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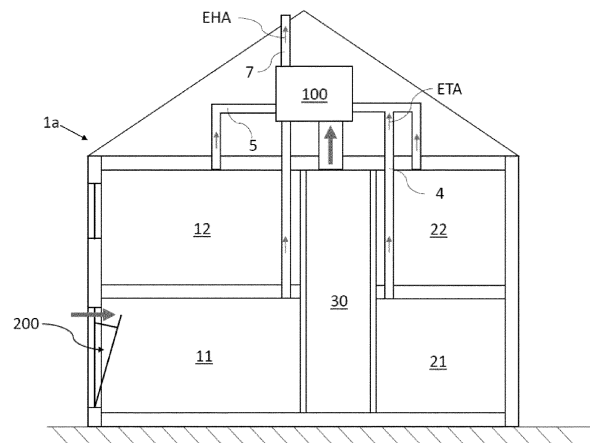
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HYGIENIC VENTILATION SYSTEM AND METHOD FOR CONTROLLING SUCH A VENTILATION SYSTEM

(57) The current invention involves a method for ventilative cooling of a building. In particular, the invention provides for a method for controlling a hygienic ventilation system comprising an exhaust flow passage that extends between a main exhaust connection and at least one auxiliary exhaust connection and exhaust flow control units to ensure an air exhaust flow from the at least one auxiliary exhaust connection and exhaust flow control units to ensure an air exhaust flow from the main exhaust connection via the exhaust flow passage to the main exhaust connection.

The method involves the steps of controlling the exhaust flow regulation elements based on one or more parameters related to the ventilation mode of the hygienic ventilation system so that when the hygienic ventilation system is in a hygienic ventilation mode, where exhaust air flows through each auxiliary exhaust connection with a zonal air exhaust flow rate of Q_{H_ETA} that corresponds to a zonal hygienic air exhaust flow rate Q_{H_HYG} related to the air quality in one or more rooms of the building associated with the respective auxiliary exhaust connection. Each zonal hygienic exhaust air flow lies in a respective pre-set hygienic ventilation range between a minimum set zonal ventilation flow rate and a maximum set zonal ventilation flow rate.

Fig. 1



Description

[0001] The current invention involves a method for controlling a hygienic balanced ventilation system for ventilative cooling of a building. The current invention also refers to a hygienic ventilation system and a hybrid ventilation system comprising this type of hygienic ventilation system as a central ventilation system.

[0002] The current invention also involves a computer-implemented method, a data processing device, a computer program that contains instructions to have a hygienic ventilation system perform the steps of the aforementioned method and a computer-readable storage medium containing the computer program.

State of the Art of Technology

[0003] Due to climate change, there are more and more periods of high temperatures, drought and much sun. This causes discomfort from overheating in residences. There is overheating of a residence if the interior temperature exceeds 25 degrees for a long period of time. This heat remains in the house for a long time and it is thus hard to keep the house cool. There is also an increasing need for cooling because houses are better insulated. No heat is lost in the winter, but no cold air can enter in the summer. Once a residence is warm, it is hard to bring the temperature down.

[0004] This is especially the case in apartments. There, the heat also comes from neighbouring apartments, so sun shades can help, but are not effective enough to keep the temperature under control, so a solution must be found to remove the heat from an apartment.

[0005] It is difficult to cool these residences. If district heating is in use, active cooling solutions (such as air-water heat pumps) are difficult to use. Solutions with air-conditioners (e.g. air-air heat pumps) then have acoustic and sustainable energy sources as a challenge.

[0006] A passive alternative is naturally cooling with air through actively opening shutters (or windows), but because sometimes there is no availability of two facades and/or there is no skylight, natural flows are often limited, so big shutters are required or a limited cooling capacity is realized.

[0007] One variant of natural cooling without using energy, is to mechanically evacuate the heat from the residence. As a result, natural solutions for cooling and hygienic mechanical ventilation systems are installed next to each other and there is no synergy between these systems in one residence, with the risk of suboptimal air quality, reduced comfort and often reduced energy performance.

[0008] This problem is very acute especially in apartments due to the specific energy provision, smaller dimensions and the collective character of energy exchange with the neighbouring apartments. But it is a general problem that applies for any type of residence, above all when there is no natural air current coming through

or cross ventilation or thermal air flow.

Objective of the invention

[0009] The current invention and the preferred designs of it have the objective of offering a solution for one or more of the aforementioned disadvantages. One objective of the invention can therefore be to create a ventilation system that is also suitable for ventilative cooling of the same residence.

[0010] Another objective of the invention can therefore be to create a method for controlling a hygienic ventilation system that is suitable for ventilative cooling of a residence.

[0011] In particular, it can be an objective of the invention to create a hygienic ventilation system for hygienic ventilation and ventilative cooling of the same residence during summer nights. Preferably with a limited influence on the acoustic load, the price and the performance or use of the ventilation system.

Description of the invention

[0012] This objective is achieved, according to the invention, with a method for ventilative cooling of a building that displays the technical characteristics of the first independent claims.

[0013] The current invention is a method for controlling a hygienic ventilation system. The term "hygienic ventilation system" refers to the whole of various components that ensure that the air in rooms of the building are refreshed in a controlled manner.

