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(54) DATA PROCESSING METHOD AND APPARATUS BASED ON POSITIVE PRESSURE VENTILATION THERAPY MACHINE

DATENVERARBEITUNGSVERFAHREN UND VORRICHTUNG AUF DER GRUNDLAGE EINER ÜBERDRUCK-BEATMUNGSMASCHINE

PROCÉDÉ ET APPAREIL DE TRAITEMENT DE DONNÉES FAISANT APPEL À UNE MACHINE DE THÉRAPIE PAR VENTILATION À PRESSION POSITIVE

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Description

Field of the Invention

[0001] The present invention relates to the technical field of data processing and specifically relates to a data processing method and device based on a positive pressure ventilation therapy machine.

Background of the Invention

[0002] When a positive pressure ventilation therapy machine is used, it is required that a gas flow output by the positive pressure ventilation therapy machine is recorded and an Apnea-Hypopnea Index (AHI) is calculated according to the gas flow, so that whether the current parameter setting of the positive pressure ventilation therapy machine is appropriate can be judged according to the AHI, and furthermore, further adjustment is provided. At present, the gas flow is generally acquired by adopting a flow sensor, however, for customers, a therapy machine with the flow sensor is overhigh cost, which results in overhigh burden. DE 20 2017 003149 U1 relates to a ventilation device having a fan, a pressure sensor, and a controller to the speed of the fan to generate a pressurized breathing gas flow.

Summary of the Invention

[0003] Embodiments of the present invention aim at providing a data processing method and device based on a positive pressure ventilation therapy machine to solve the problem of overhigh cost of a flow sensor adopted in the prior art and reduce the cost.

[0004] In order to achieve the above-mentioned purpose, an embodiment of the present invention provides a method according to claim 1. According to the embodiment of the present invention, the problem that the cost of the positive pressure ventilation therapy machine is increased due to the demand of installing a flow sensor for measuring the gas flow is solved. In addition, in the prior art, the gas flow is measured by adopting two pressure sensors instead of the flow sensor, which can also increase the additional expense, however, in the embodiment of the present invention, the current pressure value detected by a pressure sensor existing in the prior art is utilized, and the current gas flow output by the positive pressure ventilation therapy machine is determined according to the current operating parameter and the current pressure value of the draught fan as well as the preset list, so that the cost of the flow sensor specially used for measuring the gas flow and required by the positive pressure ventilation therapy machine is reduced, and the burden of a patient is relieved.

[0005] Further, the current operating parameter may be a current current value or a current voltage value. Compared with the prior art in which a way of calculating the gas flow according to the rotating speed and pressure value of the draught fan is adopted to result in the situation of inaccurate simulation for the gas flow when a characteristic curve of the draught fan is not monotonous, the embodiment of the present invention has the advantages that the rotating speed and electromagnetic torque of the draught fan have monotonicity under the condition that the voltage or current of the draught fan is unchanged, and the electromagnetic torque can be in direct proportion to the gas flow, so that the relation between the gas flow and the voltage or current of the draught fan is approximate to a logarithmic relation, and the accuracy of the gas flow obtained according to the above-mentioned relation can be guaranteed.

[0006] Further, the step of determining the current gas flow output by the positive pressure ventilation therapy machine according to the current operating parameter and the target relational expression comprises: performing calculation according to $F = \frac{1}{B}\ln\left(\frac{P}{K}\right)$ to obtain the current gas flow output by the positive pressure ventilation therapy machine, wherein F is the gas flow, P is the current operating parameter, B and K are conversion coefficients, and the conversion coefficients are related to the current pressure value. The above-mentioned calculation way is relatively simple and convenient in software implementation under the condition that the error range is taken into account as much as possible.

[0007] Further, the method may further comprise the steps of finding two relational expressions corresponding to two pressure values adjacent to the current pressure value in the preset list and determining the two relational expressions as a first relational expression and a second relational expression when the current pressure value is not found in the preset list; determining a first gas flow and a second gas flow according to the current operating parameter, the first relational expression and the second relational expression; and determining a mean value of the first gas flow and the second gas flow as the current gas flow output by the positive pressure ventilation therapy machine. A gas flow corresponding to a pressure value not existing in the preset list can also be obtained in a linear relation fitting way in the embodiment of the present invention, so that the application range of the embodiment of the present invention is widened.

[0008] An embodiment of the present invention further provides a device according to claim 5. According to the embodiment of the present invention, the problem that the cost of the positive pressure ventilation therapy machine is increased due to the demand of installing a flow sensor for measuring the gas flow is solved. In addition, in the prior art, the gas flow is measured by adopting two pressure sensors instead of the flow sensor, which can also increase the additional expense, however, in the embodiment of the present invention, the current pressure value detected by a pressure sensor existing in the prior art is utilized, and the current gas flow output by the

positive pressure ventilation therapy machine is determined according to the current operating parameter and the current pressure value of the draught fan as well as the preset list, so that the cost of the flow sensor specially used for measuring the gas flow and required by the positive pressure ventilation therapy machine is reduced, and the burden of a patient is relieved.

