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(54) Benævnelse: **Fremgangsmåde til diagnose af en ventilationsenhed med enkelt eller dobbelt gennemstrømning og tilsvarende ventilationsenhed**

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The invention concerns the field of controlled mechanical ventilation (CMV) installations and more particularly, a method for diagnosing these installations in the context of their set-up in an individual or collective housing building.

Conventionally, buildings are equipped with systems called « single-flow » or « double-flow » systems allowing ventilating the rooms of the dwellings of the building in order to evacuate the specific pollutants relating to the presence of the occupants and to evacuate the specific pollutants relating to the building itself.

Single-flow system means a system which allows circulating air coming from the outside towards the rooms called main rooms, and then towards the technical rooms to be extracted afterwards through conduits and expelled by a ventilator to the outside.

Double-flow system means a system allowing circulating air coming from the outside as described in the previous paragraph and also allowing insufflation air by a ventilator via a conduit network and insufflation outlets.

Main rooms means the rooms of a dwelling such as the dining room, the bedrooms, the living room requiring only an indirect extraction of air.

Technical rooms means the rooms of a dwelling requiring ventilation by extraction such as the toilets, the kitchen and the bathroom.

During the installation of these single-flow or double-flow ventilation assemblies, a conduit network is also installed allowing conveying and extracting air and covering the entirety of each dwelling of the building.

Conduit network means a system comprising a plurality of conduits which are controlled and governed by the same ventilation assembly.

In a known manner, the conduit network is made by assembling several components such as sheaths, fittings, spool pieces, etc. A wrong assembly of these components may result in parasitic flows likely to increase the heat losses and disturb the distribution of ventilation thereby hindering the quality of the ventilation of some rooms of the dwelling.

Furthermore, a wrong arrangement of the conduits may result in squashing or tearing of the sheaths, thereby preventing reaching the desired air flow rate at the outlets of the conduits.

Conventionally, in order to overcome the aforementioned drawbacks, separate measuring apparatuses are used allowing verifying, upon installation of the system, the permeability of the conduits and the obtainment of the proper flow rates.

However, it is often delicate to control the flow rate because the measuring apparatus are bulky and do not allow reaching the extraction and/or insufflation outlets which have a very restricted access.

Furthermore, the apparatuses for measuring the permeability of the conduit network require a specialized operator to temporarily dismount some conduits of the network in order to measure the permeability of a conduit, which increases the risk of deterioration of the conduits and the repetitive manipulations result in a drop in the initial performances of each conduit.

In addition, the previously described measuring apparatuses are very expensive and the installers are rarely provided with.

There is known from patent FR 2 811 759 B1 a method for measuring sealing which allows measuring the overall permeability of the conduit network respectively via a manometer and a flow meter positioned in the box of the ventilator respectively upstream and downstream of the ventilator. However, this method does not allow on the one hand getting an accurate measurement for each conduit, and on the other hand, identifying which conduit is permeable if a defect is noticed. In addition, this method does not allow controlling the air flow rate at each extraction and/or insufflation outlet of the conduit network, to verify the proper set-up of the conduit network.

There is known from patent application EP 2 363 656 A2 a presetting method allowing carrying out an optimized setting of the different registers of the conduits so as to obtain a preset air flow rate. However, this method does not allow measuring the permeability of each conduit and in particular between the register and the extraction and/or insufflation outlet of each conduit, which prevents from identifying a permeability defect and ensuring that the flow rate at the output of the outlet actually corresponds to the upstream preset flow rate.

The invention aims to solve all or part of the aforementioned drawbacks.

An object of the invention is a method for diagnosing a ventilation assembly comprising at least one ventilator, a discharge conduit, a conduit network comprising at least two conduits each comprising at least one air extraction outlet and/or one air insufflation outlet, at least one register positioned in each conduit, a control unit adapted to control said register, characterized in that the diagnosis method is carried out at at least one conduit and comprises the following steps:

–step A: providing at least one measuring member designed to measure the air flow rate at input or at output of the register in each conduit, said measuring member being controlled by the control unit,

–step B: obstructing the outlet(s) of the conduit to be tested,

–step C: setting the ventilator in operation at a determined operating pressure,

–step D: measuring the air flow rate of the conduit by means of the measuring member,

–step E: determining the actual pressure drop of the register,

–step F: determining the actual pressure of the conduit by subtracting the actual pressure drop of the register from the determined operating pressure applied at the ventilator,

–step G: determining the value of leak flow rate of the conduit according to the actual pressure of the conduit determined at step F and the air flow rate of the conduit measured at step D.

Thanks to the diagnosis method of the invention, it is no longer necessary to use specific measuring apparatuses external to the ventilation assembly nor does it necessary to employ a specialized workforce to diagnose the ventilation assembly upon its set-up in a dwelling.

