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(54) **A METHOD FOR MONITORING AND VENTILATING SENSITIVE AREAS**

(57) According to an example aspect of the present invention, there is provided a method for controlling humidity of a space (20) comprising: measuring humidity and temperature of the space (20), ventilating the space (20) with air through an inlet (4) and an outlet (3). In accordance with the invention the humidity and temperature of the space (20) is measured in a first measurement at the outlet (3) during ventilation, the humidity and temperature outside the space (20) is measured in a first measurement during the ventilation, temporarily ending the

ventilation, the humidity and temperature of the space (20) is measured in a second measurement at the outlet (3) during the temporarily ended ventilation, the humidity and temperature outside the space (20) is measured in a second measurement during the temporarily ended ventilation, the first and the second measurements are alternated periodically, and the first and second measurements are compared in order to determine the need for ventilation and possible water leaks in the space (20).

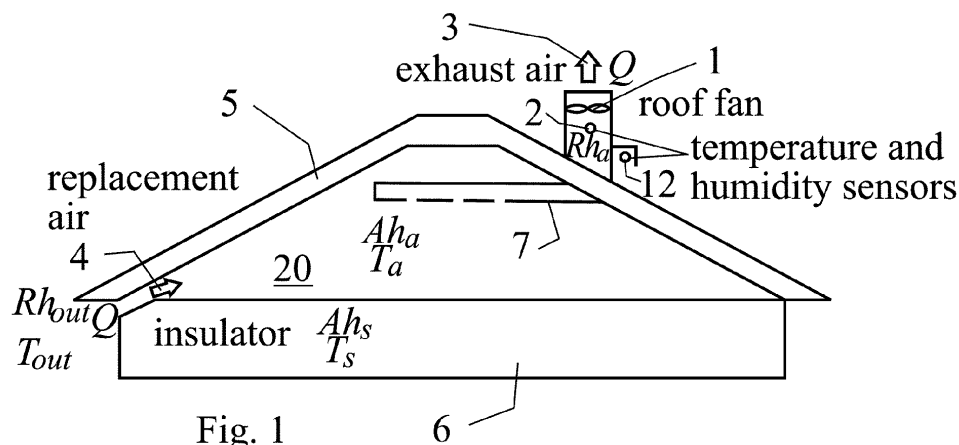


Fig. 1

Description

FIELD

5 **[0001]** The invention relates to ventilation and controlling the ventilation.

BACKGROUND

10 **[0002]** It is very important that the attic, base floor and other critical places to be drained up are ventilated as well as possible. Earlier this was done by arranging ventilation openings on different sides of the space. Today, the attic, the ground floor and similar places are often machine dried. Nowadays, in some situations, additional heating is also used to make the drying process more efficient. Regardless of whether the ventilation is passive i.e., gravity driven or active, the end result depends very much on the humidity and temperature of the outdoor air and, of course, on the space itself and the amount of moisture from other sources, such as soil. Often these types of premises are too humid for at least
15 part of the year. Because the premises are not sensed, potential water leaks are not detected until several years later, when the structures may have been damaged so severely that it is very expensive to repair them. This may even lead to a building being demolished and a new building being replaced. Wet room problems not only cause huge financial losses, but also serious indoor air problems, which, at worst, lead to serious health problems for people living or working in the premises.

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SUMMARY OF THE INVENTION

[0003] The invention is defined by the features of the independent claims. Some specific embodiments are defined in the dependent claims.

25 **[0004]** In the present invention, we disclose a method of drying, for example, attic or bottom floors, so that in preferred embodiments we not only optimize the drying process, but also analyze the condition of the premises, e.g., possible roof damage.

[0005] According to a first aspect of the present invention, there is provided a method and apparatus for controlling humidity of a space comprising measuring humidity and temperature of the space, ventilating the space with air through
30 an inlet and an outlet, the humidity and temperature of the space is measured in a first measurement at the outlet during ventilation, the humidity and temperature outside the space is measured in a first measurement during the ventilation, temporarily ending the ventilation, the humidity and temperature of the space is measured in a second measurement at the outlet during the temporarily ended ventilation, the humidity and temperature outside the space is measured in a second measurement during the temporarily ended ventilation, the first and the second measurements are alternated
35 periodically, and the first and second measurements are compared in order to determine the need for ventilation and possible water leaks in the space .

[0006] According to a second aspect of the present invention, there is provided a method and apparatus where the temporarily ending of the ventilation lasts at least monthly several hours in order to determine the structural humidity of the space.

40 **[0007]** According to a third aspect of the present invention, there is provided a method and apparatus where a fan or a controllable valve is used for creating the ventilation.

[0008] According to a fourth aspect of the present invention, there is provided a method and apparatus where a power source of the fan is used as a power source for sensors for the humidity and temperature measurements.

45 **[0009]** According to a fifth aspect of the present invention, there is provided a method and apparatus where the fan and sensors are integrated to the same structure.

[0010] According to a sixth aspect of the present invention, there is provided a method and apparatus where the water balance of the space is indicated based on the measurements and if the water content exceeds a predetermined threshold an alarm is set.