Further, the current operating parameter acquired by the acquiring unit may be a current current value or a current voltage value. Compared with the prior art in which a way of calculating the gas flow according to the rotating speed and pressure value of the draught fan is adopted to result in the situation of inaccurate simulation for the gas flow when a characteristic curve of the draught fan is not monotonous, the embodiment of the present invention has the advantages that the rotating speed and electromagnetic torque of the draught fan have monotonicity under the condition that the voltage or current of the draught fan is unchanged, and the electromagnetic torque can be in direct proportion to the gas flow, so that the relation between the gas flow and the voltage or current of the draught fan is approximate to a logarithmic relation, and the accuracy of the gas flow obtained according to the above-mentioned relation can be guaranteed.

[0009] Further, the determining unit is further used for performing calculation according to

$$F = \frac{1}{B}\ln\left(\frac{P}{K}\right)$$

to obtain the current gas flow output by the positive pressure ventilation therapy machine, wherein F is the gas flow, P is the current operating parameter, B and K are conversion coefficients, and the conversion coefficients are related to the current pressure value. The above-mentioned calculation way is relatively simple and convenient in software implementation under the condition that the error range is taken into account as much as possible.

[0010] Further, the finding unit may be further used for finding two relational expressions corresponding to two pressure values adjacent to the current pressure value in the preset list and determining the two relational expressions as a first relational expression and a second relational expression when the current pressure value is not found in the preset list; and the determining unit is further used for determining a first gas flow and a second gas flow according to the current operating parameter, the first relational expression and the second relational expression and determining a mean value of the first gas flow and the second gas flow as the current gas flow output by the positive pressure ventilation therapy machine.

[0011] An embodiment of the present invention further provides a computer readable storage medium, storing a computer program, and the computer program implements the above-mentioned data processing method based on the positive pressure ventilation therapy machine when being executed by a processor according to claim 9.

[0012] According to the above-mentioned technical solution, the current operating parameter and the current pressure value of the draught fan in the positive pressure ventilation therapy machine are acquired, the target relational expression corresponding to the current pressure value is found in the preset list according to the current pressure value, and the current gas flow output by the positive pressure ventilation therapy machine is determined according to the current operating parameter and the target relational expression. According to the embodiments of the present invention, the problem of overhigh cost of the flow sensor adopted in the prior art is solved, and the cost is reduced.

[0013] Other characteristics and advantages of the embodiments of the present invention will be described in detail in the subsequent detailed descriptions.

Description of the Drawings

[0014] The drawings are provided for further understanding the embodiments of the present invention, construct a part of the specification and are intended to explain the embodiments of the present invention together with the following detailed descriptions, rather than to limit the embodiments of the present invention. In the accompanying drawings:

Fig. 1 is a mechanical characteristic curve diagram of a draught fan;

Fig. 2 is a flow chart of a data processing method based on a positive pressure ventilation therapy machine provided by an embodiment of the present invention; and

Fig. 3 is a structural diagram of a data processing device based on a positive pressure ventilation therapy machine provided by an embodiment of the present invention.

Detailed Description of the Embodiments

[0015] The detailed descriptions of the embodiments of the present invention are described in detail below in combination with accommodating drawings. It should be understood that the detailed descriptions described herein are only intended to describe and explain the embodiments of the present invention, rather than to limit the embodiment of the present invention.

[0016] A draught fan in a positive pressure ventilation therapy machine is a power device of the positive pressure ventilation therapy machine and can provide a gas flow with a certain pressure, and a mechanical characteristic of the draught fan can be expressed by a formula (1).

$$n = \frac{30K_T U_d - RT_e}{\pi R K_e K_T} \quad \text{formula (1)}$$

[0017] Wherein n is the rotating speed of the draught fan, K_T is a torque coefficient, U_d is the voltage of the draught fan, R is the resistance of the draught fan, T_e is an electromagnetic torque, and K_e is a back electromotive force coefficient. Known from the formula (1), a mechanical characteristic curve of the draught fan is shown as Fig. 1, in addition, the rotating speed and electromagnetic torque of the draught fan have monotonicity under the condition that the voltage of the draught fan is unchanged.

[0018] Known from a formula (2), the electromagnetic torque is:

$$T_e = \frac{EI}{\omega} \quad \text{formula (2)}$$

[0019] Wherein E is a back electromotive force of a winding, I is a current of the winding, and ω is an angular speed. According to energy conservation, energy generated by the electromagnetic torque is further provided as a pressure and energy for the gas flow output by the positive pressure ventilation therapy machine in addition to being used for self-loss. When the pressure is approximate to be constant, the electromagnetic torque is further in direct proportion to the gas flow. Known from the mechanical characteristic curve of the draught fan as shown in Fig. 1, a relation between the gas flow and the voltage or current of the draught fan is approximate to a logarithmic relation under the condition that the pressure is approximate to be constant. Therefore, the gas flow is calculated according to the operating parameter and pressure value of the draught fan in the embodiment of the present invention.

[0020] Fig. 2 is a flow chart of a data processing method based on a positive pressure ventilation therapy machine provided by an embodiment of the present invention. As shown in Fig. 2, the method comprises the following steps:

Step 201, a current operating parameter and a current pressure value of a draught fan in the positive pressure ventilation therapy machine are acquired.

