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(54) **Berendezés egy helyiség szellőztetésére a mért relatív nedvességtartalom függvényében**

Device for ventilating a space according to the relative humidity recorded

The present invention relates to a ventilation device able to ventilate a space depending on the relative humidity measured in the space using a moisture-sensitive sensor.

The different rooms of a space exhibit variable ventilation requirements with respect to each other over time. This requirement evolves mostly depending on the type of rooms and the occupancy. As regards the technical rooms, the ventilation requirement is mainly dependent on the emissions of water vapors. As regards the main rooms, bedrooms and living room, it is the number of persons occupying these rooms which determines the level of necessary ventilation.

Currently, the most advanced technique in terms of management of the ventilation requirement allows subjecting the passage surface of the air inlets to the relative humidity of the ventilated spaces, the relative humidity level being related to the absolute humidity level and to the temperature by a physical law perfectly determined and known to those skilled in the art. Such a ventilation device comprises an air inlet with an adjustable passage surface controlled by a sensor. The latter is constituted by a moisture-sensitive fabric which is housed in the space to be ventilated and which undergoes physical changes, elongation or retraction, depending on the relative humidity prevailing in the space.

The document US 4460122 discloses a ventilation device according to the preamble of claim 1.

In order to obtain a ventilation device able to measure low variations of the relative humidity resulting from the modification of the occupancy of the space, and this, regardless of the season, it is known to those skilled in the art to put this moisture-sensitive sensor at a temperature, on the one hand, different from that of the space to be ventilated, and on the other hand, taking into account the outside temperature. The temperature read by the moisture-sensitive sensor can therefore be defined by the following equation,

$T_{capt} = T_{int} - K\,(T_{int} - T_{ext})$,

in which T_{capt} is the temperature read by the sensor, T_{int} the inside temperature of the space, T_{ext} the outside temperature, and K is the predefined temperature coefficient and generally comprised between 0.15 and 0.35 in the temperate regions.

In the current ventilation devices, the moisture-sensitive sensor is necessarily positioned adjacent to the air inlet in order to be in thermal communication with the outside air. Hence, it follows two major drawbacks:

- on the one hand, the air inlet flow rate which can vary in a ratio ranging from 1 to 3 and sometimes from 1 to 10, it follows that the heat exchange between the outside air and the moisture-sensitive sensor are not really under control at all times. Consequently, this means that it is not possible to permanently set the temperature coefficient K to the desired value,

- on the other hand, the assembly of the ventilation device is delicate to be achieved and the allowed geometric configurations are limited because it is necessary to integrate the moisture-sensitive sensor near the air inlet.

The present invention aims to solve the aforementioned drawbacks, and to this end, concerns a ventilation device according to claim 1.

Thus, the fact of providing a secondary conduit independent from the main inlet allows perfectly controlling the influence of the outside temperature sensor on the moisture-sensitive. Indeed, the latter is no longer in thermal communication with the main air inlet, whose passage surface is variable depending on the occupancy of the space, but with the secondary conduit whose passage surface is independent of that of the main air inlet, the heat exchanges between the outside air and the moisture-sensitive sensor are regulated, and it is therefore possible to obtain a temperature coefficient K even more stable regardless of the air flow rate passing through the main inlet.

Furthermore, the assembly of such a ventilation device is greatly simplified since it is no longer necessary to integrate the moisture-sensitive sensor in the vicinity of the main air inlet. The moisture-sensitive sensor can thus be effectively separate and distant from the main air inlet.

According to one first preferred embodiment of the invention, the passage section of the secondary conduit is constant. Consequently, the amount of air passing through the passage surface of the secondary conduit is substantially constant in the normal configurations, that is to say, when the difference in pressure on either side of the conduit is in the range of a few Pascals. It is then possible to set very precisely the temperature coefficient K.

According to a second preferred embodiment of the invention, the passage surface of the secondary conduit is subjected to the outside temperature. This complementary modulation may be useful when the weather is extreme, for example when the outside temperature falls below a predetermined value. Indeed, in this case, the variation of the amount of water in the outside air is relatively low compared to the variation of the temperature. By way of example, about 2.5 g of water per kg of air at -5°C and 1.6 g of water per kg of air at -10°C are measured, that is to say a difference of only 0.9 g of water per kg of air. In this example, so as to stay within the range of operation of the ventilation device, then it is judicious to reduce the passage surface of the secondary conduit in order to limit the influence of the outside temperature on the moisture-sensitive sensor, which ultimately amounts to set a new temperature coefficient K. Of course, the passage surface of the secondary conduit can be subjected to any other setting, without any restriction.