[0014] In particular, the invention provides for a method for controlling a hygienic ventilation system comprising an exhaust flow passage that extends between a main exhaust connection and at least one auxiliary exhaust connection and exhaust flow control units to ensure an air exhaust flow from the at least one auxiliary exhaust connection and exhaust flow control units to ensure an air exhaust flow from the main exhaust connection via the exhaust flow passage to the main exhaust connection. The term "connection" refers to an open end where an air passage may or may not be connected, such as an opening in the housing of the ventilation box or the end of an air passage. This type of hygienic ventilation system is described, for example, in NL 2014612 and NL 2022733, the content of which is included here for reference.

[0015] These and other conventional demand-based systems, such as known from the patent publications US 2012/064818 A1 and EP 4,036,486 A1, can only control the flow as a function of measured air quality, in particular the CO₂ value of the air.

[0016] In a first aspect of the invention, which may occur in combination with the other aspects and embodiments of the invention described herein, the invention comprises a method for the regulation of this type of hygienic ventilation system to cool a building through ven-

tilation. The method involves the steps of controlling the exhaust flow regulation elements based on one or more parameters related to the ventilation mode of the hygienic ventilation system so that when the hygienic ventilation system is in a hygienic ventilation mode, where exhaust air flows through each auxiliary exhaust connection with a zonal air exhaust flow rate of Q_{H_ETA} that corresponds to a zonal hygienic air exhaust flow rate Q_{H_HYG} related to the air quality in one or more rooms of the building associated with the respective auxiliary exhaust connection. Each zonal hygienic exhaust air flow lies in a respective pre-set hygienic ventilation range between a minimum set zonal ventilation flow rate and a maximum set zonal ventilation flow rate. These set ventilation flow rates are preferably determined based on the legal ventilation standards of the space to be ventilated.

[0017] This method also involves the steps of controlling the exhaust flow regulation elements based on one or more parameters related to the ventilation mode of the hygienic ventilation system so that when the hygienic ventilation system is in a summer night ventilation mode, for at least one of the auxiliary exhaust connections, the zonal air exhaust flow rate of Q_{H_ETA} corresponds to a zonal hygienic air exhaust flow rate Q_{H_HYG} and a zonal thermal flow rate. In this, the zonal exhaust air flow rate Q_{H_ETA} is higher than the maximum set zonal ventilation rate $Q_{H_SET_MAX}$. For example, a zonal thermal output of at least 5 m³/hour, or at least 10 m³/hour, of at least 15 m³/hour, of at least 20 m³/hour, of at least 25 m³/hour, of at least 30 m³/hour, of at least 35 m³/hour, of at least 40 m³/hour of at least 45 m³/hour or at least 50 m³/hour. In a preferred embodiment, the zonal thermal output is at least 100 m³/hour or at least 150 m³/hour.

[0018] In other words, the air exhaust rate Q_{ETA} that flows through the residence, is higher than in conventional demand-driven ventilation systems such that more flow is output than can be used to cool the building by ventilation. When using multiple auxiliary connections, the air exhaust flow Q_{ETA} are distributed over the multiple auxiliary connections and the air exhaust flow Q_{ETA} and the air output are consistent with the sum of the individual, zonal flows Q_{H_ETA} per auxiliary connection. At least one of these zonal flows is thus increased to effectively cool the building. To achieve this, the excess capacity of the ventilation system will be used, meaning the difference between the maximum set ventilation flow related to the applicable standard for ventilation of buildings and the ventilation capacity of the system.

[0019] The same effect of a hygienic balanced ventilation system goes against the current knowledge of hygienic ventilation. But by suctioning off an additional thermal flow on top of the hygienic flows, an extra input of fresh, cool air can be brought into the building. This type of extra flow can occur, for example, using opening elements in the residence.

[0020] In one embodiment, which may occur in combination with the other aspects and embodiments of the invention described here, there is an aforementioned

method, wherein when the hygienic ventilation system is in a hygienic ventilation mode, the air exhaust flow rate Q_{ETA} corresponds to a hygienic air exhaust flow rate Q_{HYG} related to the air quality in one or more rooms in the building. The air exhaust flow rate Q_{ETA} lies between a minimum set ventilation rate and a maximum set ventilation rate. This set ventilation flow rate is preferably determined based on the legal ventilation standards of the building to be ventilated.

[0021] With regard to the separate auxiliary connections, the air exhaust flow rate Q_{ETA} corresponds to the total exhaust rate that is removed by the ventilation systems from the residence and is thus consistent with the sum of the zonal air exhaust rates Q_{H_ETA} . They hygienic air exhaust rate Q_{HYG} corresponds to the sum of the zonal hygienic air exhaust rates Q_{H_HYG} . The minimum set ventilation rate Q_{SET_MIN} corresponds to the sum of the minimum set zonal ventilation rates. The maximum set ventilation rate Q_{SET_MAX} corresponds to the sum of the maximum set zonal ventilation rates.

