(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 743 598 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
21.10.2020 Bulletin 2020/43

(21) Application number: **13196151.8**

(22) Date of filing: **09.12.2013**

(51) Int Cl.:
F24F 13/14 *(2006.01)* ***F24F 13/02*** *(2006.01)*
F24F 11/74 *(2018.01)* ***F24F 11/00*** *(2018.01)*
F24H 3/04 *(2006.01)*

(54) Apparatus and method for adjusting air pressure of room

Vorrichtung und Verfahren zur Regelung des Luftdrucks in einem Raum

Appareil et procédé pour régler la pression d'air d'une pièce

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **13.12.2012 FI 20126303**

(43) Date of publication of application:
18.06.2014 Bulletin 2014/25

(73) Proprietors:
- **Arpomaa, Tommi**
  28300 Pori (FI)
- **Metso, Sami**
  00790 Helsinki (FI)

(72) Inventor: **Arpomaa, Tommi**
28300 PORI (FI)

(74) Representative: **Kolster Oy Ab**
(Salmisaarenaukio 1)
P.O. Box 204
00181 Helsinki (FI)

(56) References cited:
GB-A- 2 260 793
JP-A- 2001 020 547
US-A1- 2006 021 375
JP-A- S63 238 350
US-A- 4 841 733
US-A1- 2010 057 258

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 743 598 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Background

[0001] The invention relates to an apparatus for adjusting air pressure of a room.

[0002] The invention further relates to a method for adjusting air pressure of a room.

[0003] As is well known, low-pressure devices are used on building and renovation sites to prevent dust from spreading to the surroundings of the work site.

[0004] According to regulations, low-pressure devices must be equipped with air filters. Generally, filtration of at least HEPA H13 grade is used. Low pressure is formed by blowing the filtered air out of the work site.

[0005] Microfiltration-generated low pressure on work sites has long been used especially on work sites where asbestos-containing structures are demolished. However, the use of microfiltration has also spread to work sites, in which stone dust, including concrete dust, is created, because all stone dust may cause a health risk. Studies show that quartz particles, for instance, correspond to asbestos in health hazards.

[0006] Regulations concerning dust control are tightened all the time. In the renovation of public sites, in particular, the current practice is already to observe the P1 classification, according to which low pressure should be used in the work space and the air in the work space should be filtered 6 to 10 times an hour. The targeted low pressure is 8 to 10 Pa below the air pressure of the surroundings.

[0007] The output capacity of a low-pressure air purification device handling the filtration and generating the low pressure shall naturally be calculated on the basis of the cubic volume of the space being purified. For instance, if the air volume of the site being renovated is 13 000 m^3, the purification capacity needs to be at least 6 x 13 000 = 78 000 m^3/h.

[0008] A low-pressure device lowers the air pressure in the space to substantially lower than the targeted low pressure, the pressure difference may be 50 to 60 Pa, for example, in comparison to the surroundings. This may cause problems. Firstly, a big pressure difference makes air control in the space and the opening of access doors and the like difficult. Secondly, removing a large amount of air from a space may cause a very high heat loss, especially in winter. After all, warm air is removed, the replacement air of which needs to be heated. Document US 4 841 733 A discloses a temperature and humidity control system for natatoriums. Document US 2006/021375 A1 discloses an air conditioner and filtering unit producing a positive or negative pressure to create an isolation space.

Brief description

[0009] The apparatus and method for adjusting the air pressure of a room according to the invention are characterised by what is disclosed in the characterising parts of the independent claims 1 and 9. Other embodiments of the invention are characterised by what is disclosed in the other claims.

[0010] In the following, features of some embodiments of the invention are listed in a random order:

[0011] The idea of an embodiment is that a control means comprises a control plate that is fastened turnably to an air distribution casing in such a manner that it can be turned in front of a second air vent. This provides the advantage that the control plate is simple to implement and provides an extensive adjustment range.

[0012] The idea of an embodiment is that the control means is arranged to be adjusted manually and that an element reducing its motion sensitivity is arranged to it. This provides the advantage that manual adjustment can be done at low cost, and the element reducing motion sensitivity facilitates the adjustment of the apparatus.

[0013] The idea of an embodiment is that the control means is connected to be controlled by a control unit and that the control unit is connected to a pressure difference sensor detecting pressure difference in the room and its surroundings. This provides the advantage that adjustment does not require the presence of personnel and that the pressure difference can be kept as desired all the time.

[0014] The idea of an embodiment is that a second air vent is arranged to return air to the room and that the second air vent comprises a heater for heating the flowing air. This provides the advantage that the room can be heated by means of the returned air.