Furthermore, since the diagnosis method of the invention is implemented for one conduit, this method allows accurately identifying a sealing defect on this conduit by determining a value of leak flow rate corresponding to the permeability of the conduit according to the actual pressure of the conduit determined at step F.

According to the invention, steps D to G may be iterated for each conduit of the ventilation assembly, and this, in an independent manner, which allows determining, where appropriate, the defective conduit.

Advantageously, the value of leak flow rate of the conduit is expressed in m^3/h at the actual pressure of the conduit determined at step F.

According to a feature of the invention, the determination of the actual pressure drop of the register performed at step E is done by:

–E1: measuring the air flow rate flowing in the conduit by means of the measuring member,

–E2: determining the angular position of the register controlled by the control unit of the ventilation assembly, and

–E3: calculating the resulting pressure drop according to the flow rate measured at E1 and the position of the flap measured at E2.

Alternatively, the actual pressure drop of the register may be measured directly at either side of the register by means of the measuring member.

According to another feature of the invention, the diagnosis method comprises the following additional steps:

–step H: setting the ventilator in operation at another determined operating pressure,

–step I: reiterating steps D, E, F and G,

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–step K: determining an equation characterizing the permeability of the conduit from the different values of leak flow rate obtained at each iteration of step G.

According to the invention, for more accuracy in the permeability diagnosis, the method comprises a step J carried out before step K and consisting in reiterating steps H and I. Advantageously, the more steps H and I are iterated, the more the permeability equation determined at step K is accurate.

For a proper understanding of the invention, several definitions of used terms are exposed hereinafter:

–the determined operating pressure corresponds to the pressure applied at the ventilator,

–the actual pressure drop of the register corresponds to the pressure drop measured at the conduit and deduced either from a calculation based on measurements of flow rates or based on an actual measurement of the pressure drop,

–the actual pressure of the conduit corresponds to the pressure in the conduit and deduced either from a calculation during the diagnosis method or from a direct measurement,

–the value of leak flow rate corresponds to a value allowing identifying the permeability ratio of the conduit,

–the equation characterizing the permeability of the conduit corresponds to an equation allowing deducing an accurate leak flow rate of the conduit.

According to another feature of the invention, the diagnosis method is carried out for a conduit network of the ventilation assembly, each conduit of the network being diagnosed independently.

According to another feature of the invention, the method is carried out for each conduit of the ventilation assembly and comprises a step K' of identifying the permeability class of the ventilation assembly from the permeability equation of each conduit derived from step K and from the dimensions of each conduit.

According to a feature of the invention, the diagnosis method comprises the following additional steps:

–step L: opening the outlet(s) of the conduit to be tested or verifying that the outlet(s) of the conduit are open,

–step M: sending to a register of the conduit to be tested, a command corresponding to a theoretical overall flow rate of the conduit,

–step N: determining a theoretical operating pressure of the ventilation assembly, by adding to a theoretical pressure of the conduit subjected to a theoretical overall flow rate of the conduit according to step M, a theoretical pressure drop of the register of said conduit not subjected to the theoretical overall flow rate of the conduit,

–step O: setting the ventilator in operation so as to reach the theoretical overall flow rate of the conduit and the theoretical operating pressure of the ventilation assembly determined at step N,

–step P: comparing the actual pressure drop of the register determined at step E with the theoretical pressure drop of the register, when the actual pressure drop of the register is lower than the theoretical pressure drop, a defect on the outlet(s) of the tested conduit or on the conduit is identified.

Preferably, the theoretical pressure drop of the register is substantially equal to 30 Pa.

According to the invention, the theoretical overall flow rate of the conduit is determined while taking into account the use of the ventilation assembly. For example, for a conduit serving a bathroom, the theoretical overall flow rate may be substantially equal to 30 m^3/h whereas for a similar conduit serving a kitchen, the theoretical overall flow rate of this conduit is substantially equal to 135 m^3/h. Of course, these values are given as examples and in no way do they limit the invention.

According to another feature of the invention, the diagnosis method comprises the following steps:

–step Q: sending another command corresponding to the theoretical overall flow rate of the conduit according to step M to which is added a leak flow rate determined at step G or K subjected to the theoretical pressure of the conduit determined according to step N,

–step R: iterating steps N and Q so that a balance between the theoretical pressure of the conduit and the theoretical overall flow rate of the conduit is reached,

steps Q and R being preferably carried out successively between steps N and O.

Preferably, steps Q and R are carried out when the value of leak flow rate determined at step G or K is higher than substantially 2 m^3/h at a pressure of 30 Pa.