[0021] The operating parameter and pressure value of the draught fan can be acquired in real time. The pressure value can be acquired in real time by virtue of a pressure sensor arranged in the positive pressure ventilation therapy machine in the prior art. In addition, there is a requirement on a single fault in general requirements (IEC60601) of medical equipment, the current operating parameter of the draught fan, such as the current current value or current voltage value of the draught fan, can be detected by the positive pressure ventilation therapy machine in the prior art. Therefore, the current operating parameter and the current pressure value of the draught fan in the positive pressure ventilation therapy machine can be easily acquired. Compared with the prior art in which a way of calculating the gas flow according to the rotating speed and pressure value of the draught fan is adopted to result in the situation of inaccurate simulation for the gas flow when a characteristic curve of the draught fan is not monotonous, the embodiment of the present invention has the advantages that the rotating speed and electromagnetic torque of the draught fan have monotonicity under the condition that the voltage or current of the draught fan is unchanged, and the electromagnetic torque can be in direct proportion to the gas flow, so that the relation between the gas flow and the voltage or current of the draught fan is approximate to a logarithmic relation, and the accuracy of the gas flow obtained according to the above-mentioned relation can be guaranteed.

[0022] Step 202, a target relational expression corresponding to the current pressure value is found in a preset list according to the current pressure value, wherein the preset list comprises a plurality of pressure values and relational expressions corresponding to the plurality of pressure values, and each of the relational expressions corresponding to the plurality of pressure values is a relational expression between operating parameters of the draught fan and a gas flow output by the positive pressure ventilation therapy machine.

[0023] The relational expression between each of operating parameters, corresponding to the different pressure values, of the draught fan and the gas flow output by the positive pressure ventilation therapy machine is obtained through a plurality of experiments, and thus, the preset list comprising the plurality of pressure values and the relational expressions corresponding to the plurality of pressure values is obtained. The current pressure value is found in the preset list pre-stored in advance according to the current pressure value. When the current pressure value is found in the preset list, a relational expression corresponding to the current pressure value is extracted as the target relational expression for subsequent calculation.

[0024] Step 203, a current gas flow output by the positive pressure ventilation therapy machine is determined according to the current operating parameter and the target relational expression.

[0025] Calculation is performed according to $F = \frac{1}{B}\ln\left(\frac{P}{K}\right)$ to obtain the current gas flow output by the positive pressure ventilation therapy machine, wherein F is the gas flow, P is the current operating parameter, B and K are conversion coefficients, and the conversion coefficients are related to the current pressure value.

[0026] As shown in parts of the preset list in Fig. 1, values, corresponding to the different pressure values,

of *B* and *K* in the relational expression can be different. For example, B and K are correspondingly 206.48 and 0.15 when the pressure value is 4. When the draught fan is driven at the current operating parameter such as a constant voltage, the current current value of the draught fan is substituted into the above-mentioned formula, when the draught fan is driven at a constant current, the current voltage value of the draught fan is substituted into the above-mentioned formula, and thus, the gas flow output by the positive pressure ventilation therapy machine is obtained.

Table 1

Pressure value	B	K
4	206.48	0.15
9	444.97	0.121
15	686.38	0.1055
20	944.85	0.0964

[0027] According to the embodiment of the present invention, the current pressure value detected by a pressure sensor existing in the prior art is utilized, and the current gas flow output by the positive pressure ventilation therapy machine is determined according to the current operating parameter and the current pressure value of the draught fan as well as the preset list, so that the cost of the flow sensor specially used for measuring the gas flow and required by the positive pressure ventilation therapy machine is reduced, and the burden of a patient is relieved.

[0028] In an implementation manner of the present invention, the corresponding current gas flow can be obtained by adopting linear relation fitting in the prior art when the acquired current pressure value is not in the preset list. The specific processing way is:

1) two relational expressions corresponding to two pressure values adjacent to the current pressure value are found in the preset list, and the two relational expressions are determined as a first relational expression and a second relational expression when the current pressure value is not found in the preset list.

[0029] When the current pressure value is not found in the preset list, firstly, two pressure values adjacent to the current pressure value are found in the preset list, namely two pressure values of which one adjacent to the current pressure value is smaller than the current pressure value and the other is greater than the current pressure value and two relational expressions corresponding to the two pressure values are found in the preset list, and the two relational expressions are determined as the first relational expression and the second relational expression. With table 1 as an example, when the acquired current pressure value is 7, the current pressure value is not in table 1, then, two pressure values 4 and 9 adjacent to 7 as well as B and K corresponding to the pressure values 4 and 9 can be found.

[0030] 2) A first gas flow and a second gas flow are determined according to the current operating parameter, the first relational expression and the second relational expression.

[0031] The current operating parameter such as the current current value or current voltage value of the draught fan is substituted into the first relational expression and the second relational expression to obtain the first gas flow and the second gas flow. For example, after it is acquired that B corresponding to the pressure value 4 is 206.48, K corresponding to the pressure value 4 is 0.15, B corresponding to the pressure value 9 is 444.97 and K corresponding to the pressure value 9 is 0.121, the current current value or the current voltage value of the draught fan is substituted into the first relational expression corresponding to the pressure value 4 and the second relational expression corresponding to the pressure value 9 to obtain the first gas flow and the second gas flow.