50 **[0011]** According to a seventh aspect of the present invention, there is provided a method and apparatus where the sensor system is connected to external network for obtaining general weather information for controlling the ventilation.

[0012] According to a eighth aspect of the present invention, there is provided a method and apparatus for positioning multiple sensors in the space and using these sensors in the temporarily ended ventilation to locate a possible water leak.

BRIEF DESCRIPTION OF THE DRAWINGS

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[0013]

FIGURE 1 illustrates a ventilation solution in accordance with at least some embodiments of the present invention;

FIGURE 2 illustrates as a graph the moisture of some materials as a function of the temperature and relative humidity at equilibrium;

FIGURE 3 illustrates a second ventilation solution in accordance with at least some embodiments of the present invention;

FIGURE 4 illustrates a third ventilation solution in accordance with at least some embodiments of the present invention; and

FIGURE 5 illustrates a fourth ventilation solution in accordance with at least some embodiments of the present invention.

EMBODIMENTS

DEFINITIONS

[0014] In the present context, the term "general weather information" means generally available weather information and forecasts e.g., from internet.

[0015] In the present invention, we disclose a method of drying, for example, attic or bottom floors, so that in preferred embodiments we not only optimize the drying process, but also analyze the condition of the premises, e.g., possible roof damage.

[0016] Figure 1 shows a typical structure of an attic floor. This space 2 is typically limited by roof on the top and an insulator layer 6 at the bottom and of course vertical walls. The ventilation is implemented by an inlet 4 for replacement air and outlet 3 with motorized fan 1. The fan 1 may have an exhaust piping 7 for more even flow distribution in the space 20. In case of natural ventilation the ventilation control may be implemented by a manually or electronically controlled valve positioned either in the inlet 4 or outlet 3. Suppose the space 20 is ventilated by a roof fan 1, which can change the air at the speed Q (liter/second). The humidity and temperature of this space 20 is measured by first sensor 2 positioned close to the fan 1 and the outdoor temperature and humidity by a second temperature and humidity sensor 12, which is typically positioned close to the fan 1. In a typical solution in accordance with the invention is such that the sensors 2 and 12 are integrated to the fan 1 structure and the power source for all electronical components, fan and sensors is the same.

[0017] Suppose also that at time t the humidity of the attic 20 structures is Ah_s and the temperature is T_s . It is also assumed that the relative humidity of the air in attic floor is Rh_a and the temperature is T_a respectively. In principle, the relative humidity of the air in the room 20 equilibrates with that of the structures. Of course, complete equilibrium is never achieved since the temperature and the humidity of the outdoor air varies with time. Usually there is always water leaking into the space, whereby the humidity of the structures is usually always higher than the equilibrium with the surrounding air. If the outdoor conditions varies slowly and the fan is used only when conditions are suitable, at least the surface portions of the insulators 6 (porous materials) are close to equilibrium. However, of course, the relative humidity follows the temperature distribution.

[0018] Figure 2 shows the moisture of some materials as a function of the temperature and relative humidity at equilibrium. We see that under the normal conditions, the moisture level remains always below 10 %. There should be no any problems (structural deterioration, decay, mold, ...) if the moisture level remains below 17 % (temperature 15 C). This all means that, in principle, the space such as attic can be ventilated at least when the humidity is less than 80 % (temperature 20 C). On the other hand, we must remember that there is always some excess moisture in the attic through the roof or upstairs rooms, and especially in the bottom floor, from the soil. If we take these extra sources of moisture into account and if we try to keep the humidity of the structures well below 15%, it is definitely worth optimizing the ventilation so that the fan is only on if it out door air really dries the space and does not dampen the structures. Assuming that the total weight of the structures in the space is 1000 kg and the humidity is 10%, 100 kg of water is stored in the structures. If we imagine a situation where there is no ventilation, we can allow 50 kg of water into the structures and still have a humidity level of 15%. This means that even if the humidity and temperature of the outdoor air are not conducive to drying structures for a long time, it is of little importance.

[0019] Referring again to figure 1, for example, suppose a fan 1 is removing air with humidity Ah_a at speed Q , and replacement air 4, i.e. absolute moisture Ah_{out} , we remove water from the structure at speed

$$m_w = Q(Ah_a - Ah_{out}) \quad (1)$$

[0020] That is, we are drying the attic space if the absolute humidity of the exhaust air 3 is higher than the absolute humidity of the replacement air 4, i.e., $Ah_a > Ah_{out}$. The absolute moisture of the air Ah_a depends on the relative humidity Rh as follows:

$$Ah = 13.2 * 10^{-3} \frac{Rh}{T} e^{\frac{17.7(T_a - T_0)}{T_0}} \approx 13.2 * 10^{-3} \frac{Rh}{T} \quad (2)$$

where $T_0 = 273.15C$. So we can rewrite the above the water flow as follows

$$m_w = 13.2 * 10^{-3} Q e^{\frac{17.7(T_a - T_0)}{T_0}} \left(\frac{Rh_a}{T_a} - \frac{Rh_{out}}{T_{out}} e^{\frac{17.7(T_{out} - T_a)}{T_0}} \right)$$

$$m_w \approx 13.2 * 10^{-3} Q \left(\frac{Rh_a}{T_a} - \frac{Rh_{out}}{T_{out}} \right) \quad (3)$$

where the approximation is valid if $T_{out} \cong T_a$. In practice, if the ventilation speed is high, and outdoor air is only slightly dryer than indoor air, then Ah_a is very close to Ah_{out} and due to the measurement inaccuracy of the sensors 2 and 12, we do not know exactly whether we are really drying the space or not. Of course, there is no need to ventilate the room 20 if it does not clearly dry it. However, if we only ventilate when it is useful, we can measure the amount of water we extract from the space per unit of time.