[0015] The idea of an embodiment is that the heater comprises an electric resistor. This provides the advantage that the electric resistor provides a simple and safe means of heating air.

[0016] The idea of an embodiment is that the apparatus comprises an air filter unit that is arranged in front of an air receive duct as seen in the flow direction, and a fan that is arranged to generate air flow through the apparatus. This provides the advantage that it is possible to take care of the adjustment of the air pressure level in the room and the filtration with the same apparatus.

[0017] The idea of an embodiment is that the air filter unit and fan are arranged in a low-pressure air purification device and that the apparatus comprises fastening means for fastening the air receive duct detachably and in a substantially air-tight manner to the low-pressure air purification device. This provides the advantage that the apparatus can be transported in smaller units and that, if necessary, the low-pressure air purification device can be used without the apparatus.

[0018] The idea of an embodiment is that the second air vent is equipped with a pipe output fitting that is attachable to the air duct for conveying air away from the air distribution casing. This provides the advantage that the second air vent is easily attached to the ventilation ducts of the room, for instance.

Brief description of the figures

[0019] Some embodiments of the solution are explained in more detail in the accompanying drawings, in which

Figure 1 is a schematic representation of an apparatus and method for adjusting the air pressure of a room, and

Figure 2 is a schematic representation of a second apparatus and method for adjusting the air pressure of a room.

[0020] For the sake of clarity, the figures show some embodiments of the solution in a simplified manner. Like reference numerals identify like elements in the figures.

Detailed description

[0021] Figure 1 is a schematic representation of an apparatus and method for adjusting the air pressure of a room.

[0022] The apparatus 1 is arranged in the room 2 that is separated in a substantially air-tight manner from its surroundings with an air-tight boundary 3. The apparatus 1 is shown by a dot-and-dash line in the figure.

[0023] In this specification, a room refers to an entity of one or more rooms or corresponding spaces, which is isolated from its surroundings in a substantially dust- and air-tight manner so that it is possible to form a pressure difference to its surroundings.

[0024] The boundary 3 can be made up of parts of a building, such as walls, windows, floor, ceiling, and/or material, such as plastic film, tape, temporary non-bearing wall structures, added for sealing purposes.

[0025] The apparatus 1 comprises an air receive duct 4 arranged to receive air from the room 2. The receive duct 4 is at its simplest an opening in the device, but may naturally also comprise a suitably dimensioned pipe portion or the like.

[0026] In the embodiment shown in Figure 1, the air of the room 2 flows through a low-pressure air purification device 17 before arriving in the receive duct 4. The low-pressure air purification device 17 is described in more detail later on in this specification.

[0027] Air flows from the air receive duct 4 to an air distribution casing 5. In addition to the air receive duct 4, also a first air vent 6 and a second air vent 7 are connected to the air distribution casing 5.

[0028] The air vents 6, 7 are arranged to convey air flowing from the receive duct 4 to the air distribution casing 5 out of the apparatus 1.

[0029] The first air vent 6 is arranged to convey air outside the room 2, such as to an adjacent room or out of the building. The second air vent 7 conveys air to the room 2, in other words, back to the space, from which it was removed.

[0030] Both the receive duct 4 and the air vent 6, 7 may be a simple opening, or it may comprise a suitably dimensioned pipe portion or the like.

[0031] A control means 8 is arranged in the air distribution casing 5 to adjust the flow resistance of the second air vent 7 in relation to the first air vent 6.

[0032] In the embodiment shown in Figure 1, the control means 8 is arranged to adjust the flow surface area of the second air vent 7. In a second embodiment, the control means 8 is arranged to adjust the flow surface area of the first air vent 6, and in a third embodiment, the control means 8 is arranged to adjust the flow surface area of both the first and the second air vent 6.

[0033] According to an idea, the control means 8 can be arranged elsewhere than in the air distribution casing 5, in either or both air vents 6, 7, for example.

[0034] The control means 8 now comprises a control plate or damper 9 that is fastened to the air distribution casing 5 to be turnable in relation to the second air vent 7. Instead of the control plate 9, a guillotine, register, rotatable valve disc or some other known air flow control means can also be used.

[0035] The second air vent 7 can be completely closed with the control plate 9, or the air flowing through it can be restricted so as to obtain the desired ratio of air flowing out of the apparatus through the different air vents 6, 7.

[0036] In an embodiment of the apparatus and method, the position of the control plate 9 is adjusted manually. In such a case, an element 10 that reduces the motion sensitivity of the control plate, such as a gas spring or friction mechanism, is connected to the control plate. This prevents an uncontrolled movement of the control plate 9 when the control plate 9 is adjusted in a strong air flow. When the correct position of the control plate 9 has been found, it is locked into this position with a suitable locking member.