[0032] 3) A mean value of the first gas flow and the second gas flow is determined as the current gas flow output by the positive pressure ventilation therapy machine.

[0033] A gas flow corresponding to a pressure value not existing in the preset list can also be obtained in the above-mentioned linear relation fitting way.

[0034] According to the embodiment of the present invention, the problem that the cost of the positive pressure ventilation therapy machine is increased due to the demand of installing the flow sensor for measuring the gas flow is solved. In addition, in the prior art, the gas flow is measured by adopting two pressure sensors instead of the flow sensor, which can also increase the additional expense, however, in the embodiment of the present invention, the gas flow can be obtained according to a self-existent parameter and a preset relational expression. In addition, compared with the prior art in which the way of calculating the gas flow according to the rotating speed and pressure value of the draught fan is adopted to result in the situation of inaccurate simulation for the gas flow when the characteristic curve of the draught fan is not monotonous, the embodiment of the present invention has the advantages that the rotating speed and electromagnetic torque of the draught fan have monotonicity under the condition that the voltage or current of the draught fan is unchanged, and the electromagnetic torque can be in direct proportion to the gas flow, so that the relation between the gas flow and the voltage or current of the draught fan is approximate to the logarithmic relation, and the accuracy of the gas flow obtained according to the above-mentioned relation can be guaranteed. Accordingly, Fig. 3 is a structural diagram of a data processing device based on a positive pressure ventilation therapy machine provided by an embodiment of the

present invention. As shown in Fig. 3, the device comprises:

an acquiring unit 31, used for acquiring a current operating parameter and a current pressure value of a draught fan in the positive pressure ventilation therapy machine;

a finding unit 32, used for finding a target relational expression corresponding to the current pressure value in a preset list according to the current pressure value, wherein the preset list comprises a plurality of pressure values and relational expressions corresponding to the plurality of pressure values, and each of the relational expressions corresponding to the plurality of pressure values is a relational expression between operating parameters of the draught fan and a gas flow output by the positive pressure ventilation therapy machine; and

a determining unit 33, used for determining a current gas flow output by the positive pressure ventilation therapy machine according to the current operating parameter and the target relational expression.

[0035] According to the embodiment of the present invention, the current gas flow output by the positive pressure ventilation therapy machine is determined according to the current operating parameter and the current pressure value of the draught fan as well as the preset list, so that the cost of the flow sensor specially used for measuring the gas flow and required by the positive pressure ventilation therapy machine is reduced, and the burden of a patient is relieved.

[0036] Further, the current operating parameter acquired by the acquiring unit is a current current value or a current voltage value.

[0037] Further, the determining unit is further used for

$$F = \frac{1}{B}\ln\left(\frac{P}{K}\right)$$

performing calculation according to

to obtain the current gas flow output by the positive pressure ventilation therapy machine, wherein F is the gas flow, P is the current operating parameter, B and K are conversion coefficients, and the conversion coefficients are related to the current pressure value.

[0038] Further, the finding unit is further used for finding two relational expressions corresponding to two pressure values adjacent to the current pressure value in the preset list and determining the two relational expressions as a first relational expression and a second relational expression when the current pressure value is not found in the preset list; and

the determining unit is further used for determining a first gas flow and a second gas flow according to the current operating parameter, the first relational expression and the second relational expression and determining a mean value of the first gas flow and the second gas flow as the current gas flow output by the positive pressure ventilation therapy machine.

[0039] Various units in the data processing device based on the positive pressure ventilation therapy machine in the embodiment of the present invention are used for executing the corresponding steps of the data processing method based on the positive pressure ventilation therapy machine described in the above-mentioned embodiment to achieve the same or similar technical effect with the above-mentioned data processing method based on the positive pressure ventilation therapy machine, and therefore, more details of the data processing device based on the positive pressure ventilation therapy machine in the present embodiment can refer to the description of the data processing method based on the positive pressure ventilation therapy machine in the above-mentioned embodiment, the descriptions of the same content are omitted herein.

[0040] Accordingly, an embodiment of the present invention further provides a data processing device based on a positive pressure ventilation therapy machine, comprising a processor, a memory and a computer program stored in the memory and capable of operating on the processor, and the computer program implements the steps of the data processing method based on the positive pressure ventilation therapy machine in the above-mentioned embodiment when being executed by the processor.

[0041] Accordingly, an embodiment of the present invention further provides a computer readable storage medium, storing a computer program, and the computer program implements the steps of the data processing method based on the positive pressure ventilation therapy machine in the above-mentioned embodiment when being executed by a processor.

[0042] Optional implementation manners of the embodiments of the present invention are described in detail above in combination with the accompanying drawings, however, the embodiments of the present invention are not limited to the concrete details in the above-mentioned implementation manners.

[0043] The skilled in the art can understand that all or parts of steps of the method in the above-mentioned embodiment can be completed by related hardware instructed by a program, the program is stored in a storage medium and comprises a plurality of instructions for causing a single chip microcomputer, a chip or a processor to execute all or parts of the steps of the method in each of the embodiments of the present application. The above-mentioned storage medium comprises various media, such as a USB disk, a mobile hard disk, a Read-Only Memory (ROM), a Random Access Memory (RAM), a diskette or an optical disc, capable of storing program codes.

