is forward biased and provides a high resistance when the active diode is reverse biased.

[Claim 20]

A computer program, which when run on a computer, causes the computer to: modulate air flow through a fuel cell stack periodically and independently of current demand on the fuel cell system to start a rehydration operation of the fuel cell stack in a fuel cell system when one or more of the following criteria are satisfied:

a) a fuel cell stack core temperature is greater than a minimum core temperature threshold;

b) a fuel cell stack core temperature is less than a maximum core temperature threshold;

c) an ambient air temperature is less than a maximum ambient air temperature threshold;

d) a current drawn from the fuel cell system is greater than a minimum current threshold;

e) a current drawn from the fuel cell system is less than a maximum current threshold; and

f) a signal to indicate that fan pulsing is prohibited from a load device, or an application associated with the load device, has not been received.

[Claim 21]

The computer program according to Claim 20, which when run on a computer, further causes the computer to:

periodically check whether or not one or more of criteria a) to f) are satisfied, and start the rehydration operation only when the one or more of criteria a) to f) are satisfied.

[Claim 22]

A computer program, which when run on a computer, causes the computer to: modulate air flow through a fuel cell stack periodically and independently of current demand on a fuel cell system to stop a rehydration operation of the fuel cell stack in the fuel cell system when one or more of the following criteria are satisfied:

i. a stack voltage has not dropped by a voltage drop threshold amount within a first threshold period of time during the rehydration operation;

ii. a core temperature is greater than a maximum core temperature threshold during the rehydration operation;

iii. a current drawn from the fuel cell stack to an external load falls below a minimum current threshold during the rehydration operation;

iv. a current drawn from the fuel cell stack to an external load is greater than a maximum current threshold during the rehydration operation;

v. a signal from a load device, or an application associated with the load device, to indicate that an immediate delivery of power is required has been received.

[Claim 23]

The computer program according to Claim 22, which when run on a computer, further causes the computer to:

periodically check whether or not one or more of criteria i) to v) are satisfied, and stop the rehydration operation only when the one or more of criteria i) to v) are satisfied".

(Further, hereinafter, the invention according to Claim 1 is referred to as "the Invention".)

As the Appellant alleges in a written request for appeal, the written amendment on April 3, 2019 is an amendment that introduces the content of Claim 2 before the amendment to Claim 1 before the amendment, which canceled Claim 1 before the amendment, and changed the content of Claim 2 before the amendment to a new independent claim to be Claim 1. Accordingly, the purpose of the amendment falls under the deletion of a claim or claims in Article 17-2(5)(i) of the Patent Act.

Therefore, the written amendment on April 3, 2019 has been done legitimately.

3. Reasons for refusal stated in the examiner's decision

The outline of Reason 1 for refusal stated in the examiner's decision with respect to Claim 1 of the written amendment dated April 3, 2019 is as follows.

"Since the Invention could have been easily invented by a person who had ordinary skill in the art before the application was filed, on the basis of the invention described in Cited Document 1 (National Publication of International Patent Application No. 2002-520779) and the matters described in Cited Document 2 (Japanese Unexamined Patent Application Publication No. 2004-47427), the Appellant should not be granted a patent for the Invention under the provisions of Article 29(2) of the Patent Act".

4. Cited Documents

Cited Document 1 (National Publication of International Patent Application No. 2002-520779) cited in the reasons for refusal stated in the examiner's decision describes the following matters with the drawings.

a "Referring now to FIG. 3, a plurality of fuel cells 10 are shown where they are serially electrically connected together to produce electrical current having a predetermined voltage and current output. A shorting control circuit 120 is shown. The shorting control circuit 120 has an electrical path 121 which electrically couples the anode 52 and cathode 53 of one of the fuel cells together. It should be understood that this electrical circuit is provided on each of the fuel cells shown in FIG. 3 or otherwise associated with it.. That is, each of discrete shorting control circuits 120 individually electrically couples together the anode and cathode of each of the serially coupled fuel cells. In FIG. 3, however, for the sake of simplicity, only one of these circuits is shown. Each of the shorting control circuits is electrically coupled to a single shorting controller which is generally designated by reference numeral 122. As noted, above, the shorting controller is illustrated as being coupled to only one shunt control circuit. However, the shorting controller may in reality be coupled to numerous shorting control circuits corresponding to each of the serially coupled fuel cells. FIG. 3, as noted above, is greatly simplified to illustrate the present invention.