According to another feature of the invention, the method may comprise an additional step M' consisting in sending a command of a so-called low theoretical overall flow rate to the other registers of the other conduits of the ventilation assembly. Low theoretical overall flow rate means a low theoretical overall flow rate lower than the theoretical overall flow rate used on the conduit to be tested. This step M' allows mastering the theoretical overall flow rate of the conduit to be tested, the command of low theoretical overall flow rate being preferably performed substantially at the same time as step M. Preferably, the command of low theoretical overall flow rate is substantially in the range of 10 m^3/h.

For a good understanding of the invention, several definitions of used terms are exposed hereinafter:

–the theoretical overall flow rate of the conduit corresponds to a maximum flow rate passing in the conduit at the outlet(s) of the conduit,

–the theoretical operating pressure of the ventilation assembly corresponds to the pressure applied at the ventilator and determined theoretically,

–the theoretical pressure of the conduit corresponds to the supposed pressure within the conduit,

–the theoretical pressure drop of the register of said conduit corresponds to the supposed pressure drop of the register, this supposition being based considering the type of register and the dimensions of said register,

–the balance between the theoretical pressure of the conduit and the pressure producing the theoretical overall flow rate of the conduit when considering leakages is reached when the theoretical pressure of the conduit produces the same leak flow rate.

According to a feature of the invention, steps L to P, including or excluding steps Q and R, may be reiterated for each register of each conduit.

Advantageously, steps L to P, including or excluding steps Q and R, may be carried out after step G or after step K or K'.

According to another feature of the invention, the method comprises an assessment of the discharge of the ventilation assembly by verifying the obtainment of a theoretical overall flow rate at the ventilation assembly with respect to a predetermined theoretical overall flow rate. The assessment of the discharge allows verifying whether there is a problem at the discharge conduit of the ventilation assembly.

According to a feature of the invention, the diagnosis method comprises the following steps:

–step S: sending a command combining the set of commands of theoretical overall flow rate sent to each register of each conduit according to step M,

–step T: determining the theoretical pressure of each conduit subjected to the theoretical overall flow rate of each conduit,

–step U: identifying the most disadvantaged conduit of the network, by comparing the actual pressure determined for each conduit at step F, the conduit having the highest actual pressure being the most disadvantaged conduit of the network,

–step V: calculating the theoretical pressure of the ventilation assembly by adding a theoretical pressure drop of the register of the most disadvantaged conduit, the theoretical pressure drop being subjected to the theoretical pressure of the most disadvantaged conduit,

–step W: adding the set of commands of theoretical overall flow rate of each register to a set of leak flow rates of each conduit according to step G or K, each leak flow rate being subjected to the theoretical operating pressure of the ventilation assembly,

–step X: setting the ventilator in operation in order to obtain the set of commands of theoretical overall flow rate of each register and the theoretical pressure,

–step Y: comparing the actual pressure drop of the register of the most disadvantaged conduit with the theoretical pressure drop of the register of said most disadvantaged conduit, when the actual pressure drop of the register of the most disadvantaged conduit is lower than the theoretical pressure drop of the register of said most disadvantaged conduit then the discharge conduit of the ventilation assembly presents a defect.

According to a feature of the invention, the diagnosis method may comprise an additional step Z consisting in increasing the flow rate of the ventilator until obtaining the flow rates of each conduit to verify whether the ventilation assembly is correctly installed with respect to predetermined standard compliance criteria. Advantageously, step Z is carried out after step Y.

Advantageously, step S is carried out after step K or K' or after step P.

The invention also concerns a ventilation assembly comprising at least one ventilator, a conduit network comprising at least two conduits each comprising at least one air extraction outlet and/or one air insufflation outlet, at least one register positioned in each conduit, a control unit adapted to control said register, characterized in that the set comprises at least one measuring member designed to measure the air flow rate at input or at output of the register of each conduit, said member being controlled by the control unit.

Advantageously, the measuring member is a flow meter. Preferably, at least one measuring members is integrated on each register.

According to the invention, the ventilation assembly is designed to implement the diagnosis method described hereinabove, upon its installation in a dwelling.

The invention will be better understood, thanks to the description hereinafter, which relates to two embodiments according to the present invention, given as non-limiting examples and explained with reference to the appended schematic drawings wherein:

–Figure 1 is a schematic representation of a ventilation assembly according to the invention,

–Figure 2 is a flowchart representing the steps of the method according to a first embodiment of the invention,

–Figure 3 is a flowchart representing the steps of the method according to a second embodiment of the invention,

–Figure 4 is a flowchart representing optional steps according to the first embodiment represented in Figure 2, and

–Figure 5 is a flowchart representing optional steps according to the second embodiment represented in Figure 3.