Claims

1. A data processing method of determining a flow based on a positive pressure ventilation therapy machine, the method comprising:

   acquiring (201) a current operating parameter and a current pressure value of a draught fan in the positive pressure ventilation therapy machine;
   finding (202) a target relational expression corresponding to the current pressure value in a preset list according to the current pressure value, wherein the preset list comprises a plurality of pressure values and relational expressions corresponding to the plurality of pressure values, and each of the relational expressions corresponding to the plurality of pressure values is a relational expression between operating parameters of the draught fan and a gas flow output by the positive pressure ventilation therapy machine; and
   determining (203) a current gas flow output by the positive pressure ventilation therapy machine according to the current operating parameter and the target relational expression, wherein the step of determining the current gas flow output by the positive pressure ventilation therapy machine according to the current operating parameter and the target relational expression comprises:
   performing calculation according to $F = \frac{1}{B}\ln\left(\frac{P}{K}\right)$ to obtain the current gas flow output by the positive pressure ventilation therapy machine, wherein F is the gas flow, P is the current operating parameter, B and K are conversion coefficients, and the conversion coefficients are related to the current pressure value.

2. The method according to claim 1, wherein the current operating parameter is a current current value or a current voltage value.

3. The method according to claim 1 or 2, further comprising:
   determining (203) the current gas flow output by the positive pressure ventilation therapy machine by adopting linear relation fitting when the current pressure value is not found in the preset list.

4. The method according to claim 3, wherein the step (203) of determining the current gas flow output by the positive pressure ventilation therapy machine by adopting linear relation fitting when the current pressure value is not found in the preset list comprises:

   finding two relational expressions corresponding to two pressure values adjacent to the current pressure value in the preset list and determining the two relational expressions as a first relational expression and a second relational expression when the current pressure value is not found in the preset list;
   determining a first gas flow and a second gas flow according to the current operating parameter, the first relational expression and the second relational expression; and
   determining a mean value of the first gas flow and the second gas flow as the current gas flow output by the positive pressure ventilation therapy machine.

5. A device of determining a flow based on a positive pressure ventilation therapy machine, the device comprising:

   an acquiring unit (31), used for acquiring a current operating parameter and a current pressure value of a draught fan in the positive pressure ventilation therapy machine;
   a finding unit (32), used for finding a target relational expression corresponding to the current pressure value in a preset list according to the current pressure value, wherein the preset list comprises a plurality of pressure values and relational expressions corresponding to the plurality of pressure values, and each of the relational expressions corresponding to the plurality of pressure values is a relational expression between operating parameters of the draught fan and a gas flow output by the positive pressure ventilation therapy machine; and
   a determining unit (33), used for determining a current gas flow output by the positive pressure ventilation therapy machine according to the current operating parameter and the target relational expression,
   wherein the determining unit (33) is further used for performing calculation according to $F = \frac{1}{B}\ln\left(\frac{P}{K}\right)$ to obtain the current gas flow output by the positive pressure ventilation therapy machine, wherein F is the gas flow, P is the current operating parameter, B and K are conversion coefficients, and the conversion coefficients are related to the current pressure value.

6. The device according to claim 5, wherein the current operating parameter acquired by the acquiring unit (31) is a current current value or a current voltage

value.

7. The device according to claim 5 or 6, wherein the determining unit (33) is further used for determining the current gas flow output by the positive pressure ventilation therapy machine by adopting linear relation fitting when the current pressure value is not found in the preset list.

8. The device according to claim 7, wherein the finding unit (32) is further used for finding two relational expressions corresponding to two pressure values adjacent to the current pressure value in the preset list and determining the two relational expressions as a first relational expression and a second relational expression when the current pressure value is not found in the preset list; and
the determining unit (33) is further used for determining a first gas flow and a second gas flow according to the current operating parameter, the first relational expression and the second relational expression and determining a mean value of the first gas flow and the second gas flow as the current gas flow output by the positive pressure ventilation therapy machine.

9. A computer readable storage medium, the computer readable storage medium stores a computer program, and the computer program implements the method of determining a flow based on the positive pressure ventilation therapy machine according to any one of claims 1-4 when being executed by a processor.

Patentansprüche

1. Datenverarbeitungsverfahren zum Bestimmen eines Durchflusses auf der Grundlage einer Überdruck-Beatmungstherapiemaschine, wobei das Verfahren umfasst:

   Erfassen (201) eines aktuellen Betriebsparameters und eines aktuellen Druckwertes eines Saugventilators in der Überdruck-Beatmungstherapiemaschine;
   Finden (202) eines relationalen Zielausdrucks, der dem aktuellen Druckwert entspricht, in einer voreingestellten Liste gemäß dem aktuellen Druckwert, wobei die voreingestellte Liste eine Vielzahl von Druckwerten und relationalen Ausdrücken umfasst, die der Vielzahl von Druckwerten entsprechen, und jeder der relationalen Ausdrücke, die der Vielzahl von Druckwerten entsprechen, ein relationaler Ausdruck zwischen Betriebsparametern des Saugventilators und einem Gasfluss ist, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird; und
   Bestimmen (203) eines aktuellen Gasflusses, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, gemäß dem aktuellen Betriebsparameter und dem relationalen Zielausdruck, wobei der Schritt des Bestimmens des aktuellen Gasflusses, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, gemäß dem aktuellen Betriebsparameter und dem relationalen Zielausdruck umfasst:
   Durchführen einer Berechnung gemäß

   $$F = \frac{1}{B} ln\left(\frac{P}{K}\right)$$

   um den aktuellen Gasfluss zu erhalten, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, wobei *F* der Gasfluss ist, *P* der aktuelle Betriebsparameter ist, *B* und *K* Umwandlungskoeffizienten sind und die Umwandlungskoeffizienten mit dem aktuellen Druckwert in Beziehung stehen.

2. Verfahren nach Anspruch 1, wobei der aktuelle Betriebsparameter ein aktueller Stromwert oder ein aktueller Spannungswert ist.

3. Verfahren nach Anspruch 1 oder zwei, des Weiteren umfassend:
   Bestimmen (203) des aktuellen Gasflusses, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, durch Annehmen einer linearen Verhältnisanpassung, wenn der aktuelle Druckwert nicht in der voreingestellten Liste gefunden wird.

4. Verfahren nach Anspruch 3, wobei der Schritt (203) zum Bestimmen des aktuellen Gasflusses, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, durch Annehmen einer linearen Verhältnisanpassung, wenn der aktuelle Druckwert nicht in der voreingestellten Liste gefunden wird, umfasst:

   Finden von zwei relationalen Ausdrücken, die zwei Druckwerten neben dem aktuellen Druckwert in der voreingestellten Liste entsprechen, und Bestimmen der zwei relationalen Ausdrücke als einen ersten relationalen Ausdruck und einen zweiten relationalen Ausdruck, wenn der aktuelle Druckwert nicht in der voreingestellten Liste gefunden wird;
   Bestimmen eines ersten Gasflusses und eines zweiten Gasflusses in Abhängigkeit von dem aktuellen Betriebsparameter, dem ersten relationalen Ausdruck und dem zweiten relationalen Ausdruck; und
   Bestimmen eines Mittelwerts des ersten Gasflusses und des zweiten Gasflusses als aktueller Gasfluss, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird.

5. Vorrichtung zum Bestimmen eines Durchflusses auf der Grundlage einer Überdruck-Beatmungstherapiemaschine, wobei die Vorrichtung umfasst:

eine Erfassungseinheit (31), die zum Erfassen eines aktuellen Betriebsparameters und eines aktuellen Druckwertes eines Saugventilators in der Überdruck-Beatmungstherapiemaschine verwendet wird;
eine Auffindungseinheit (32), die zum Finden (32) eines relationalen Zielausdrucks, der dem aktuellen Druckwert entspricht, in einer voreingestellten Liste gemäß dem aktuellen Druckwert verwendet wird, wobei die voreingestellte Liste eine Vielzahl von Druckwerten und relationalen Ausdrücken umfasst, die der Vielzahl von Druckwerten entsprechen, und jeder der relationalen Ausdrücke, die der Vielzahl von Druckwerten entsprechen, ein relationaler Ausdruck zwischen Betriebsparametern des Saugventilators und einem Gasfluss ist, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird; und
eine Bestimmungseinheit (33), die zum Bestimmen eines aktuellen Gasflusses, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, gemäß dem aktuellen Betriebsparameter und dem relationalen Zielausdruck verwendet wird,
wobei die Bestimmungseinheit (33) ferner zum Durchführen einer Berechnung gemäß $F = \frac{1}{B} ln\left(\frac{P}{K}\right)$ verwendet wird, um den aktuellen Gasflussausstoß zu erhalten, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, wobei *F* der Gasfluss ist, *P* der aktuelle Betriebsparameter ist, B und K Umwandlungskoeffizienten sind und die Umwandlungskoeffizienten mit dem aktuellen Druckwert in Beziehung stehen.

6. Vorrichtung nach Anspruch 5, wobei der aktuelle Betriebsparameter, der von der Erfassungseinheit (31) erfasst wird, ein aktueller Stromwert oder ein aktueller Spannungswert ist.

7. Vorrichtung nach Anspruch 5 oder 6, wobei die Bestimmungseinheit (33) ferner zum Bestimmen des aktuellen Gasflusses, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird, durch Annehmen einer linearen Verhältnisanpassung verwendet wird, wenn der aktuelle Druckwert nicht in der voreingestellten Liste gefunden wird.

8. Vorrichtung nach Anspruch 7, wobei die Auffindungseinheit (32) ferner zum Finden von zwei relationalen Ausdrücken, die zwei Druckwerten neben dem aktuellen Druckwert in der voreingestellten Liste entsprechen, und Bestimmen der zwei relationalen Ausdrücke als einen ersten relationalen Ausdruck und einen zweiten relationalen Ausdruck verwendet wird, wenn der aktuelle Druckwert nicht in der voreingestellten Liste gefunden wird; und
die Bestimmungseinheit (33) ferner zum Bestimmen eines ersten Gasflusses und eines zweiten Gasflusses gemäß dem aktuellen Betriebsparameter, dem ersten relationalen Ausdruck und dem zweiten relationalen Ausdruck und zum Bestimmen eines Mittelwerts des ersten Gasflusses und des zweiten Gasflusses als der aktuelle Gasfluss verwendet wird, der von der Überdruck-Beatmungstherapiemaschine ausgegeben wird.