[0021] In the present invention, we disclose a method of drying, for example, attic or bottom floors, so that in preferred embodiments we not only optimize the drying process, but also analyze the condition of the premises, e.g., possible roof damage. We can also say this other way round: we measure the moisture of the materials in the space and the ventilation is optimized based on this information and ventilation is optimized based on this information as well as current and future weather. In addition, we also take into account the seasonal variations so that we can allow the humidity of the space to rise to some extent if we know that within a few months we will be able to effectively dry the premises. The humidity analysis of the rooms is done by stopping the ventilation machine 1 (if turned on) and waiting until the air in the ventilated room 20 is in equilibrium with the humidity of the structures. The fan 1 is then turned on and the temperature and humidity of the incoming air is monitored by sensor 2 until all the air in the room has been changed. From this information, we were able to estimate the moisture content of the structures. In addition, based on outdoor humidity and temperature data, we calculate how much new water we brought into the space and, of course, how we removed it during the plank test. Based on the new measurement and the old results, we will optimize the drying of the space in the future. The method provides us with information on both the moisture content of the structure and its changes, but also how much water enters the room through the air and how much we remove it through ventilation. In fact, we get two different estimates of the amount of water that enters the space, and of course the results should be to some degree of accuracy. The excess amount of water entering the space is either acceptable or normal or too large, which means a building failure in the new building and water leakage in the old building, clogging of the drain or other damage.

[0022] In the method we need to install moisture and temperature sensor 2 only at the inlet of the fan 1 and, of course, also another outdoor sensor 12 near the roof fan 1. When the fan 1 is not running the humidity inside the fan 1 is very close to that outdoors and thus we can calibrate the sensor 2 automatically against sensor outside 12. Furthermore, the outdoor sensor can be calibrated against meteorological data. We do not need to have any sensor the space itself and thus there is no need to have battery operated sensors. The electronics unit is placed either inside or outside the roof fan, and in a simpler case, the electronics controls a relay that turns the fan 1 on and. Certainly, it is advantageous if the electronics are integrated into the roof fan 1 in the factory and even better if the fan speed can be adjusted. The sensor unit is typically connected to the Internet utilizing radio networks such as Sixfox, LoraWan, LTE. Of course, any wireless or wired networks in building can be used. The control unit transmits the data one per day to the cloud service where the results are analyzed. On the other hand, the service provides instructions to the electronics unit for further action.

Method

[0023] Next we describe the method step by step:

[0024] 1) First assume that the space 20 has not been ventilated for a long time (e.g. 6 - 24 hours). The humidity and temperature of the air in the space 20 are thus in equilibrium with the structures. Very shortly (10 sec) after the fan 1 is turned on, the humidity and temperature of the air entering the fan 1 corresponds to the humidity and temperature of the space 20. This data is measured at intervals of at least 10 seconds and data is stored. At the same time, the humidity and temperature of the air are measured to determine how much water has entered the space during the process. The blasting will stop after a few minutes, when we are sure that the entire air mass in the space has been changed.

[0025] 2) The measurement data is sent to the cloud service, where it is used to estimate the current humidity of the structures. Based on the seasonal and near-term weather forecasts, the electronics unit will be given instructions on how to ventilate the space 20 near future. In addition, the average amount of water removed from the space and the amount of replacement air brought to the space are also calculated based on the new information. Based on this information, the amount of water that enters the space, e.g. from the ground, through the roof, etc., is also recorded. For new properties, this information is compared to typical values. Of course, the estimate takes into account the rains. If the results are within normal limits, the results obtained are used as a reference for the control of structures. In addition to estimating the amount of water entering the room, we can also estimate the temperature of the structures and the amount of heat entering or leaving the room. This information not only helps to determine the condition of the insulation, but also allows us to optimize ventilation while saving as much energy as possible.

[0026] 3) If the amount of water entering the space has increased substantially after rain, for example, the system enters the analysis mode. This means that the fan is turned on and off several times and, if possible, the machine is rotated at different speeds. The data is used to estimate both the size of the spill (how many liters of water has come in relation to the intensity of the rain) and the curve to estimate the location of the spill (mainly the distance from where the air is drawn). If the flow dynamics of the space is calculated using FEM models, we can estimate the leakage point more closely. Based on the results, a report is sent to the property manager explaining the size of the leak and the possible cause of the leak. In the case of the lower ditch, changes can be very slow (clogging of drainage systems) or sometimes very fast (heavy rain drifts to the bottom). Since the system keeps structures very dry (probably 5 % - 8% humidity in attic spaces), the relative humidity of the standing air is only 20 % - 30%, so even the small amount of water that enters the room significantly increases the humidity in the air. In addition, since the sensor measures mainly outdoor humidity and temperature before measurement and the humidity and temperature of the outdoor air flowing through the room at the end of the test, the systematic error and hysteresis of the sensor do not affect the result. This allows us to utilize the humidity sensor results up to 0.1% moisture content in practice. Using several humidity sensors in the space 20 makes the locationing of the leak more accurate. The system must of course be able to communicate with these sensors and know their locations.