According to the invention, the ventilation assembly 1 is designed to be installed in a dwelling 10 of a collective housing building (not represented). The dwelling 10 comprises rooms called technical rooms 11 and main rooms 12.

The ventilation assembly 1, comprises a conduit network cooperating with a ventilator 2 intended to convey or extract air in the conduits 4. In the example illustrated in Figure 1, only the technical rooms 11 are served by the conduits 4. Furthermore, the ventilation assembly comprises a discharge conduit 13 to evacuate the extracted air to the outside of the building.

Each conduit 4 comprises at least one register 5 equipped with a measuring member such as a flow meter 5'. Furthermore, each conduit 4 comprises an air extraction outlet 6 or an air insufflation outlet 6' opening into a technical room 11 of the dwelling 10.

As illustrated in Figure 1, the ventilation assembly 1 comprises a control unit 3 which controls the registers 5 and the flow meters 5' as well as the ventilator 2. Thanks to the control unit 3 of the ventilation assembly 1, it is possible to implement the operation diagnosis method described hereinabove according to the invention and control the registers 5, the flow meters 5' and the ventilator 2 so as to carry out the diagnosis steps.

Advantageously, as soon as the ventilation assembly 1 is set in place in a dwelling 10, the diagnosis method is implemented to determine whether the set-up of this ventilation assembly 1 is compliant with respect to a determined standard and that there is no leakage.

In the representation of the steps of the diagnosis method, in Figures 2 to 5, steps (a) to (g) have been added for a good understanding of the method and of the figures. Of course, in no way are these steps limitative.

In Figure 2, a first embodiment of the diagnosis method is represented. In this first embodiment, steps A to G are carried out successively.

According to the example illustrated in Figure 2, the ventilation assembly 1 comprises at least one measuring member 5' designed to measure the air flow rate at input or at output of the register 5 in each conduit 4, which corresponds to step A. Afterwards, the outlet(s) 6, 6' of a conduit 4 to be tested must be obstructed (step B), the ventilator 2 must be set in operation at a determined operating pressure (step C), the air flow rate at the conduit 4 must be measured by means of the measuring member 5' (step D). Then, the actual pressure drop of the register 5 of the conduit 4 must be determined (step E) by means of the control unit 3, which allows determining the actual pressure of the conduit 4 (step F). Thus, it is possible to determine the permeability of the conduit 4 (step G) according to the actual pressure of said conduit 4 and the measured air flow rate of the conduit 4.

After steps A to G, a test step (a) is carried out and consists in determining whether steps A to G have been reproduced for each conduit 4 of the network. If not, steps D, E, F and G are reiterated. If so, another test step (b) is carried out.

The test step (b) consists in determining whether there is a need for accuracy on the value of leak flow rate of each conduit. If not, the method proceeds with steps L to P which will be detailed hereinafter. If so, steps H and I are executed.

After step I, a test step (c) is carried out consisting in determining whether the level of accuracy on the value of leak flow rate of each conduit is sufficient. If so, step K of determining an equation characterizing permeability is carried out. If not, step J consisting in reiterating steps H and I is carried out until the level of accuracy is considered as sufficient (test step (d)) to proceed to step K. The decision regarding the sufficiency of accuracy may be made according to a predetermined threshold level. When the threshold level is reached, step K may be executed. Advantageously, the threshold level is predetermined depending on needs.

After step K or K', a new test step (e) is carried out to determine whether the diagnosis method should continue. If so, the diagnosis method proceeds with steps L to P which will be detailed hereinafter. If not, a test step (f) is triggered to determine whether a diagnosis of the discharge should be executed. If so, steps S to Y are carried out, see Figure 4. If not, the diagnosis method is stopped (step (g)).

According to the invention, steps A to G and preferably A to K or A to K' allow assessing the permeability of each conduit 4 of the conduit network.

After assessing permeability, we check whether the ventilation assembly has been correctly installed and in particular when it is desired to determine whether a conduit 4 sheath is squashed or has a shape not enabling a correct air flow with respect to standards. Thus, the ventilation assembly 1 implements steps L to P using the results of the previously determined values of leak flow rate.

Steps L to P are carried out successively. To do so, the outlet(s) 6 of the conduit 4 to be tested must be opened or opening of the outlets 6 of the conduit must be verified, and then a theoretical flow rate command is sent via the control unit 3 to a register 5 of the conduit 4. Then, a theoretical pressure of the ventilation assembly 1 must be determined by adding a theoretical pressure drop of the register 5 of the conduit 4, and the value of leak flow rate of the conduit 4. Afterwards, the ventilator 2 is set in operation and the actual pressure drop of the register 5 of the conduit 4 is determined. When the actual pressure drop of the register 5 is lower than the theoretical pressure drop, this means that there is a defect on the outlet 6, 6' of the tested conduit 4 or on the conduit 4 itself.