9. Computerlesbares Speichermedium, wobei das computerlesbare Speichermedium ein Computerprogramm speichert und das Computerprogramm das Verfahren zum Bestimmen eines Durchflusses auf der Grundlage der Überdruck-Beatmungstherapiemaschine nach einem der Ansprüche 1 bis 4 implementiert, wenn es von einem Prozessor ausgeführt wird.

Revendications

1. Procédé de traitement de données consistant à déterminer un débit sur la base d'une machine de thérapie par ventilation à pression positive,
le procédé comprenant :

l'acquisition (201) d'un paramètre de fonctionnement actuel et d'une valeur de pression actuelle d'un ventilateur de tirage dans la machine de thérapie par ventilation à pression positive ;
la découverte (202) d'une expression relationnelle cible correspondant à la valeur de pression actuelle dans une liste prédéfinie en fonction de la valeur de pression actuelle, dans lequel la liste prédéfinie comprend une pluralité de valeurs de pression et des expressions relationnelles correspondant à la pluralité de valeurs de pression, et chacune des expressions relationnelles correspondant à la pluralité de valeurs de pression est une expression relationnelle entre des paramètres de fonctionnement du ventilateur de tirage et un débit de gaz délivré par la machine de thérapie par ventilation à pression positive ; et
la détermination (203) d'un débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive en fonction du paramètre de fonctionnement actuel et de l'expression relationnelle cible,

dans lequel l'étape de détermination du débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive en fonction du paramètre de fonctionnement actuel et de l'expression relationnelle cible comprend :
la mise en oeuvre d'un calcul selon l'expression $F = \frac{1}{B} ln\left(\frac{P}{K}\right)$ pour obtenir le débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive, dans lequel F est le débit de gaz, P est le paramètre de fonctionnement actuel, B et K sont des coefficients de conversion, et les coefficients de conversion sont liés à la valeur de pression actuelle.

2. Procédé selon la revendication 1, dans lequel le paramètre de fonctionnement actuel est une valeur de courant actuelle ou une valeur de tension actuelle.

3. Procédé selon la revendication 1 ou 2, comprenant en outre :
la détermination (203) du débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive en adoptant un ajustement à relation linéaire quand la valeur de pression actuelle n'est pas découverte dans la liste prédéfinie.

4. Procédé selon la revendication 3, dans lequel l'étape (203) de détermination du débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive en adoptant un ajustement à relation linéaire quand la valeur de pression actuelle n'est pas découverte dans la liste prédéfinie comprend :

la découverte de deux expressions relationnelles correspondant à deux valeurs de pression adjacentes à la valeur de pression actuelle dans la liste prédéfinie et la détermination des deux expressions relationnelles en tant que première expression relationnelle et deuxième expression relationnelle quand la valeur de pression actuelle n'est pas découverte dans la liste prédéfinie ;
la détermination d'un premier débit de gaz et d'un deuxième débit de gaz en fonction du paramètre de fonctionnement actuel, de la première expression relationnelle et de la deuxième expression relationnelle ; et
la détermination d'une valeur moyenne du premier débit de gaz et du deuxième débit de gaz en tant que débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive.

5. Dispositif de détermination d'un débit basé sur une machine de thérapie par ventilation à pression positive, le dispositif comprenant :

une unité d'acquisition (31), utilisée pour acquérir un paramètre de fonctionnement actuel et une valeur de pression actuelle d'un ventilateur de tirage dans la machine de thérapie par ventilation à pression positive ;
une unité de découverte (32), utilisée pour découvrir une expression relationnelle cible correspondant à la valeur de pression actuelle dans une liste prédéfinie en fonction de la valeur de pression actuelle, dans lequel la liste prédéfinie comprend une pluralité de valeurs de pression et des expressions relationnelles correspondant à la pluralité de valeurs de pression, et chacune des expressions relationnelles correspondant à la pluralité de valeurs de pression est une expression relationnelle entre des paramètres de fonctionnement du ventilateur de tirage et un débit de gaz délivré par la machine de thérapie par ventilation à pression positive ; et
une unité de détermination (33), utilisée pour déterminer un débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive en fonction du paramètre de fonctionnement actuel et de l'expression relationnelle cible,
dans lequel l'unité de détermination (33) est en outre utilisée pour mettre en oeuvre un calcul selon l'expression $F = \frac{1}{B} ln\left(\frac{P}{K}\right)$ pour obtenir le débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive, dans lequel F est le débit de gaz, P est le paramètre de fonctionnement actuel, B et K sont des coefficients de conversion, et les coefficients de conversion sont liés à la valeur de pression actuelle.

6. Dispositif selon la revendication 5, dans lequel le paramètre de fonctionnement actuel acquis par l'unité d'acquisition (31) est une valeur de courant actuelle ou une valeur de tension actuelle.