[0037] In the embodiment shown in Figure 1, the position of the control plate 9 is arranged to be adjusted by a control unit 11 that controls an actuator, such as an electric motor, used in turning the control plate.

[0038] The control unit 11 may comprise a programmable logic and/or processor, for instance, that executes a computer program code downloaded into the control unit. A pressure difference sensor 12 detecting a pressure difference between the room 2 and its surroundings is connected to the control unit 11.

[0039] The control unit 11 adjusts the position of the control plate 9 in such a manner that said pressure difference remains as desired. According to an idea, the pressure in the room 2 is approximately 8 to 10 Pa below the air pressure of the surroundings, but it should be noted that the pressure difference could also be other than this.

[0040] If the pressure difference exceeds a certain preset limit value, the control unit 11 turns the control plate 9 clockwise in the figure, which increases the ratio of air volume flow returning to the room 2 in relation to the air flow volume removed from the room 2.

[0041] If the pressure difference becomes smaller than

a certain pre-set limit value, the control unit 11 turns the control plate 9 counterclockwise in the figure, which decreases the ratio of air volume flow returning to the room 2 in relation to the airflow volume removed from the room 2. Thus, the apparatus 1 is controlled automatically.

[0042] According to a third embodiment, the position of the control plate 9 is changed by an actuator, such as an electric motor, that is operated by a person responsible for the adjustment of the apparatus.

[0043] Thus, the control of the apparatus 1 can be manual or at least to some extent automatic. In a fully automatic solution, the use of the air flow controllers can be controlled on the basis of information obtained from various measuring arrangements. Said measuring arrangements can be based on measuring pressure difference, air pressure, air flow or the like. The operation of air flow control motors of the apparatus 1 is controlled by means of the measuring arrangements. According to an idea, the above-mentioned measuring arrangements are measurement sensors that are fixedly attached to the apparatus and measure pressure differences or the like through a flow pipe and thus control the air flow. The measuring and control apparatuses may also be measurement sensors or systems based on a radio signal, gsm signal or some other digital data transmission, which control the operation of the air flow control plates of the device.

[0044] It should be noted that the above alternatives for turning the control plate 9 can also be applied to control means 8 of other type.

[0045] The apparatus 1 can be equipped with a heating device 13 to heat the air flowing in the second air vent 7. In the embodiment shown in Figure 1, the heating device 13 comprises an electric resistor 14, but it is also possible to use a heat exchanger connected to the water circulation, an oil- or gas-operated heater or a heater utilizing wood- or plant-based energy, such as a wood, pellet, chip or bio-oil heater.

[0046] The apparatus 1 is connected to a low-pressure air purification device 17 that comprises an air filter unit 15, through which air removed from the room 2 flow into the apparatus 1. The air filter unit 15 may comprise one or more filter elements arranged in series. In an embodiment, the air filter unit 15 comprises a filter element of HEPA H13-grade or higher.

[0047] The low-pressure air purification device 17 also comprises a fan 16 that produces an air flow required in the operation of the apparatus 1 and low-pressure purification device 17. The fan 16 is typically an electric fan. The capacity of the fan 16 is dimensioned to achieve the necessary air flow. According to an idea, the capacity is enough to filter the room 2 air 6 to 10 times an hour. The replacement air of the room 2 can be taken from outside the building or inside the building, but outside the room 2. The present invention brings about an especially big cost saving during the heating period, because the amount of cold replacement air from outdoors can be reduced. In addition, this provides the advantage that any temporary building heaters in the room 2 operate with the higher operating efficiency, the higher the temperature of the replacement air coming to them is.

[0048] The apparatus 1 comprises fastening means 18, with which the air receive duct 4 can be detachably and substantially air-tightly fastened to the vent of the low-pressure purification device 17. Thanks to the fastening means 18, the apparatus 1 and low-pressure purification device 17 can be moved and transported separately and only connected to each other in the room 2. To move the apparatus, it can be equipped with wheels 20. If necessary, the low-pressure air purification device 17 can also be used without the apparatus 1.

[0049] The second air vent 7 of the apparatus 1 is equipped with a pipe output fitting 19 that is dimensioned for connection to any generally used ventilation pipe. This way, the air in the air vent 7 can be conveyed away from the apparatus 1. According to an idea, the second air vent 7 is connected to a normal ventilation duct 21 of the room 2, which is isolated from the ventilation machine of the room by plugging, for instance. This way, the heat of the return air and the pressure equalization gain can be evenly distributed in the room 2, which is advantageous in large and multiform rooms, in particular. Another advantage may be derived from the fact that the ventilation ducts of the room 2 can be kept under overpressure all the time, in which case any dust caused by an operation in the room 2 will not enter the ventilation ducts.