[0027] 4) The method can be improved by utilizing extra heaters, which are separately controlled via cloud service. If so, we calculate the price of this extra energy used for drying and this is taken into account when planning the drying process. The owner of the properties, of course, can modify the parameters but when doing that the cloud service gives the estimated moisture level of the structures as a function of heating costs so he can made decisions based on the real facts.

[0028] Although the starting point of the invention is simple, that is, to ventilate the premises only when the absolute humidity of the outdoor air is lower than the absolute humidity of the ambient air, the invention offers significant advantages:

[0029] The system uses only two humidity/thermometers at minimum. If we ventilate several rooms with separate top fans, we only need one sensor per device, since the outdoor temperature is sufficient to measure at one point. If the property has information on outdoor temperature and humidity, we do not need a separate outdoor meter. Of course, we could only use the weather data, but this could bring in the need to communicate with the electronics unit several times a day, which adds unnecessary telecommunications costs. It is also a great advantage because we do not have to use battery-powered sensors. In addition, the sensors can be calibrated against each other and against the weather every day.

[0030] The arrangement optimizes the space as a result of ventilation so that we only have to use the fan for maybe 10% to 20%. If the fan also removes radon, then of course the fan must be on for longer periods of time. This results in a longer life of the fan and a reduction in energy costs. In addition, since we do not ventilate the premises, for example in winter, except when necessary, the heating costs are also reduced.

[0031] The system not only optimizes ventilation but also monitors the premises and their condition on a daily basis. The advantage of a new building is that faults during construction are detected and thus can be addressed immediately. In a new building, of course, there may be a need to ventilate the structures more than normal, for example because the concrete will continue to dry for a very long time after the construction phase. Following this too will give you more insight into the success of your construction. In the case of an old building, perhaps the most significant individual benefit of the system is that the owner is always aware that the structures are in order and will be alerted if something unexpected happens. In addition, we know that the ceiling fan is fine. It is also easy to add an inexpensive accelerometer (€ 1) to the system, which is attached to the proof fan, allowing us to detect its condition (bearing failure, wing imbalance.).

[0032] The drying efficiency can be improved by heating the space. The electric heater is plugged in the electric

network via an adapter, which turns power on and off. Through the service, the heater is instructed on the next day's heating needs, e.g., one hour on, two hours off, etc. Outdoor air through a heat exchanger minimizing the need for extra heating. If the incoming air is preheated, we will be able to dry the underfloor much more efficiently and also ventilation is possible in wet spring weather being without extra heating catastrophic. That is, in such a case, we are not only trying to dry the room, but also to heat it to make it easier to keep it dry in the future. It is a good idea to dry the cold space by first changing the air in the room to the outside and then damping the fan. The air is heated and waited until the surface layers of the premises have dried. The warm moist air is then removed. Because heating only lasts for hours, we do not need to heat the structures, only the air. In this way, we get efficient drying with low energy costs.

Other Applications

[0033] Of course, the method described below can be used not only to dry and to analyze the bottom or top floors, but also to dry any rooms or buildings such as a summer cottages, storage rooms, basements, etc. In addition, the method can be used to dry a separate "floating" floor placed on a floor, e.g. Figure 4 illustrates the arrangement. The floor is supported in such a way that the space between the concrete and the floor can be dried by taking air from one side and mechanically sucking the air from the other side and directing the air out. In this case, control and analysis are done as described above, but now the air is extracted from the room air. The method works particularly well in cold countries in winter, because then the relative humidity of the indoor air is very low. In addition, a similar method may be used to measure other gases or particles. For example, if the bottom is ventilated due to radon emissions, the amount of radon can be temporarily enriched by temporarily shutting the ventilation and measuring the radon concentration from the top fan sample from time to time.

[0034] The invention is advantageous also with additional sensors in the space to be measured. Then, during the non-ventilation time when the ventilation fan is off, the location of the additional sensor may help to indicate a water leak, because the change (rise) of humidity value is detected first by the sensor closest to the leak because of diffusion. In ventilated operation this location information might be lost.

[0035] In an advantageous solution of the invention, the fan 1 may be equipped with a closable valve such that when the fan 1 is shut off also the valve is closed. With this solution the sensor 2 gets more accurate information of the equilibrium state of the humidity of the space 20. Also the time constant for reaching the equilibrium is shorter with this solution.

[0036] Of course, the method can be used to dry the concrete floor or to prevent harmful impurities from entering the room using a separate "floating" floor placed on top of the floor. Figure 4 shows an example of such an arrangement.