7. Dispositif selon la revendication 5 ou 6, dans lequel l'unité de détermination (33) est en outre utilisée pour déterminer le débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive en adoptant un ajustement à relation linéaire quand la valeur de pression actuelle n'est pas découverte dans la liste prédéfinie.

8. Dispositif selon la revendication 7, dans lequel

l'unité de découverte (32) est en outre utilisée pour découvrir deux expressions relationnelles correspondant à deux valeurs de pression adjacentes à la valeur de pression actuelle dans la liste prédéfinie, et pour déterminer les deux

expressions relationnelles comme une première expression relationnelle et une deuxième expression relationnelle quand la valeur de pression actuelle n'est pas découverte dans la liste prédéfinie ; et

l'unité de détermination (33) est en outre utilisée pour déterminer un premier débit de gaz et un deuxième débit de gaz en fonction du paramètre de fonctionnement actuel, de la première expression relationnelle et de la deuxième expression relationnelle, et pour déterminer une valeur moyenne du premier débit de gaz et du deuxième débit de gaz comme le débit de gaz actuel délivré par la machine de thérapie par ventilation à pression positive.

9. Support de stockage lisible par un ordinateur, dans lequel le support de stockage lisible par un ordinateur stocke un programme informatique, et le programme informatique implémente le procédé de détermination d'un débit sur la base de la machine de thérapie par ventilation à pression positive selon l'une quelconque des revendications 1 à 4 quand il est exécuté par un processeur.

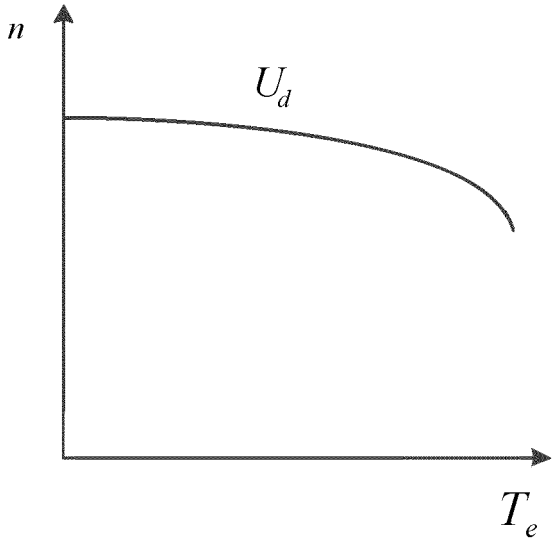
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Fig. 1

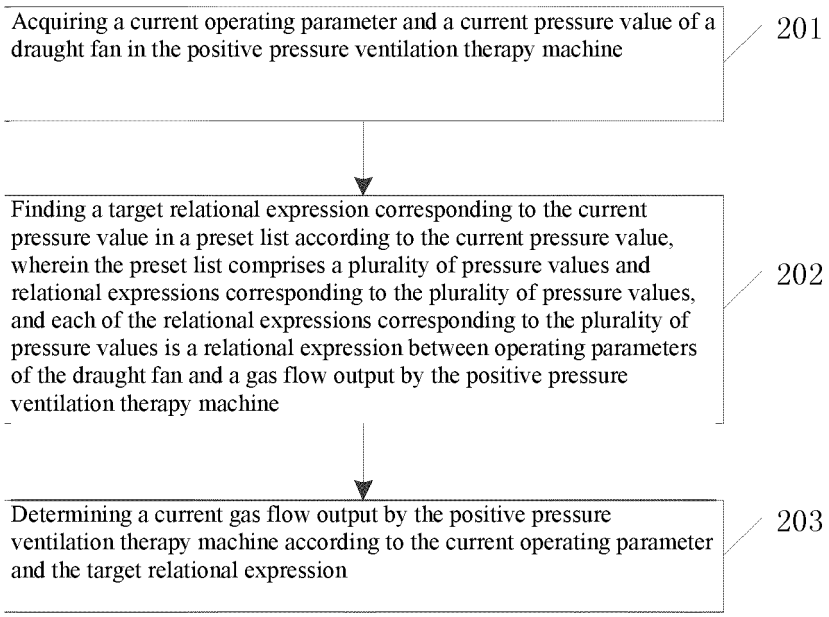
Acquiring a current operating parameter and a current pressure value of a draught fan in the positive pressure ventilation therapy machine
201
Finding a target relational expression corresponding to the current pressure value in a preset list according to the current pressure value, wherein the preset list comprises a plurality of pressure values and relational expressions corresponding to the plurality of pressure values, and each of the relational expressions corresponding to the plurality of pressure values is a relational expression between operating parameters of the draught fan and a gas flow output by the positive pressure ventilation therapy machine
202
Determining a current gas flow output by the positive pressure ventilation therapy machine according to the current operating parameter and the target relational expression
203

Fig. 2

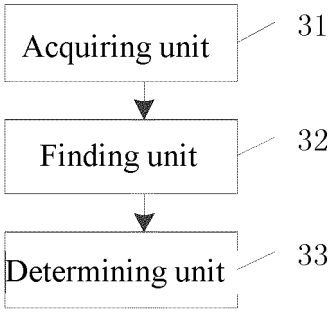

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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