[0050] Figure 2 is a schematic representation of a second apparatus and method for adjusting the air pressure of a room.

[0051] The principle of the apparatus 1 and method does not differ per se from what is shown in Figure 1, but now the air filter unit 15 and fan 16 are accommodated in the same shell with the air distribution casing 5. This way, the apparatus 1 forms an assembly that is capable of independent operation, can be used to adjust the pressure difference between the room 2 and its surroundings and purifies the air in the room 2.

[0052] Heat recovery 22, with which thermal energy is recovered from the air removed from the room 2, can be arranged in the first air vent 5. This thermal energy can be utilized in heating the air flowing in the second air vent 7, for instance. It should be noted that heat recovery 22 can also be arranged in the apparatus shown in Figure 1 and those described in its description.

[0053] In some cases, features disclosed in this application may be used as such, regardless of other features. On the other hand, when necessary, features disclosed in this application may be combined in order to provide different combinations.

[0054] In summary, the apparatus of the invention is characterised in that it comprises an air receive duct that is arranged to receive air from the room, an air distribution casing connected to the receive duct, first and second air vents connected to the air distribution casing and arranged to convey air coming from the receive duct out of the apparatus, and a control means arranged to adjust

the flow resistance of the second air vent in relation to that of the first air vent.

[0055] Further, it can be noted that the method of the invention is characterised by connecting the air receive duct to receive air from the room, conveying air from the receive duct to the air distribution casing, conveying a first part of the air from the air distribution casing to the first air vent and through it out of the room, and conveying a second part of the air from the air distribution casing to the second air vent and through it back to the room, and adjusting the flow resistance of the second air vent in relation to that of the first air vent.

[0056] The drawings and the related description are only intended to illustrate the idea of the invention. It is apparent to a person skilled in the art that the invention is not restricted to the embodiments described above, in which the invention is described by means of some examples, but many modifications and different embodiments of the invention are possible within the scope of the inventive idea defined in the following claims.

Reference numerals

[0057]

1	apparatus
2	room
3	air tight boundary
4	air receive duct
5	air distribution casing
6	first air vent
7	second air vent
8	control means
9	control plate
10	element reducing motion sensitivity
11	control unit
12	pressure difference sensor
13	heating device
14	electric resistor
15	air filter unit
16	fan
17	low-pressure air purification device
18	fastening means
19	pipe output fitting
20	wheel
21	room ventilation duct
22	heat recovery

Claims

1. An apparatus for adjusting the air pressure of a room comprising
an air receive duct (4) arranged to receive air from the room (2).
an air distribution casing (5) connected to the receive duct (4),
first and second air vents (6, 7) connected to the air distribution casing (5) and arranged to convey air coming from the receive duct (4) out of the apparatus (1), and
the second air vent (7) is arranged to return air to the same room (2),
the first air vent (6) is arranged to convey air outside the room (2), **characterised in that** the apparatus comprises a control means (8) arranged to adjust the flow resistance of the second air vent (7) in relation to that of the first air vent (6),
that the control means (8) comprises air flow control means in connection with the second air vent (7) to adjust the flow resistance, and
that the control means (8) is connected to be controlled by a control unit (11) and that the control unit (11) is connected to a pressure difference sensor (12) detecting the pressure difference in the room (2) and its surroundings.

2. An apparatus as claimed in claim 1, **characterised in that** the control means (8) comprises a control plate (9) that is fastened turnably to the air distribution casing (5) to be turnable in front of the second air vent (7).

3. An apparatus as claimed in any one of the preceding claims, **characterised in that** the second air vent (7) comprises a heater (13) for heating the flowing air.

4. An apparatus as claimed in claim 3, **characterised in that** the heater (13) comprises an electric resistor (14).

5. An apparatus as claimed in any one of the preceding claims, **characterised in that** it comprises an air filter unit (15) that is arranged in front of the air receive duct (4) in the flow direction, and a fan (16) that is arranged to generate the air flow flowing through the apparatus (1).

6. An apparatus as claimed in claim 5, **characterised in that** the air filter unit (15) and fan (16) are arranged in the low-pressure air purification device (17) and that the apparatus (1) comprises fastening means (18) for fastening the air receive duct (4) detachably and substantially air-tightly to the low-pressure air purification device (17).

7. An apparatus as claimed in any one of the preceding claims, **characterised in that** the second air vent (7) is equipped with a pipe output fitting (19) that is connectable to the air channel for conveying air away from the air distribution casing (5).