Advantageously, the passage section of the secondary conduit is lower than 10% of the passage section of the main air inlet, and preferably comprised between 2 and 5%.

Preferably, a heat insulator is positioned between the secondary conduit and the moisture-sensitive sensor. According to the retained configuration, without this heat insulator, it might therefore be necessary to provide a secondary conduit having a very reduced passage surface in order to obtain adequate heat exchanges between the secondary conduit and the moisture-sensitive sensor. However, in such a case, it would be relatively delicate to establish adequate heat exchanges since any disruption would very quickly cause a variation of the temperature of the moisture-sensitive sensor, and therefore of the temperature coefficient K. Consequently, the presence of a separating heat insulator allows the use of a secondary conduit with enlarged passage surface since it allows tempering, in a predetermined manner, the influence of the latter on the moisture-sensitive sensor. Furthermore, the presence of an insulator allows preventing the formation of condensation in the compartment of the moisture-sensitive sensor, which might disrupt it, or even damage it in case of direct contact,

Even advantageously, the main air inlet and moisture-sensitive sensor are respectively housed in separate compartments. The secondary conduit can be adjusted to the most varying geometric conditions.

Preferably, the two compartments are positioned in the extension of each other.

Even preferably, the sensor is made using a moisture-sensitive fabric strip attached, on the one hand, to a fixed element of the compartment in which it is housed, and on the other hand, to a lever pivotally mounted about an axis of rotation. Advantageously, this lever is able, by pivoting about its axis of rotation, to cause the rotation of a crank secured to a rod to which is attached a flap associated to the main air inlet.

The invention will be better understood using the following detailed description given hereinafter with reference to the appended drawings in which:

Figure 1 is a front view of a ventilation device according to the invention when the flap is open, with the omission of the covers.

Figure 2 is a partial perspective view of the ventilation device shown in Figure 1.

Figure 3 is a front view of the ventilation device shown in Figure 1 when the flap is closed.

A ventilation device 1 according to the invention, as shown in Figure 1, is intended to be fastened to the inside of the space and comprises, on the one hand, a first compartment 2 in which is provided a main inlet air 3 whose passage surface is variable depending on the positioning of a flap 4 which is associated thereto, and on the other hand, a second compartment 5 in which is formed a secondary conduit 6 which can connect the inside of the space with the outside through a secondary air inlet 7 cut in the bottom 8 of the compartment 5. These two compartments 2, 5 are disposed in the extension of each other and separated from each other by a partition wall 23. The covers closing each of the two compartments 2, 5 have not been shown.

Referring to Figures 1 to 3, there is is observed that the compartment 5 contains a moisture-sensitive sensor made in the form of a horizontal strip 9 of moisture-sensitive fabric, an insulator 10 disposed between the secondary conduit 6 and the strip 9, as well as an actuating system of the associated flap 4 at the main air inlet 3.

More precisely, the secondary conduit 6 is delimited by the bottom 8 of the compartment 5, by a lower edge 11 projecting from the bottom 8, by the lower portion of the insulator 10, and finally by the inner face of the cover of the compartment 5 (not shown).

The strip 9 is attached, on the one hand, to the actuating system of the flap 4, and on the other hand, to a member 13 secured to the compartment 5. More precisely, the actuating system is made of a lever 14 having a first end to which is attached said strip 9. Right above this attachment point, the lever 14 includes an axis of rotation 15 each end of which is housed in a slot 16 of a fork joint 17 attached to the compartment 5. Right below the attachment point between the strip 9 and the lever 14, a perforated lamina 18 is fastened in the end of the lever 14. A spring 19 held stretched horizontally between the lamina 18 and a pin 20, allows permanently keeping the strip 9 under tension. The lever 14 also includes a second jaw-shaped end 21 able to cooperate with a crank 22 passing through the partition wall 23 between the two compartments 2, 5. This crank 22 is secured to a horizontal rod 24 to which the flap 4 is attached.

The ventilation device 1 according to the invention operates in the following manner. The moisture-sensitive fabric strip 9 reacts when an increase or a significant reduction of the relative humidity within the space occurs. The variation of the passage surface of the main air inlet 3 is related to the relative humidity variation of the space and to the temperature in the compartment 5, influenced by the outside temperature. Indeed, the secondary air inlet 7 has a constant passage surface allowing, permanently, the passage of an amount of air substantially constant along the secondary conduit 6, this air amount firstly modifying the temperature of the insulator 10 then that of the strip 9. This amount of outside air, after flowing along the secondary conduit 6, ultimately enters the space and is mixed with the air of the space without modifying the characteristics thereof.