[0037] It is to be understood that the embodiments of the invention disclosed are not limited to the particular structures, process steps, or materials disclosed herein, but are extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular embodiments only and is not intended to be limiting.

[0038] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment.

[0039] As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. In addition, various embodiments and example of the present invention may be referred to herein along with alternatives for the various components thereof. It is understood that such embodiments, examples, and alternatives are not to be construed as de facto equivalents of one another, but are to be considered as separate and autonomous representations of the present invention.

[0040] Furthermore, the described features, structures, or characteristics may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of lengths, widths, shapes, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0041] While the forgoing examples are illustrative of the principles of the present invention in one or more particular applications, it will be apparent to those of ordinary skill in the art that numerous modifications in form, usage and details of implementation can be made without the exercise of inventive faculty, and without departing from the principles and concepts of the invention. Accordingly, it is not intended that the invention be limited, except as by the claims set forth below.

[0042] The verbs "to comprise" and "to include" are used in this document as open limitations that neither exclude nor require the existence of also un-recited features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated. Furthermore, it is to be understood that the use of "a" or "an", i.e. a singular form, throughout this document does not exclude a plurality.

[0043] INDUSTRIAL APPLICABILITY

[0044] The invention is industrially applicable

REFERENCE SIGNS LIST

[0045]

- 1 Fan
- 2 Humidity and temperature sensor of the fan
- 3 Exhaust air
- 4 Replacement air
- 5 Roof
- 6 Insulator
- 7 Exhaust piping
- 10 Heater
- 11 Concrete
- 12 Outdoor temperature and humidity sensor
- 20 Space to be measured and ventilated, attic or room to be ventilated

Claims

1. A method for controlling humidity of a space (20) comprising:

- measuring humidity and temperature of the space (20),
- ventilating the space (20) with air through an inlet (4) and an outlet (3), **characterized in that**
- the humidity and temperature of the space (20) is measured in a first measurement at the outlet (3) during ventilation,
- the humidity and temperature outside the space (20) is measured in a first measurement during the ventilation,
- temporarily ending the ventilation,
- the humidity and temperature of the space (20) is measured in a second measurement at the outlet (3) during the temporarily ended ventilation,
- the humidity and temperature outside the space (20) is measured in a second measurement during the temporarily ended ventilation,
- the first and the second measurements are alternated periodically, and
- the first and second measurements are compared in order to determine the need for ventilation and possible water leaks in the space (20).

2. A method in accordance with claim 1, **characterized in that** the temporarily ending of the ventilation lasts at least monthly several hours in order to determine the structural humidity of the space (20).

3. A method in accordance with claim 1 or 2, **characterized in that** a fan (1) is used for creating the ventilation, and/or a valve is used for controlling the ventilation.

4. A method in accordance with claim 1, 2 or 3, **characterized in that** a power source of the fan (1) is used as a power source for sensors for the humidity and temperature measurements; and/or the fan (1) and sensors (2, 12) are integrated to the same structure.

5. A method in accordance with any previous claim or their combination, **characterized in that** water balance of the space (20) is indicated based on the measurements and if the water content exceeds a predetermined threshold an alarm is set.

6. A method in accordance with any previous claim or their combination, **characterized in that** sensor system (2, 12) is connected to external network for obtaining general weather information for controlling the ventilation.

7. A method in accordance with any previous claim or their combination, **characterized in** positioning multiple sensors in the space (20) and using these sensors in the temporarily ended ventilation to locate a possible water leak.

8. A method in accordance with any previous claim or their combination, **characterized in** closing the ventilation by a valve at the outlet (3) in the temporarily ended ventilation.

9. An apparatus for controlling humidity of a space (20) comprising:

- means for controlling (1) the ventilation of the space (20),
- first humidity and temperature sensor (2) positioned in exhaust flow (3) of the space (20), and
- second humidity and temperature sensor (12) positioned outside the space (20) close to the means for controlling (1) the ventilation of the space (20)

characterized in that the means for controlling (1) ventilation of the space (20) further includes

- means for measuring the humidity and temperature of the space (20) in a first measurement at the outlet (3) during ventilation,
- means for measuring the humidity and temperature outside the space (20) in a first measurement during the ventilation,
- means for ending temporarily the ventilation,
- means for measuring the humidity and temperature of the space (20) in a second measurement at the outlet (3) during the temporarily ended ventilation,
- means for measuring the humidity and temperature outside the space (20) in a second measurement during the temporarily ended ventilation,
- means for comparing the first and second measurements in order to determine the need for ventilation and possible water leaks in the space (20).

10. An apparatus in accordance with claim 9, **characterized in that** means for controlling (1) the ventilation of the space (20), the first humidity and temperature sensor (2) and the second humidity and temperature sensor (12) are positioned in the same unit and powered by a common power source.

11. An apparatus in accordance with claim 9 or 10, **characterized in that** means for controlling (1) the ventilation of the space (20) is a fan (1), a valve, and/or an electronically controllable valve.