8. An apparatus as claimed in any one of the preceding claims, **characterised in that** heat recovery (22) is arranged in the first air vent (6).

9. A method for adjusting the air pressure of a room, the method comprising:

connecting an air receive duct (4) to receive air from the room (2),
conveying air from the air receive duct (4) to an air distribution casing (5),
conveying a first part of the air from the air distribution casing (5) to a first air vent (6) and through it away from said room (2),
conveying a second part of the air from the air distribution casing (5) to a second air vent (7) and through it back to said room (2), and
adjusting the flow resistance of the second air vent (7) in relation to the flow resistance of the first air vent (6)
conveying the first part of the air from the air distribution casing (5) through the first air vent (6) away from said room (2), **characterised by**
adjusting the flow resistance by adjusting air flow control means in connection with the second air vent (7), and
controlling the air flow control means with a control unit (11) by means of a pressure difference sensor (12) detecting the pressure difference in the room (2) and its surroundings.

10. A method as claimed in of claim 9, comprising heating the air flowing through the second air vent (7).

11. A method as claimed in any one of claims 9 to 11, comprising conveying air first to an air filter unit (15) for purification and the purified air then to the receive duct (4).

Patentansprüche

1. Einrichtung zum Anpassen des Luftdrucks eines Raums, die Folgendes umfasst
einen Luftaufnahmekanal (4), der angeordnet ist, Luft aus dem Raum (2) aufzunehmen,
ein Luftverteilungsgehäuse (5), das mit dem Aufnahmekanal (4) verbunden ist,
eine erste und eine zweite Entlüftungsklappe (6, 7) die mit dem Luftverteilungsgehäuse (5) verbunden und angeordnet sind, Luft, die aus dem Aufnahmekanal (4) kommt, aus der Einrichtung (1) zu befördern, und
die zweite Entlüftungsklappe (7) ist angeordnet, Luft zum selben Raum (2) zurückzugeben,
die erste Entlüftungsklappe (6) ist angeordnet, Luft aus dem Raum (2) zu befördern,
dadurch gekennzeichnet, dass
die Einrichtung ein Steuermittel (8) umfasst, das angeordnet ist, den Strömungswiderstand der zweiten Entlüftungsklappe (7) mit Bezug auf die erste Entlüftungsklappe (6) anzupassen,
dass das Steuermittel (8) ein Luftstromsteuermittel in Verbindung mit der zweiten Entlüftungsklappe (7) umfasst, um den Strömungswiderstand anzupassen, und
dass das Steuermittel (8) verbunden ist, um von einer Steuereinheit (11) gesteuert zu werden, und dass die Steuereinheit (11) mit einem Druckdifferenzsensor (12), der die Druckdifferenz im Raum (2) und von dessen Umgebung detektiert, verbunden ist.

2. Einrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Steuermittel (8) eine Steuerplatte (9) umfasst, die drehbar am Luftverteilungsgehäuse (5) befestigt ist, um vor der zweiten Entlüftungsklappe (7) drehbar zu sein.

3. Einrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Entlüftungsklappe (7) eine Heizung (13) zum Erwärmen der strömenden Luft umfasst.

4. Einrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** die Heizung (13) einen elektrischen Widerstand (14) umfasst.

5. Einrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine Luftfiltereinheit (15), die in der Strömungsrichtung vor dem Luftaufnahmekanal (4) angeordnet ist, und einen Lüfter (16), der angeordnet ist, den Luftstrom zu erzeugen, der durch die Einrichtung (1) strömt, umfasst.

6. Einrichtung nach Anspruch 5, **dadurch gekennzeichnet, dass** die Luftfiltereinheit (15) und der Lüfter (16) in der Niederdruckluftreinigungsvorrichtung (17) angeordnet sind und dass die Einrichtung (1) Befestigungsmittel (18) zum lösbaren und im Wesentlichen luftdichten Befestigen des Luftaufnahmekanals (4) an der Niederdruckluftreinigungsvorrichtung (17) umfasst.

7. Einrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Entlüftungsklappe (7) mit einem Rohrauslassanschluss (19) ausgerüstet ist, der zum Befördern von Luft vom Luftverteilungsgehäuse (5) weg mit der Luftdurchführung verbindbar ist.

8. Einrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Wärmerückgewinnung (22) in der ersten Entlüftungsklappe (6) angeordnet ist.