In Figures 1 and 2, the passage surface of the main air inlet 3 is maximum since the flap 4 is in the retracted position. After a period of time, the relative humidity within the space will fall, which will cause the retraction of the strip 9. This one will therefore exert traction forces on the lever 14 higher than those exerted by the spring 19 on the lamina 18, and it follows that the lever 14 will pivot about its axis of rotation 15 in a counterclockwise direction. In doing so, as shown in Figure 3, the jaw 21 of the lever 14 will be lowered and will drive the crank 22 in rotation which, itself, will drive in rotation the rod 24 and therefore cause the closure of the flap 4.

Conversely, when the relative humidity significantly increases within the space, the strip 9 extends and causes, by cooperation with the spring 19, the pivoting of the lever 14 about its axis of rotation 15 in clockwise direction. Consequently, the jaw 21 of the lever 14 rises and drives in rotation the crank 22 which, itself, causes the opening of the flaps 4 by actuation on the rod 24.

While the invention has been described in relation with particular embodiments, it is obvious that it is not limited thereto and that it comprises all the technical equivalents of the described means as well as combinations thereof if those ones are within the scope of the invention, as described in claims 1-9.

Berendezés egy helyiség szellőztetésére a mért relatív nedvességtartalom függvényében

Szabadalmi igénypontok

1. Szellőztető berendezés (1), amely képes egy helyiséget a relatív nedvességtartalom függvényében szellőztetni, amelyet a helyiségben egy nedvességérzékeny mérőelem (9) segítségével mérnek, amely mérőelem egy rekeszben (5) van elhelyezve, ahol az említett berendezésnek egy fő levegőbemenete (3) van, amely egy, a nedvességérzékeny mérőelem által vezérelt modulálható áteresztő felülettel rendelkezik, egy másodlagos csatornát (6) tartalmazva, amely olyan áteresztő keresztmetszettel rendelkezik, amely független a fő levegőbemenet áteresztő keresztmetszetétől és termikus összeköttetésben áll a nedvességérzékeny mérőelem rekeszével, ***azzal jellemezve***, hogy a berendezés össze tudja kötni a helyiség belsejét külső környezettel és ezáltal képes változtatni az említett nedvességérzékeny mérőelem hőmérsékletét.

2. Az 1. igénypont szerinti berendezés (1), ***azzal jellemezve***, hogy a másodlagos csatorna (6) áteresztő keresztmetszete állandó.

3. Az 1. igénypont szerinti berendezés (1), ***azzal jellemezve***, hogy a másodlagos csatorna (6) áteresztő keresztmetszete a külső hőmérséklet által van szabályozva.

4. Az 1-3. igénypontok bármelyike szerinti berendezés (1), ***azzal jellemezve***, hogy a másodlagos csatorna (6) áteresztő keresztmetszete kisebb, mint a fő levegőbemenet (3) áteresztő keresztmetszetének 10%-a, és előnyösen annak 2-5%-a.

5. Az 1-4. igénypontok bármelyike szerinti berendezés (1), ***azzal jellemezve***, hogy egy hőszigetelő anyag (10) van elrendezve a másodlagos csatorna (6) és a nedvességérzékeny mérőelem (9) között.

6. Az 1-5. igénypontok bármelyike szerinti berendezés (1), ***azzal jellemezve***, hogy a fő levegőbemenet (3) és a nedvességérzékeny mérőelem (9) más-más rekeszben (2, 5) van elhelyezve.

7. A 6. igénypont szerinti berendezés (1), ***azzal jellemezve***, hogy a két rekesz (2, 5) mindenkor egymás meghosszabbításában van elrendezve.

8. A 7. igénypont szerinti berendezés (1), ***azzal jellemezve***, hogy a mérőelem egy nedvességérzékeny szövetből készült szalag (9) segítségével van megvalósítva, amely egyrészt azon rekesz (5) egy helyhez kötött eleméhez (13) van erősítve, amelyben el van helyezve, másrészt pedig egy emelőkarhoz (14), amely egy forgástengely körül csuklósan elfordíthatóan van felszerelve.