Subsequently to step P, the test step (f) is triggered to determine whether a diagnosis of the discharge should be executed. If so, steps S to Y are carried out, see Figure 4. If not, the diagnosis method is stopped (step (g)).

In Figure 3 is represented a second embodiment of the diagnosis method.

The second embodiment differs from the first embodiment only in that steps Q and R are integrated in the method between steps N and O. Steps Q and R allow obtaining the desired theoretical flow rate taking into account the leakage. Step R is a test step which consists in determining whether the balance between the theoretical pressure of the conduit 4 and the theoretical overall flow rate of the conduit 4 is reached. If so, the method proceeds on step O and if not, the method loops back on step N, until the desired balance is reached.

Subsequently to step P of the second embodiment, the test step (f) is executed to determine whether a diagnosis of the discharge should be executed. If so, steps S to Y or S to Z are carried out, see Figure 5. If not, the diagnosis method is stopped (step (g)).

Optionally, steps S to Y or S to Z allow checking whether the discharge conduit 13 of the ventilation assembly 1 is compliant with respect to standards. The ventilation assembly 1 then implements steps S to Y or S to Z of the diagnosis method.

Steps S to Y are carried out successively and end at the diagnosis end step (g). Optionally, step Z is carried out after step Y and before the end step (g) of the diagnosis method. In Figure 4, is represented the assessment of the discharge 13 subsequently to the first embodiment whereas in Figure 5 is represented the assessment of the discharge 13 subsequently to the second embodiment. Steps S to Z remain unchanged regardless of the considered embodiment.

Regardless of the embodiment, steps K', M' and Z represented in dotted line in Figures 2 to 5 are considered as optional.

The diagnosis method according to the invention is valid both for a single-flow ventilation assembly and for a double-flow ventilation assembly. In a double-flow ventilation assembly, the insufflation outlets have the same role as the extraction outlets and need to be obstructed during the assessment of the permeability and opened during the checking of the conduit to determine whether the sheath is squashed or defective.

Patentkrav

1. Diagnosefremgangsmåde til en ventilationsenhed (1), som omfatter mindst en ventilator (2), en fortrængningsledning (13), et rørledningsnet med mindst to rørledninger (4), som hver især omfatter mindst én luftudledningsåbning (6) og/eller en luftindblæsningsåbning (6'), mindst ét luftspjæld (5), der er anbragt i hver rørledning (4), en styringsenhed (3), der er indrettet til at styre luftspjældet (5), **kendetegnet ved, at** diagnosefremgangsmåden udføres ved mindst én rørledning (4) og omfatter de følgende, på hinanden følgende trin:

- trin A: tilvejebringe mindst ét målingselement (5'), der er indrettet til at måle luftmængden ved indgangen og udgangen af luftspjældet (5) i hver rørledning (4), hvor målingselement (5') styres af styringsenheden (3),
- trin B: lukke åbningen eller åbningerne af den rørledning (4), som skal testes,
- trin C: drive ventilatoren (2) ved et bestemt driftstryk,
- trin D: måle luftmængden af rørledningen ved hjælp af målingselementet (5'),
- trin E: bestemme det faktiske tryktab af luftspjældet (5),
- trin F: bestemme det reelle tryk af rørledningen (4) ved at fratrække det faktiske tryktab af luftspjældet (5) fra det bestemte driftstryk, som anvendes ved ventilatoren (2),
- trin G: bestemme værdien af lækagetabet af rørledningen (4) i forhold til det faktiske tryk af rørledningen (4) bestemt i trin F og luftmængden af rørledningen (4) målt i trin D.

2. Diagnosefremgangsmåde ifølge krav 1, **kendetegnet ved, at** fremgangsmåden omfatter de følgende yderligere trin:

- trin H: drive ventilatoren (2) ved et andet bestemt driftstryk,
- trin I: gentage trin D, E, F og G
- trin K: bestemme en ligning til karakterisering af gennemtrængeligheden af rørledningen (4) ud fra forskellige værdier for lækagetabene, som opnås ved hver gentagelse af trin G.

3. Diagnosefremgangsmåde ifølge krav 2, **kendetegnet ved, at** diagnosefremgangsmåden udføres for hver rørledning (4) af ventilationsenheden og omfatter et identificeringstrin K' af gennemtrængelighedsklassen af ventilationsenheden (1) ud fra ligningen for gennemtrængelighed af hver rørledning (4), som stammer fra trin K, og dimensionerne af hver rørledning (4).