9. Verfahren zum Anpassen des Luftdrucks eines Raums, wobei das Verfahren Folgendes umfasst:

Verbinden eines Luftaufnahmekanals (4) zum Aufnahmen von Luft aus dem Raum (2),
Befördern von Luft aus dem Luftaufnahmekanal (4) zu einem Luftverteilungsgehäuse (5),
Befördern eines ersten Teils der Luft aus dem Luftverteilungsgehäuse (5) zu einer ersten Entlüftungsklappe (6) und durch sie hindurch weg vom Raum (2),
Befördern eines zweiten Teils der Luft aus dem Luftverteilungsgehäuse (5) zu einer zweiten Entlüftungsklappe (7) und durch sie hindurch zurück zum Raum (2) und
Anpassen des Strömungswiderstands der zweiten Entlüftungsklappe (7) mit Bezug auf den Strömungswiderstand der ersten Entlüftungsklappe (6)
Befördern des ersten Teils der Luft aus dem Luftverteilungsgehäuse (5) durch die erste Entlüftungsklappe (6) weg vom Raum (2), **gekennzeichnet durch**
Anpassen des Strömungswiderstands durch Anpassen des Luftstromsteuermittels in Verbindung mit der zweiten Entlüftungsklappe (7) und Steuern des Luftstromsteuermittels mit einer Steuereinheit (11) mittels eines Druckdifferenzsensors (12), der die Druckdifferenz im Raum (2) und von dessen Umgebung detektiert.

10. Verfahren nach Anspruch 9, das das Erwärmen der Luft, die durch die zweite Entlüftungsklappe (7) strömt, umfasst.

11. Verfahren nach einem der Ansprüche 9 bis 11, das das Befördern von Luft zuerst zur Reinigung zu einer Luftfiltereinheit (15) und dann der gereinigten Luft zum Aufnahmekanal (4) umfasst.

Revendications

1. Appareil pour régler la pression d'air d'une pièce comprenant
un conduit de réception (4) d'air agencé pour recevoir l'air de la pièce (2),
un boîtier de distribution d'air (5) connecté au conduit de réception (4),
des premier et deuxième évents d'aération (6, 7) connectés au boîtier de distribution d'air (5) et agencés pour acheminer l'air provenant du conduit de réception (4) hors de l'appareil (1), et
le deuxième évent d'aération (7) est agencé de manière à renvoyer l'air dans la même pièce (2),
le premier évent d'aération (6) est agencé pour acheminer l'air à l'extérieur de la pièce (2),
caractérisé en ce que
l'appareil comprend un moyen de commande (8) agencé pour régler la résistance à l'écoulement du deuxième évent d'aération (7) par rapport à celle du premier évent d'aération (6),
en ce que le moyen de commande (8) comprend un moyen de commande d'écoulement d'air en connexion avec le deuxième évent d'aération (7) pour régler la résistance à l'écoulement, et
en ce que le moyen de commande (8) est connecté pour être commandé par une unité de commande (11) et **en ce que** l'unité de commande (11) est connectée à un capteur de différence de pression (12) détectant la différence de pression dans la pièce (2) et ses environs.

2. Appareil tel que revendiqué dans la revendication 1, **caractérisé en ce que** le moyen de commande (8) comprend une plaque de commande (9) qui est fixée en rotation au boîtier de distribution d'air (5) pour pouvoir tourner devant le deuxième évent d'aération (7).

3. Appareil tel que revendiqué dans l'une quelconque des revendications précédentes, **caractérisé en ce que** le deuxième évent d'aération (7) comprend un élément chauffant (13) pour chauffer l'air en circulation.

4. Appareil tel que revendiqué dans la revendication 3, **caractérisé en ce que** l'élément chauffant (13) comprend une résistance électrique (14).

5. Appareil tel que revendiqué dans l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend une unité de filtre à air (15) qui est agencée devant le conduit de réception d'air (4) dans la direction d'écoulement, et un ventilateur (16) qui est agencé pour générer l'écoulement d'air circulant à travers l'appareil (1).

6. Appareil tel que revendiqué dans la revendication 5, **caractérisé en ce que** l'unité de filtre à air (15) et le ventilateur (16) sont agencés dans le dispositif de purification d'air à basse pression (17) et **en ce que** l'appareil (1) comprend des moyens de fixation (18) pour fixer le conduit de réception d'air (4), de manière détachable et sensiblement étanche à l'air, au dispositif de purification d'air à basse pression (17).

7. Appareil tel que revendiqué dans l'une quelconque des revendications précédentes, **caractérisé en ce que** le deuxième évent d'aération (7) est équipé d'un raccord de sortie de tuyau (19) qui peut être connecté au canal d'air pour acheminer l'air loin du boîtier de distribution d'air (5).

8. Appareil tel que revendiqué dans l'une quelconque des revendications précédentes, **caractérisé en ce qu'**un dispositif de récupération de chaleur (22) est agencé dans le premier évent d'aération (6).