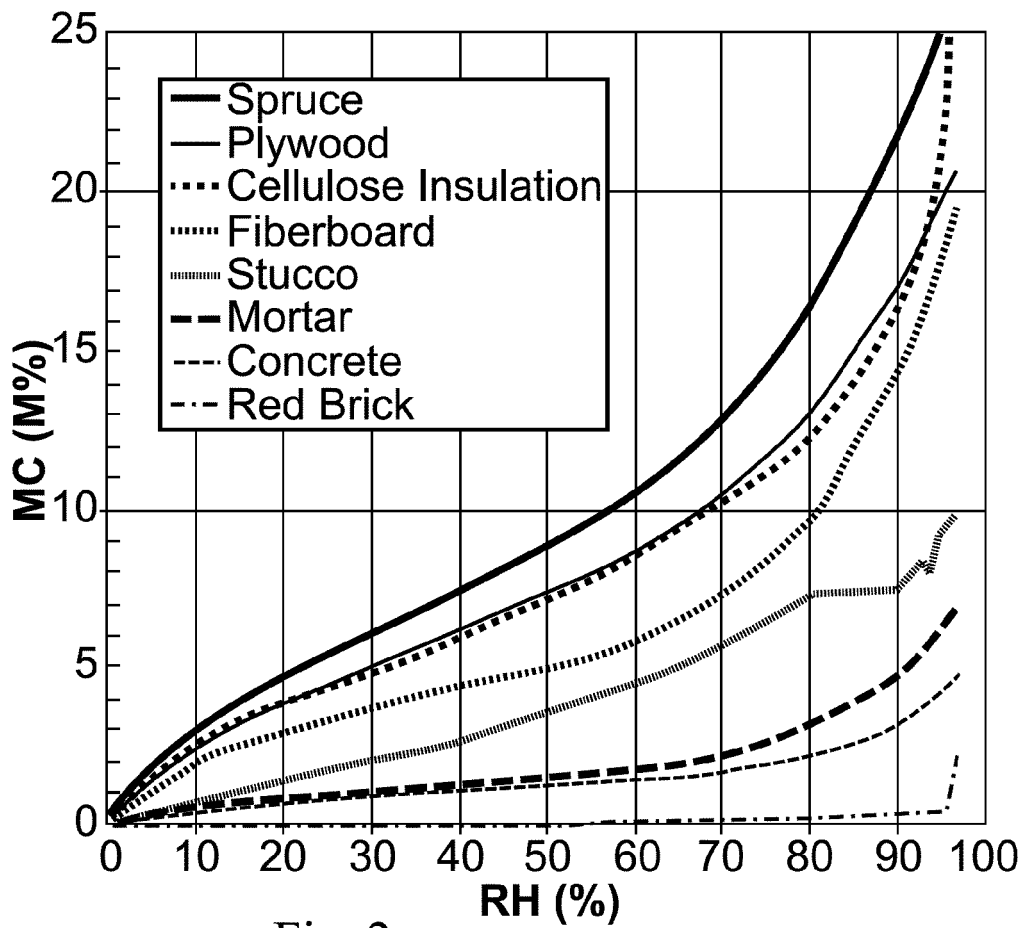
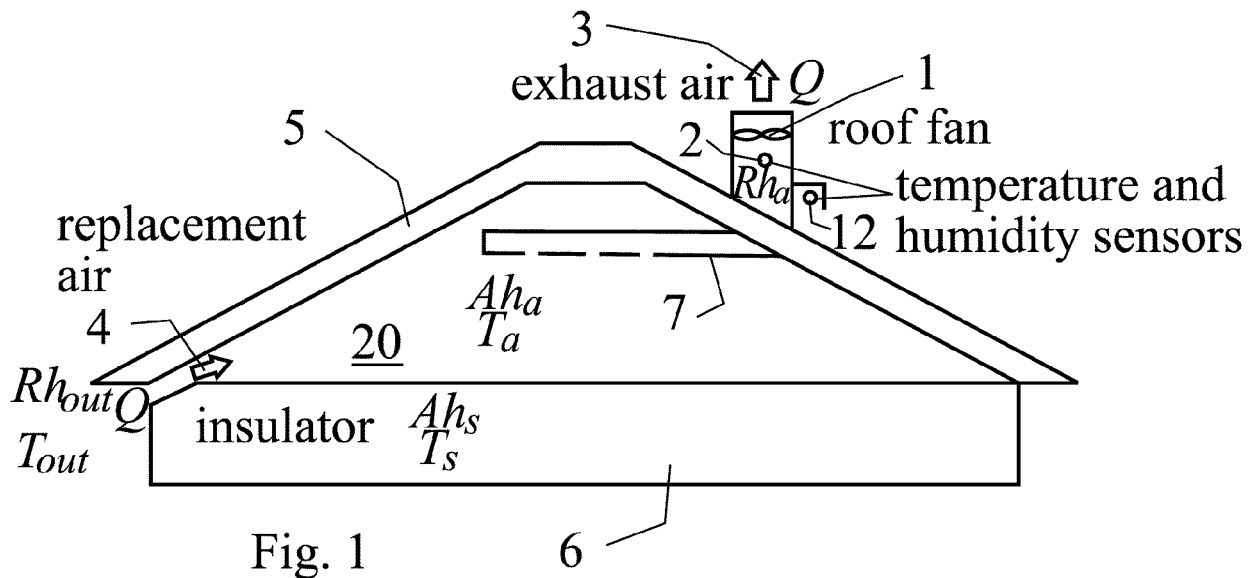
12. An apparatus in accordance with claim 9, 10, or 11, **characterized in that** it includes a wireless network connection.