The shorting controller 122 comprises a number of individual components including a set of voltage sensors 123 which are electrically coupled with the anode 52 and the cathode 53 to sense the voltage at the anode 52 and the cathode 53 of each of the fuel cells 10. Still further, the shorting controller is electrically coupled to an electrical switch 124, here shown as being a field effect transistor of conventional design. A suitable commercially acceptable MOSFET may be secured from Mitsubishi obtained under the trade designation FS100UMJ. The shorting controller 122 may be purchased through conventional retail sources. A suitable controller 122 for the present application is a programmable microcontroller chip having MC68HC705P6A as the trade designation [W ユ 2 (W Yu 2)]. The chip may be utilized and programmed to execute the program logic, as shown in FIG. 4, and will allow the shorting control circuit to react to the first and second operational conditions of the fuel cell 10, as will be described in greater detail below. The shorting controller 122 is further electrically coupled to the valves 104 which are disposed in fluid metering relation relative to the supply of fuel gas 105 (described as "the fuel gas shut-off control" in the drawing). The shorting control circuit 120 further has a bypass electrical circuit 126 which electrically couples together the anode 52 and the cathode 53 of each of the fuel cells 10. The bypass electrical circuit is composed of a diode 127. A current sensor 128 is further electrically coupled to the fuel cells 10 to detect the current. The current sensor is made integral with the shorting controller 122. As noted above, the shorting control circuit 120 is controlled by programmable logic which is written more specifically in FIG. 4 and is generally indicated by reference numeral 130. The bypass electrical circuit is operable to short circuit an electrical current between the anode and cathode of the fuel cells 10 upon failure of the shorting controller 122.

As best understood by a study of FIG. 3, the fuel cell 10 has the anode 52 and the cathode 53 which produce electrical power having a predetermined current and voltage output. The shorting controller 122 is electrically coupled with the fuel cell 10 and is operable to short circuit the electrical current between the anode and the cathode of the fuel cell under predetermined operational conditions. As discussed earlier, the shorting controller 122 includes a voltage sensor 123 and a current sensor 128 which are disposed in voltage and current sensing relation relative to the voltage and current output of the fuel cell 10 and are further electrically coupled with the anode 52 and cathode 53 of the fuel cell 10. Still further, the shorting controller 122 further comprises an electrical switch which is shown herein as a field effect transistor 124. The field effect transistor 124 has opened and closed electrical conditions as conditions. As will be described in further detail below, the shorting controller 122 upon sensing, by way of the voltage sensor 123 and the current sensor 128, a predetermined voltage and current output of the fuel cell 10, adjusts the valve 104 into a predetermined fluid metering relationship relative to the supply of fuel gas. Still further, the shorting controller 122 positions the field effect transistor in an "opened" or "closed" electrical condition, based upon predetermined performance parameters for the respective fuel cells 10.

In this regard, in a first operational condition where a fuel cell is performing at or below predetermined performance, parameters or expectations, as might be the case where the voltage output of the fuel cell is less than about 0.4 volts, the shorting controller 122 locates the valve 104 at a position where the supply of the fuel gas 105 to the fuel cell 10 is stopped, and simultaneously brings the electrical switch 124 into the closed electrical condition, thereby shorting circuit the current from the anode 52 to the cathode 53 so as to substantially prevent heat-related damage to the fuel cell 10, which might be occasioned when a negative drop phenomenon occurs. This was discussed earlier in the specification. Still further, if the electrical switch 124 is subsequently brought in the opened condition, the shorting controller 122 is operable to cause the valve 104 to be placed in a condition which allows the substantially continuous supply of fuel gas to the fuel cell". ([0020] to [0023])

Referring to the above descriptions and FIG. 3, the plurality of fuel cells serially electrically connected together configure the fuel cell system.

There is the description that "As best understood by a study of FIG. 3, the fuel cell 10 has the anode 52 and the cathode 53 which produces electrical power having a predetermined current and voltage output. The shorting controller 122 is electrically coupled with the fuel cell 10 and is operable to short circuit the electrical current between the anode and the cathode of the fuel cell under predetermined operational conditions," and the fuel cell outputs, since it supplies power to the load; that is, since the load needs power, and it means there is current (power) demand. Nevertheless, the shorting controller operates, since the shorting controller operates independently of current demand on the fuel cell system. Therefore, it can be said that the one described in Cited Document 1 stops the supply of fuel gas to the fuel cell independently of current demand on the fuel cell system.

According to the above described matters, Cited Document 1 describes the invention of

"A fuel cell system comprising:

a plurality of fuel cells serially electrically connected together;

a field effect transistor which electrically couples an anode and a cathode of each of the fuel cells; and

a shorting control circuit which stops the supply of fuel gas to the fuel cell when the voltage output of the fuel cell is less than about 0.4 volts, and independently of current demand on the fuel cell system, so as to prevent a negative hydration drop phenomenon"

(hereinafter, referred to as "the Cited Invention").