9. Procédé pour régler la pression d'air d'une pièce, le procédé comprenant les étapes suivantes :

connecter un conduit de réception d'air (4) pour recevoir l'air de la pièce (2),
acheminer l'air du conduit de réception d'air (4) vers un boîtier de distribution d'air (5),
acheminer une première partie de l'air du boîtier de distribution d'air (5) vers un premier évent d'aération (6) et l'éloigner à travers celui-ci de ladite pièce (2),
acheminer une deuxième partie de l'air du boîtier de distribution d'air (5) vers un deuxième évent d'aération (7) et la ramener à travers celui-ci dans ladite pièce (2), et
régler la résistance à l'écoulement du deuxième évent d'aération (7) par rapport à la résistance à l'écoulement du premier évent d'aération (6),
acheminer la première partie de l'air du boîtier de distribution d'air (5), à travers le premier évent d'aération (6), loin de ladite pièce (2), **caractérisé par**
le réglage de la résistance à l'écoulement en réglant un moyen de commande d'écoulement d'air en connexion avec le deuxième évent d'aération (7), et
le commande du moyen de commande d'écoulement d'air par une unité de commande (11), au moyen d'un capteur de différence de pression (12) détectant la différence de pression dans la pièce (2) et ses environs.

10. Procédé tel que revendiqué dans la revendication 9, comprenant le chauffage de l'air circulant à travers le deuxième évent d'aération (7).

11. Procédé tel que revendiqué dans l'une quelconque des revendications 9 à 11, comprenant l'acheminement de l'air d'abord vers une unité de filtre à air (15) pour la purification et l'air purifié ensuite vers le conduit de réception (4).