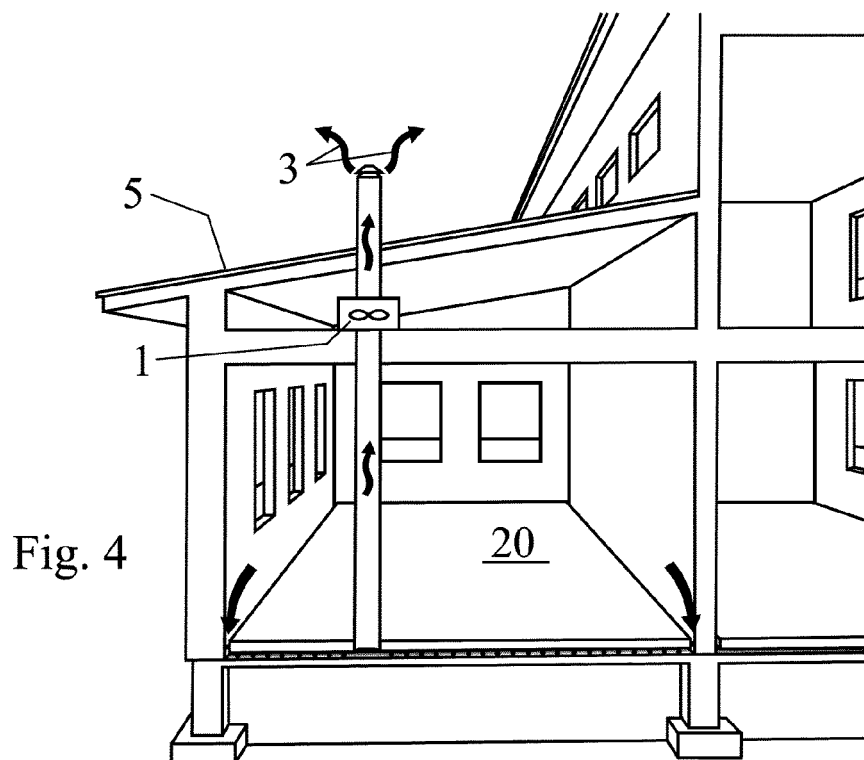
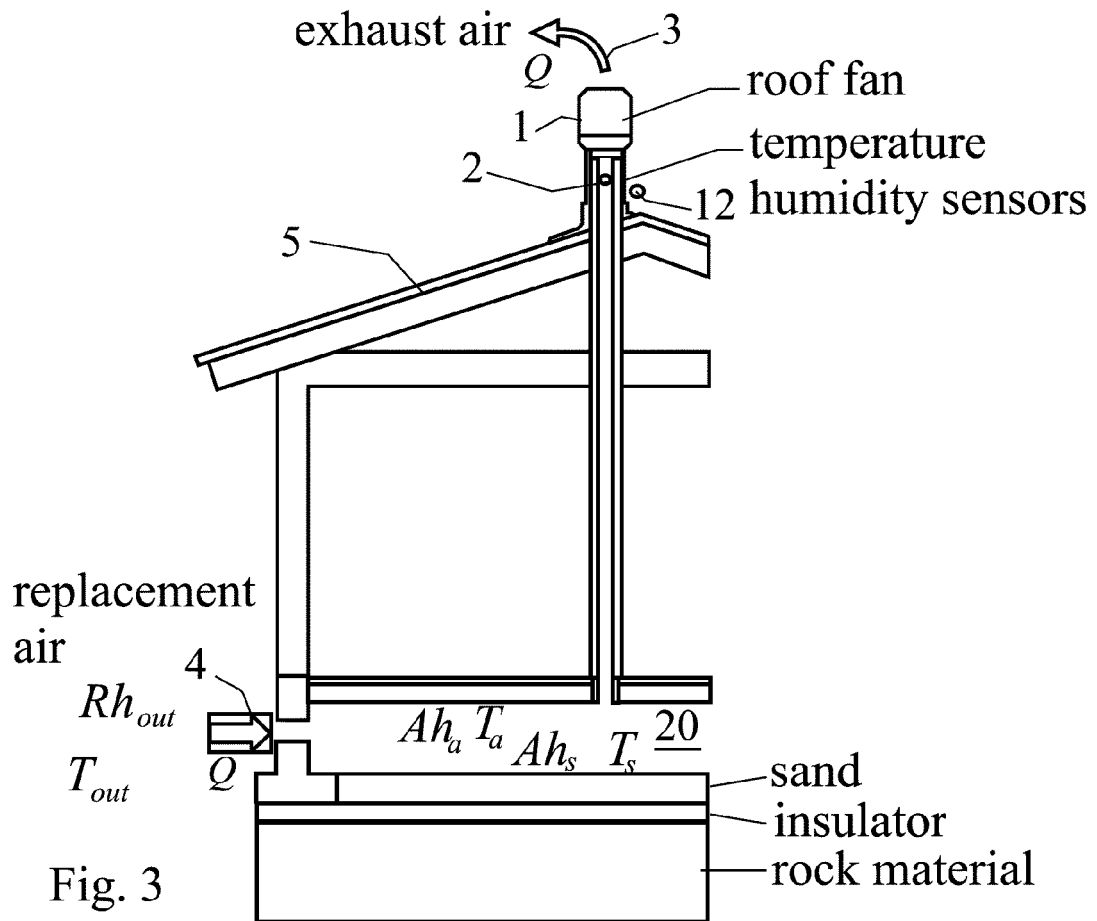
13. An apparatus in accordance with any previous claim or their combination, **characterized in that** multiple sensors are positioned in the space (20) and using these sensors in the temporarily ended ventilation to locate a possible water leak.