Similarly, Cited Document 2 (Japanese Unexamined Patent Application Publication No. 2004-47427) cited in the reasons for refusal stated in the examiner's decision describes the following matters with the drawings.

b "FIG. 14 is an example of a time chart for explaining the operation of the fuel cell device of FIG. 13, and is an example in which the output voltage when the load current of the fuel cell is constant is used for detection as a parameter of the dry state. The horizontal axis represents time t, and the vertical axis represents cell voltage Vcell when the load current is constant. The cell voltage Vcell corresponds to the output voltage Vout of the fuel cell main body 171. In this fuel cell device, when the output voltage drop of the fuel cell main body 171 becomes remarkable, the control unit 173 detects the output voltage drop, and when it is determined that it is equal to or less than a certain value (for example, Vth in FIG. 12), the air supply compressor 176 is controlled to stop blowing by a signal from the control unit 173.

When recovering the power generation performance, first, the air supply from the air supply compressor 176 is controlled. For example, while the output voltage of the fuel cell main body 171 is lowered, the operation of the air supply compressor 176 can be temporarily stopped to stop the air supply. By temporarily stopping the air supply compressor 176, the evaporation of water can be stopped, and the generated water can be rapidly permeated into the electrolyte membrane, and the power generation performance can be restored quickly due to the evaporation suppression of the water and the permeation of the generated water into the electrolyte membrane.

Further, due to the transition of the low resistance circuit unit to low resistance, the fuel cell main body 171 changes to a state in which the output terminals thereof are low in resistance or short-circuited, which makes large overcurrent flow through the fuel cell main body 171. Due to the overcurrent flowing through the fuel cell main body 171, oxygen atoms are actively combined with hydrogen atoms at the oxygen side electrode to temporarily generate a large amount of generated water, and when the output decrease is due to drying, it is possible to instantly restore the output to return the electrolyte membrane to promptly a wet state. When the air supply to the fuel cell main body 171 is stopped, the potential difference of the output terminal; that is, the cell voltage Vcell, also sharply decreases, so that it falls below the required voltage (for example, voltage Vs in FIG. 12) in a relatively short time as shown in FIG. 14, and the control unit 173 detects that the output voltage has dropped below the required voltage, and shifts to normal air supply control. Then, the air supply control unit returns to the normal state and supplies air to the oxygen side electrode. As a result, the cell voltage Vcell; that is, the output voltage Vout, is also inverted and rapidly increases. When the output voltage Vout of the fuel cell main body 171 becomes high again and exceeds the voltage Vb of the floating battery 180, power is supplied from the fuel cell main body 171 to the load device 175 again. At this stage, when the air supply to the fuel cell main body 171 is stopped, a large amount of generated water is generated, and the electrolyte membrane is quickly brought into a wet state, so that the output can be recovered instantly.

FIG. 14 also illustrates the case where the fuel cell device is further operated, and if the same output voltage drop occurs by continuing the operation again, the air supply to the fuel cell main body 171 for the same functional recovery can be stopped, and the output voltage can be improved as well. Further, if the air supply in the fuel cell main body 111 can maintain the self-humidifying state, the output voltage will be equilibrated at a predetermined value, and the output voltage can be maintained at that value to generate electricity for a long time". ([0094] to [0098])

According to the above described matters, Cited Document 2 describes that "while the output voltage of the fuel cell main body 171 is lowered, the operation of the air supply compressor 176 is temporarily stopped to stop the evaporation of water, and by making generated water rapidly permeate into an electrolyte membrane, the power generation performance can be restored quickly due to the evaporation suppression of these water and the permeation of the generated water into the electrolyte membrane".

5. Comparison

Then, in comparison of the Invention and the Cited Invention, "fuel cells," "a field effect transistor," "a shorting control circuit," and "stops the supply" of Cited

Invention correspond to "a fuel cell stack," "a first rectifier," "a controller," and "configured to modulate air flow" of the Invention, respectively.

"A plurality of fuel cells serially electrically connected together" of the Cited Invention, since there are two or more fuel cells serially connected, correspond to "a first fuel cell stack and a second fuel cell stack in series with the first fuel cell stack" of the Invention.

"A field effect transistor which electrically couples an anode and a cathode of each of the fuel cells" of the Cited Invention corresponds to "a first rectifier in parallel with the first fuel cell stack" of the Invention.

"So as to prevent a negative hydration drop phenomenon" of the Cited Invention corresponds to "to provide rehydration intervals that increase the hydration levels of the first fuel cell stack" of the Invention.

"When the voltage output of the fuel cell is less than about 0.4 volts" of the Cited Invention and "periodically" of the Invention are identical in the point of "under a predetermined condition".