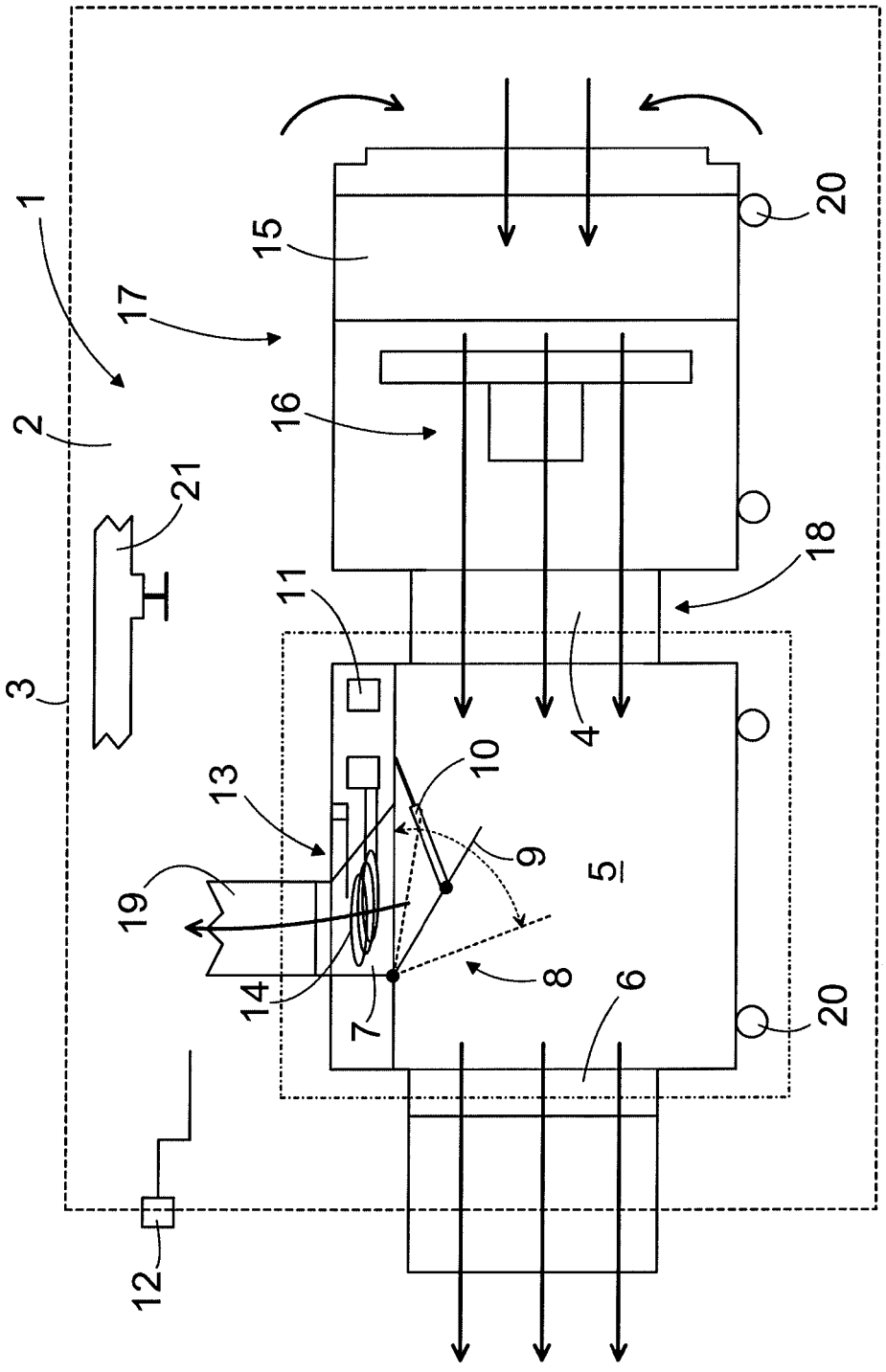


Fig.1

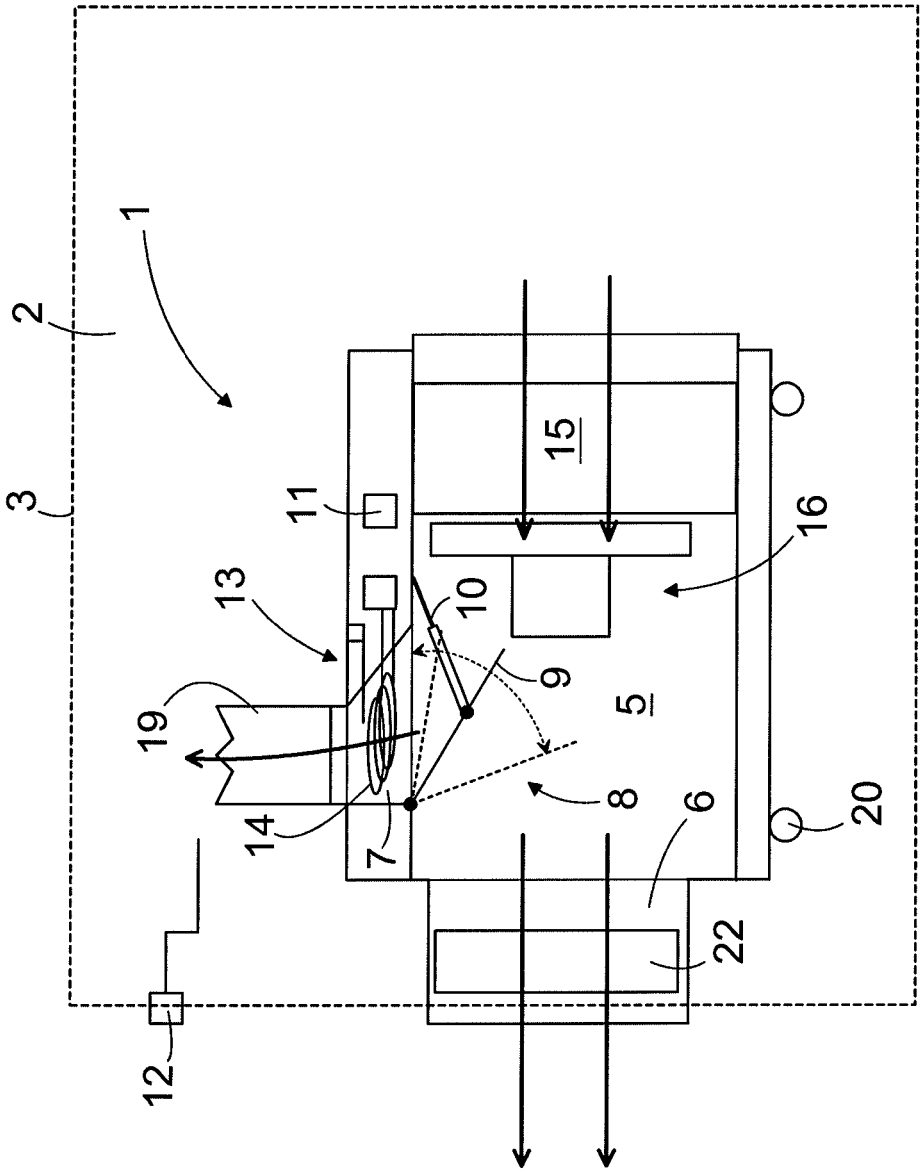


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4841733 A **[0008]**
- US 2006021375 A1 **[0008]**