4. Diagnosefremgangsmåde ifølge et hvilket som helst af kravene 1 til 3, **kendetegnet ved, at** fremgangsmåden omfatter de følgende yderligere trin:

- trin L: åbne åbningen eller åbningerne (6, 6') af den rørledning (4), som skal testes, eller kontrollere, at åbningerne (6, 6') af rørledningen (4) er åbne,
- trin M: sende til luftspjældet (5) af den rørledning (4), som skal testes, en fast værdi, som svarer til en teoretisk samlet luftmængde af rørledningen (4),
- trin N: bestemme et teoretisk driftstryk af ventilationsenheden (1), ved at der til et teoretisk tryk af rørledningen (4) afhængigt af den teoretiske samlede luftmængde af rørledningen (4) ifølge trin M, tilsættes et teoretisk tryktab af luftspjældet (5) af rørledningen (4) uafhængigt af den teoretiske samlede luftmængde af rørledningen (4),
- trin O: drive ventilatoren (2) til at opnå af den teoretiske samlede luftmængde af rørledningen (4) og det teoretiske driftstryk af ventilationsenheden (1),
- trin P: sammenligne det faktiske tryktab af luftspjældet (5) bestemt i trin E med det teoretiske tryktab af luftspjældet (5), når det faktiske tryktab af luftspjældet (5) er mindre end det teoretiske lufttab, identificeres en defekt på åbningen eller åbningerne (6, 6') af den testede rørledning (4) eller på rørledningen (4).

5. Diagnosefremgangsmåde ifølge krav 4, **kendetegnet ved, at** diagnosefremgangsmåden omfatter de følgende trin:

- trin Q: sende en anden fast værdi, som svarer til den samlede teoretiske luftmængde af rørledningen (4) ifølge trin M, hvortil der tilsættes et lækagetab bestemt i trin G eller K afhængigt af det bestemte teoretiske tryk (4) ifølge trin N,

- trin R: gentage trinnene N og Q for at opnå en ligevægt mellem det teoretiske tryk af rørledningen (4) og den samlede teoretiske luftmængde af rørledningen (4),

hvor trinnene Q og R fortrinsvis udføres successivt mellem trinnene N og O.

6. Diagnosefremgangsmåde ifølge et hvilket som helst af kravene 1 til 5, **kendetegnet ved, at** fremgangsmåden udføres for et rørledningsnet af ventilationsenheden (1), hvor hver rørledning (4) af nettet diagnosticeres indbyrdes uafhængigt.

7. Diagnosefremgangsmåde ifølge et hvilket som helst af kravene 1 til 6, **kendetegnet ved, at** fremgangsmåden omfatter en vurdering af fortrængningen af ventilationsenheden (1) ved kontrol af opnåelsen af en samlet luftmængde ved ventilationsenheden (1) i forhold til en forudbestemt teoretisk samlet luftmængde.