14. A non-transitory computer readable medium having stored thereon a set of computer readable instructions that, when executed by at least one processor, cause an apparatus to at least:

- measure humidity and temperature of the space (20),
- ventilate the space (20) with air through an inlet (4) and an outlet (3), **characterized in that** the set of computer readable instructions, when executed by the at least one processor, further cause the apparatus to at least:
- measure the humidity and temperature of the space (20) in a first measurement at the outlet (3) during ventilation,
- measure the humidity and temperature outside the space (20) in a first measurement during the ventilation,
- end temporarily the ventilation,
- measure the humidity and temperature of the space (20) in a second measurement at the outlet (3) during the temporarily ended ventilation,
- measure the humidity and temperature outside the space (20) in a second measurement during the temporarily ended ventilation,
- compare the first and second measurements in order to determine the need for ventilation and possible water leaks in the space (20).

15. A computer program configured to cause a method in accordance with at least one of claims 1-8 to be performed.





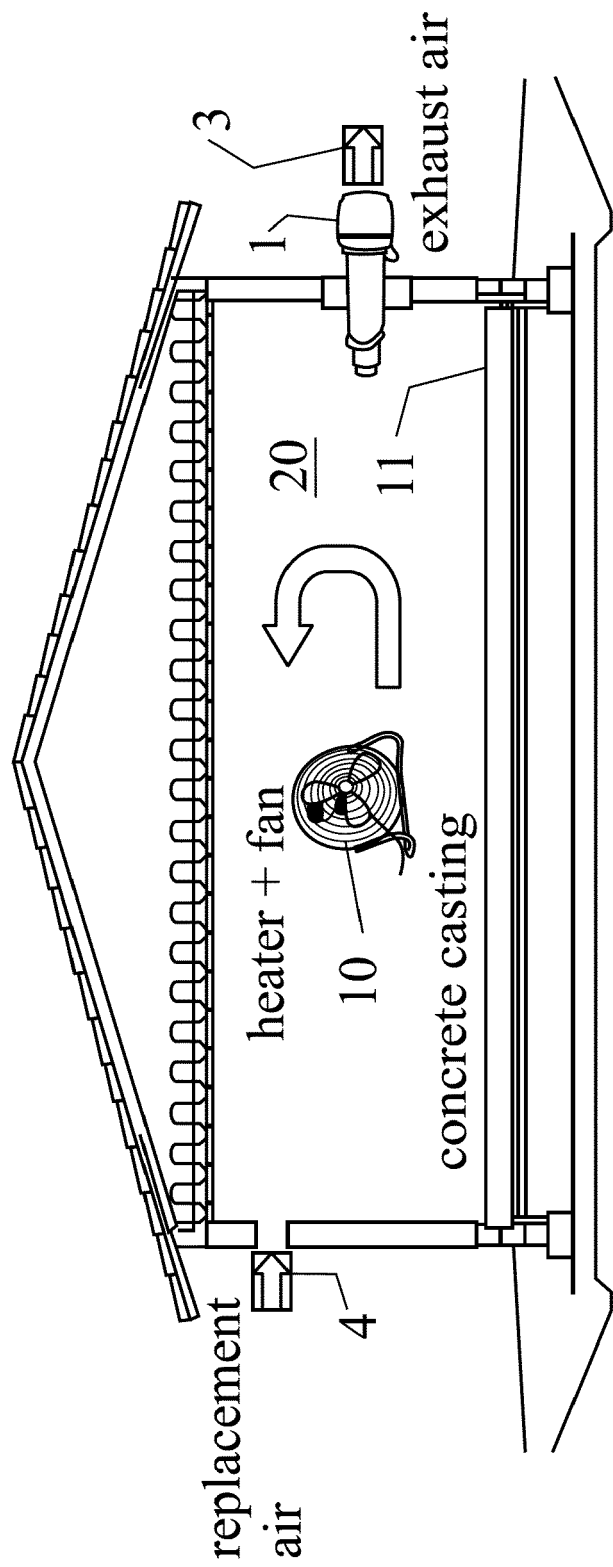


Fig. 5



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