9. A 8. igénypont szerinti berendezés (1), ***azzal jellemezve***, hogy az emelőkar (14) képes egy forgástengelye (15) körüli csuklós elfordulással egy hajtókart (22) forgásba hozni, amely szilárdan össze van kötve egy rúddal (24), amelyre egy a fő levegőbemenethez (3) hozzárendelt csappantyú (4) van felszerelve.

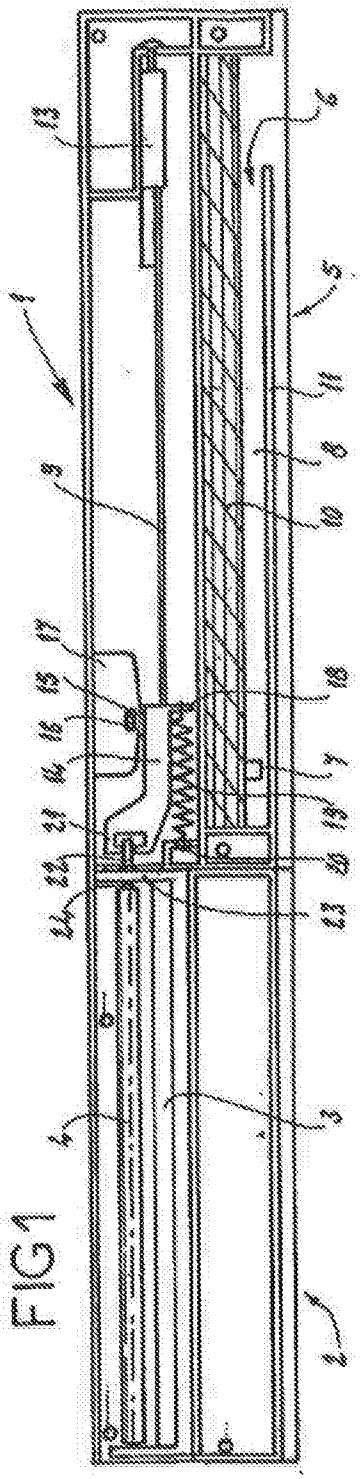

FIG1

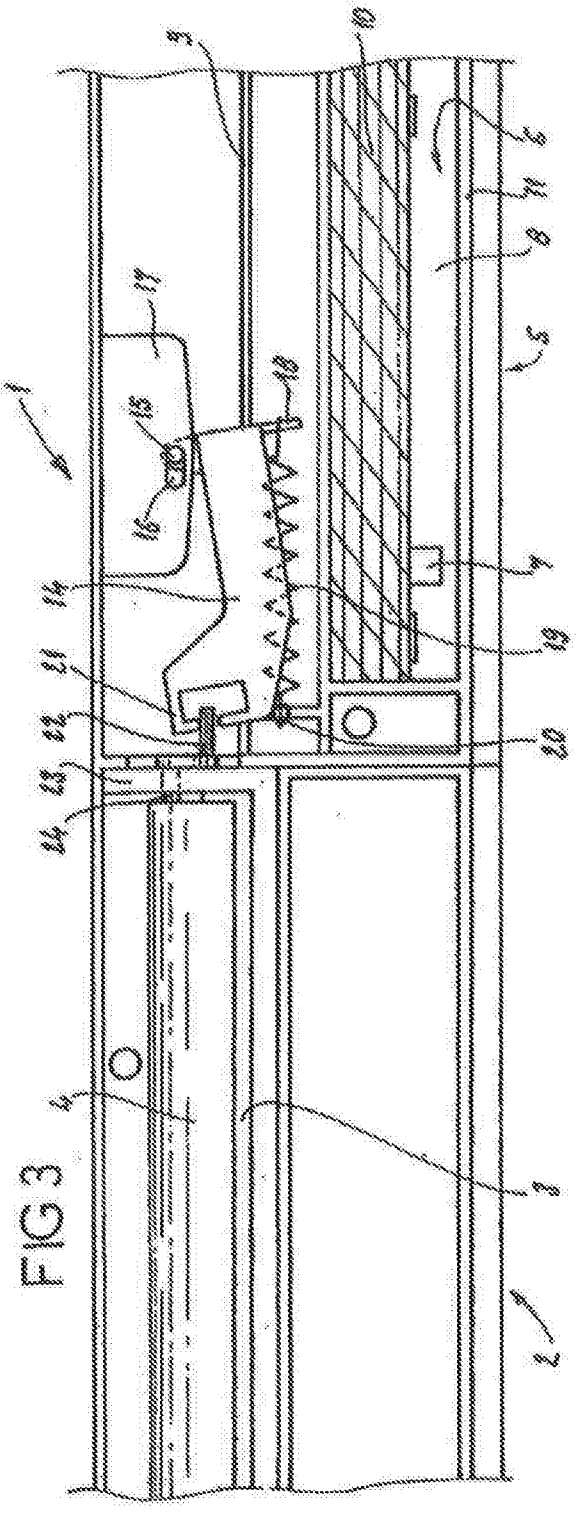

FIG3

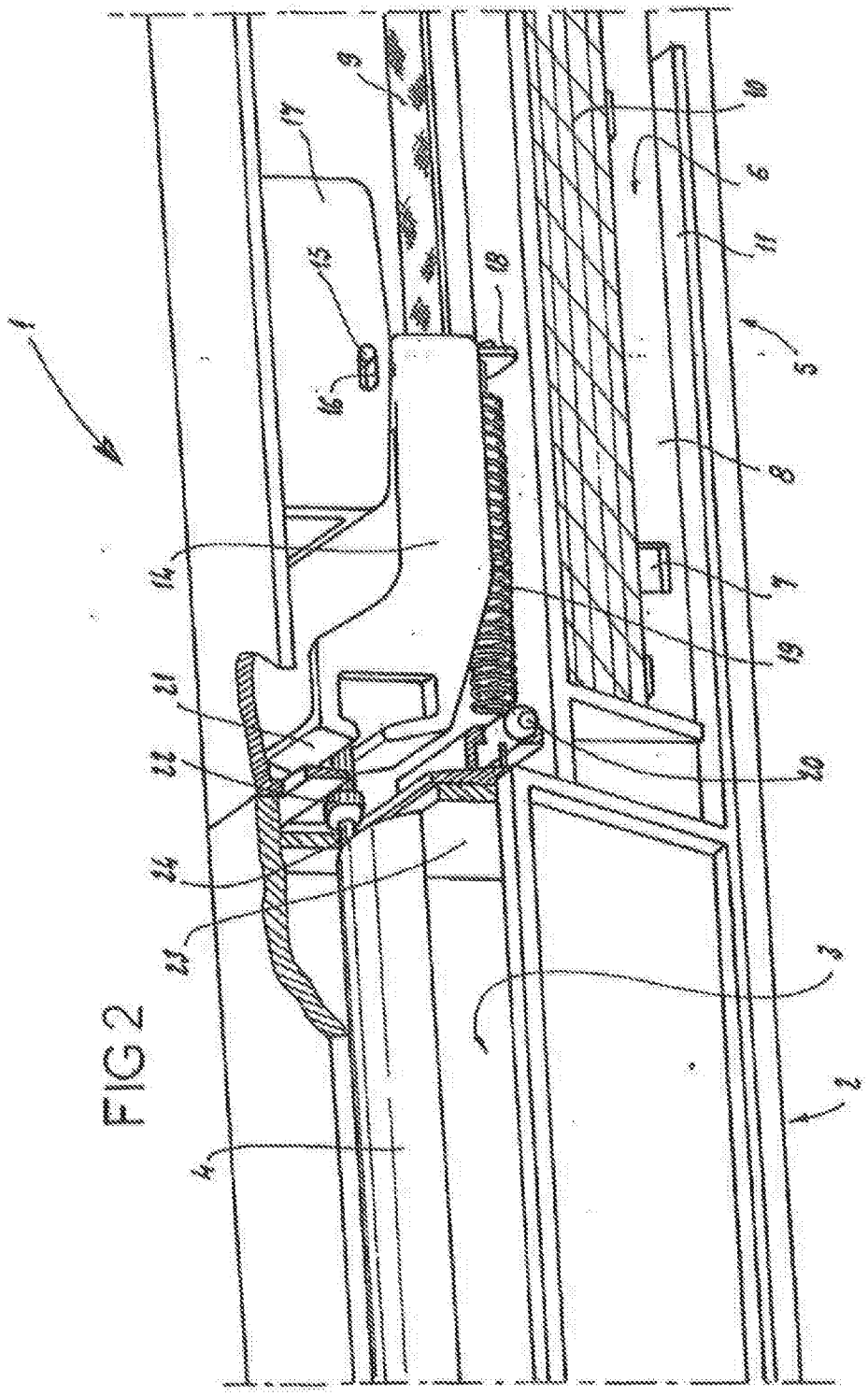

FIG 2