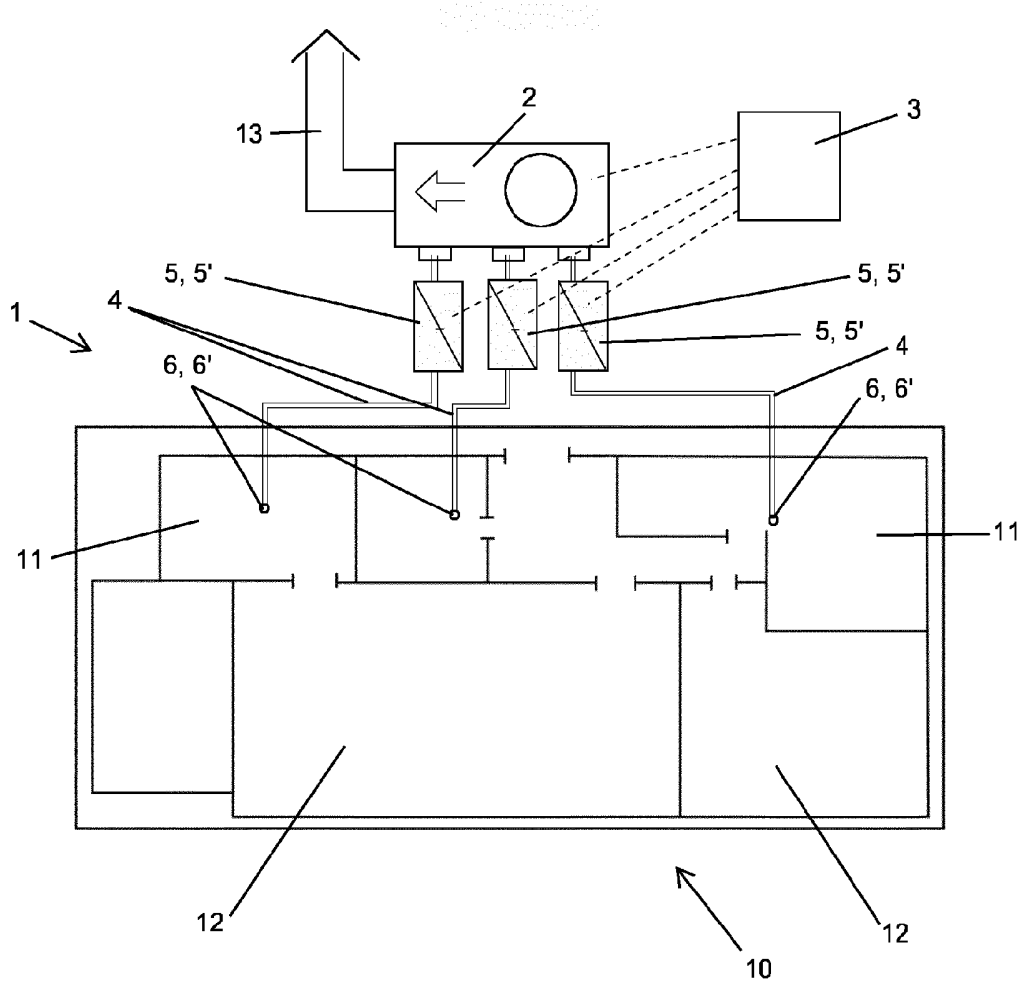

Figure 1

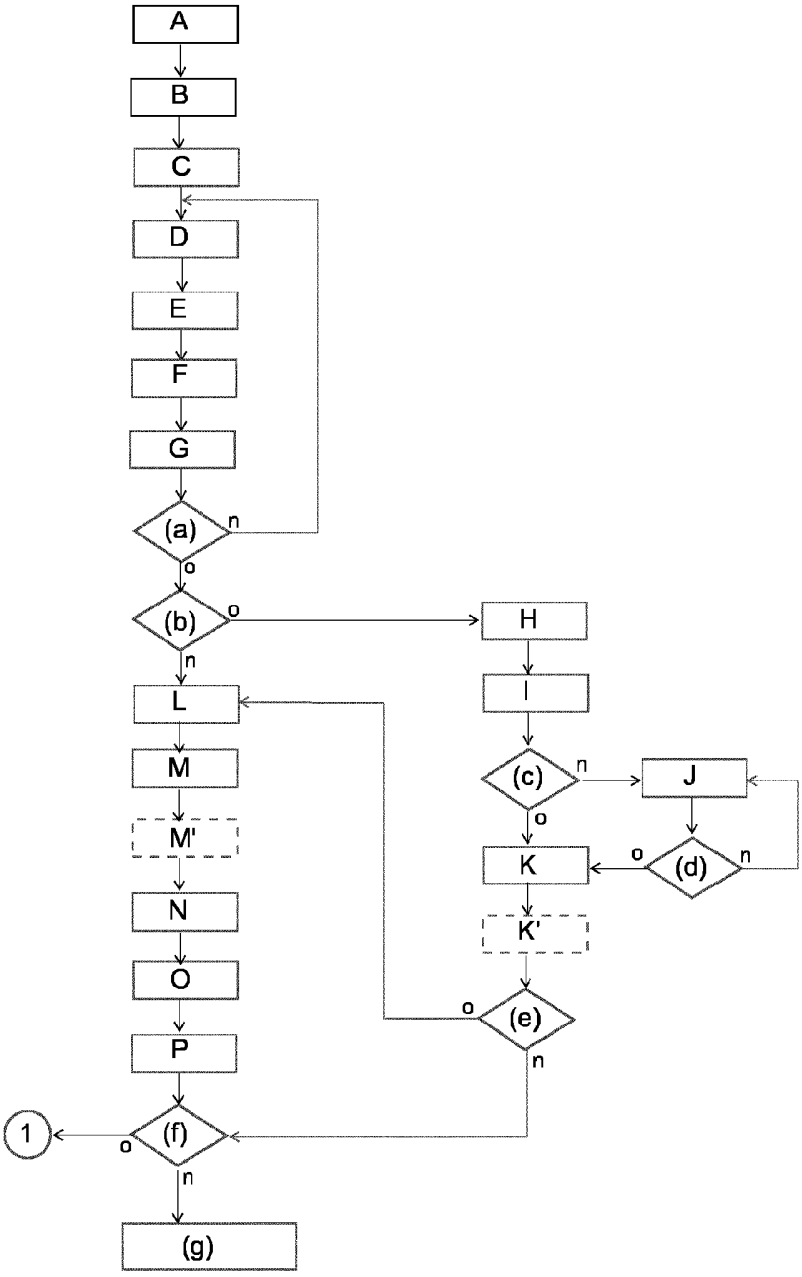

Figure 2

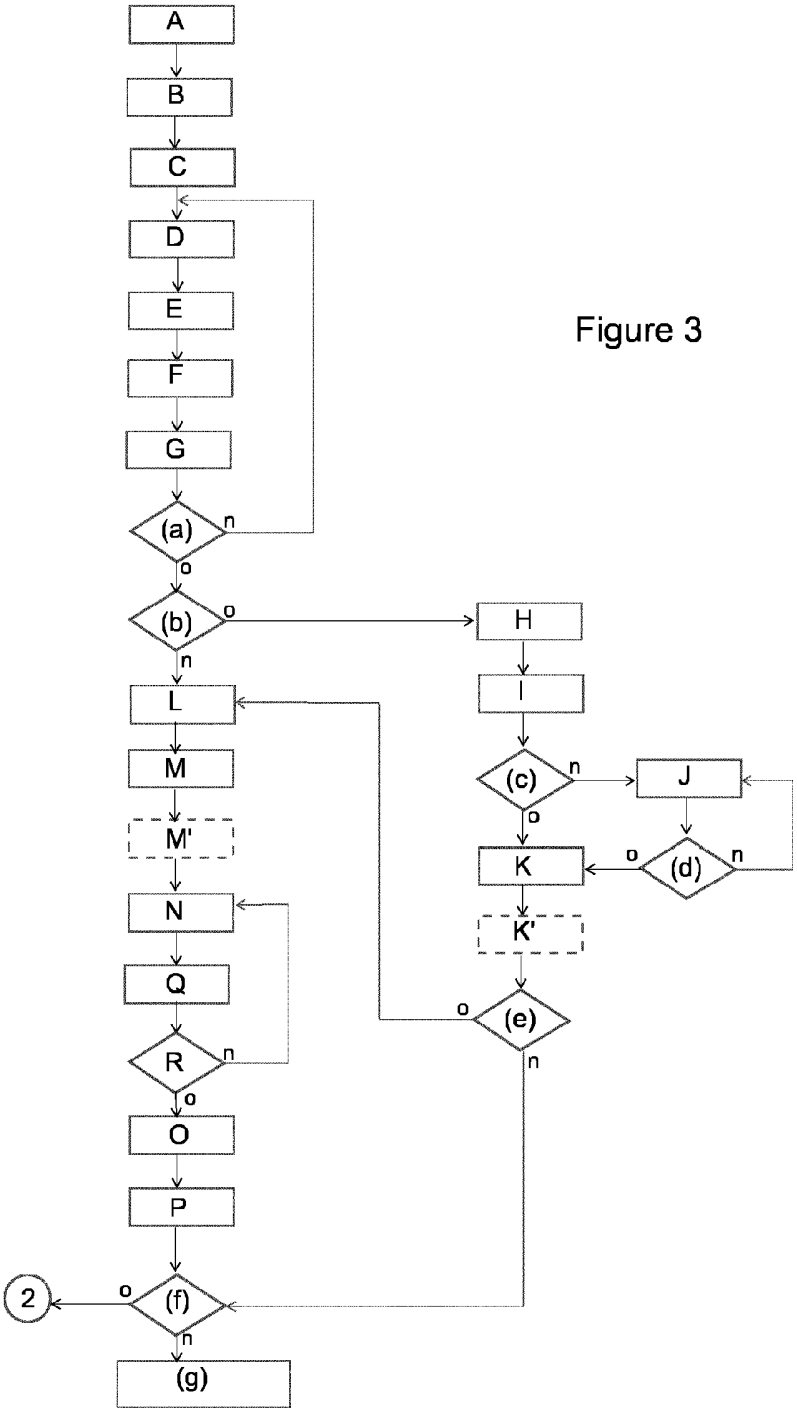

Figure 3

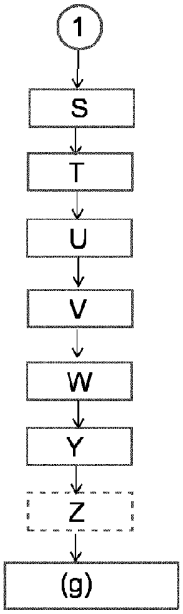

Figure 4

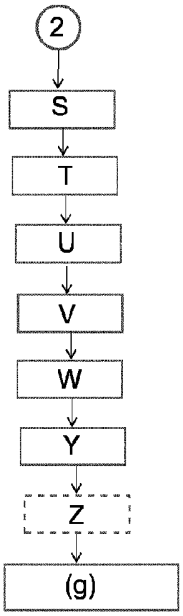

Figure 5