"Stops the supply of fuel gas to the fuel cell independently of current demand on the fuel cell system" of the Cited Invention and "configured to modulate air flow through the first fuel cell stack independently of current demand on the fuel cell system" of the Invention are identical in the point of configured to modulate gas flow through the first fuel cell stack independently of current demand on the fuel cell system".

Accordingly, the two inventions are identical in the point of
"A fuel cell system, comprising:

a first fuel cell stack;

a second fuel cell stack in series with the first fuel cell stack;

a first rectifier in parallel with the first fuel cell stack; and

a controller configured to modulate gas flow through the first fuel cell stack under a predetermined condition and independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack,"

and are different in the following points.

[Different Feature 1]

Concerning a predetermined condition, it is "periodically" in the Invention, whereas it is "when the voltage output of the fuel cell is less than about 0.4 volts" in the Cited Invention.

[Different Feature 2]

Concerning the modulation of gas flow, in the Invention, gas refers to air, whereas, in the Cited Invention, gas refers to fuel gas.

6. Judgment

Regarding Different Feature 1

For the maintenance to be required, generally there are a method to be performed when the output of the device changes beyond a threshold value, and a method of to be performed when the usage frequency and usage time in which the output of the device might change over the threshold value on the basis of the past data, regardless of whether or not the actual output has changed by a threshold value or more.

Further, it is a well known matter that in a fuel cell, a moisturizing level of a fuel battery cell is periodically increased by periodically modulating an air flow rate regardless of current demand of a load outside the fuel cell, as can be seen in National Publication of International Patent Application No. 2009-528657 (see, especially [Abstract], [0009], [0011], [0029] to [0031]).

Therefore, in the Cited Invention, it is recognized that it can be done easily by person skilled in the art to modulate gas flow periodically instead of operating a controller when the output voltage of a fuel cell is less than about 0.4 volts.

Regarding Different Feature 2

In the Cited Invention, it is recognized that it can be easily conceived by a person skilled in the art to stop the supply of air like as described in Cited Document 2 so as to stop the drying of supplied air or increase the efficiency of rehydration by avoiding power generation by residual fuel gas and air, since the supplied air causes the drying of the fuel cell even if the shorting controller stops the supply of the fuel gas to the fuel cell, when the output voltage of a fuel cell is less than about 0.4 volts.

Further, in the written request for appeal, the Appellant alleges that "against this, in Cited Document 1, there is no description about modulating air flow through the fuel cell stack to increase a hydration level, that is providing rehydration intervals. Hence, in Cited Document 1, there is no description and suggestion about Feature A (Note by the body: "to modulate air flow through the first fuel cell stack periodically and independently of current demand on the fuel cell system to provide rehydration intervals that increase the hydration levels of the first fuel cell stack"). Further, although Cited Document 2 describes that the operation of the air supply compressor 176 is stopped to stop the supply of air to the fuel cell and suppress the evaporation of water to perform rehydration, there is no description or suggestion about modulating air flow periodically and independently of current demand to provide rehydration intervals, like as Feature A".

However, even if there is no description of air flow in Cited Document 1, there is a motivation to apply Cited Document 2 as mentioned above, and Cited Document 2 describes that "Further, in the present embodiment, an example in which a predetermined output characteristic recovery operation is performed while monitoring the output voltage of the fuel cell main body and the like has been described, but the present invention is not limited to this, and a predetermined output characteristic recovery operation can be automatically performed by a timer and the like" ([0130]). Furthermore, as mentioned above, since it is a well known matter that a moisturizing level of a fuel battery cell is periodically increased by periodically modulating an air flow rate regardless of current demand of a load outside a fuel cell, as can be seen in National Publication of International Patent Application No. 2009-528657, the Appellant's allegation described above cannot be accepted.

Function and effects of the Invention are within a scope that can be predicted by a person skilled in the art from the Cited Invention and the matters described in Cited Document 2.

Accordingly, since the Invention could have been easily invented by a person skilled in the art on the basis of the Cited Invention and the matters described in Cited Document 2, the Appellant should not be granted a patent for the Invention under the provisions of Article 29(2) of the Patent Act.

7. Closing

Therefore, since the Invention could have been easily invented by a person skilled in the art on the basis of the Cited Invention and the matters described in Cited Document 2, the Appellant should not be granted a patent for the Invention under the provisions of Article 29(2) of the Patent Act.

Then, the examiner's decision indicating that the present application should be rejected should be maintained.

Therefore, the appeal decision shall be made as described in the conclusion.

June 5, 2020

Chief administrative judge:	SASAKI, Yoshie
Administrative judge:	HORIKAWA, Ichiro
Administrative judge:	NAGAMA, Nozomi