[0022] This method also involves the steps of controlling the exhaust flow regulation elements based on one or more parameters related to the ventilation mode of the hygienic ventilation system so that when the hygienic ventilation system is in a summer night ventilation mode, the air exhaust flow rate of Q_{ETA} corresponds to the sum of the hygienic air exhaust rate Q_{HYG} and a thermal flow rate, wherein the air exhaust rate is higher than the set ventilation rate. For example, a thermal output of at least 5 m³/hour, or at least 10 m³/hour, of at least 15 m³/hour, of at least 20 m³/hour, of at least 25 m³/hour, of at least 30 m³/hour, of at least 35 m³/hour, of at least 40 m³/hour of at least 45 m³/hour or at least 50 m³/hour. In a preferred embodiment, the thermal output is at least 100 m³/hour or at least 150 m³/hour. With regard to the different auxiliary connections, the thermal flow rate corresponds to the sum of the zonal thermal flow rates.

[0023] In one embodiment, which may occur in combination with the other aspects and embodiments of the invention described here, there is an aforementioned method wherein an exhaust flow passage extends from the at least one auxiliary exhaust connection, further comprising the steps of determining the ventilation rate of the exhaust flow passage and controlling the exhaust flow regulation elements such that when the hygienic ventilation system is in summer night ventilation mode, the zonal air exhaust rate Q_{H_ETA} lies between the maximum set zonal ventilation rate $Q_{H_SET_MAX}$ and the ventilation capacity of the exhaust flow passage, preferably the zonal air exhaust rate Q_{H_ETA} corresponds to the ventilation capacity of the exhaust flow passage.

[0024] In a first embodiment, which may occur in combination with the other aspects and embodiments of the invention described here involves an aforementioned method, wherein the exhaust flow regulators are formed by an exhaust booster to create an air exhaust flow from the main exhaust connection via the exhaust air passage to at least one auxiliary exhaust connection. The method

also includes the step of ensuring the air exhaust flow by creating the air exhaust flow with the exhaust booster.

[0025] A second embodiment, which may occur in combination with the other aspects and embodiments of the invention described here involves an aforementioned method, wherein the exhaust flow regulators are formed by one or more exhaust regulator valves for controlling the air exhaust flow of a generated air flow that flows from the main exhaust connection via the exhaust air passage to at least one auxiliary exhaust connection. The method further includes the step of ensuring the air exhaust flow by adjusting the flow of the exhaust regulation valves.

[0026] In a second aspect of the invention, which may occur in combination with the other aspects and embodiments of the invention described here, the invention comprises a hygienic ventilation system configured to execute an aforementioned method, comprising an exhaust flow passage that extends between a main exhaust connection and at least one auxiliary exhaust connection and exhaust flow control units to ensure an air exhaust flow from the at least one auxiliary exhaust connection via the exhaust flow passage to the main exhaust connection.

[0027] In one embodiment, which may occur in combination with the other aspects and embodiments of the invention described here, the invention is an aforementioned hygienic ventilation system comprising a hygienic ventilation assembly consisting of a housing, a supply passage that extends between a main supply connection and at least one auxiliary supply connection and supply flow control means to ensure a supply airflow from the main supply connection via the supply flow passage to at main supply connection.

[0028] In a third aspect of the invention, which may arise in combination with the other aspects and designs of the invention described here, the invention contains a hybrid ventilation system comprising an aforementioned central hygienic ventilation system and a decentralized hygienic ventilation system for bringing outside air into the building. The decentralized air input system can passively allow air to flow in by using the influence of the pressure difference between the interior and exterior of the building to bring outside air into the building, or actively bring air in using mechanical ventilation. The decentralized air input system can be designed as a window, door, sliding door, grate or in particular a summer night ventilation shutter.

[0029] In a fourth aspect of the invention, which may occur in combination with the other aspects of the embodiments of the invention described here, the invention involves a computer-implemented method for the ventilation and ventilative cooling of a building, involving the steps of developing a control signal by a processor for controlling the exhaust flow regulators of an aforementioned hygienic ventilation system; provision by the processor of the control signal to the exhaust flow regulators and controlling the exhaust flow regulators in reaction to the control signal to adjust the exhaust rate to the zonal

air exhaust rate Q_{H_ETA} for at least one of the auxiliary exhaust connections consistent with the sum of the zonal hygienic air exhaust rate Q_{H_HYG} and a zonal thermal flow rate Q_{H_THERM} , wherein the zonal air exhaust rate Q_{H_ETA} is higher than the maximum set zonal ventilation rate $Q_{H_SET_MAX}$, preferably to adjust the exhaust rate to an air exhaust rate consistent with the sum of a hygienic air exhaust rate and a thermal flow rate, wherein the air exhaust rate is higher than a maximum, set ventilation rate.

[0030] In one embodiment, which may occur in combination with the other aspects of the embodiments of the invention described here, there is an aforementioned computer-implemented method, further involving the step of: developing a control signal by the processor for controlling a decentralized air supply system for the supply of outside air via an opening in an outside facade of the building; providing the control signal by the processor to the decentralized air supply system and controlling the exhaust rate regulators in reaction to the control signal to increase the decentralized supply rate of outside air.

[0031] In a fifth aspect of the invention, which may occur in combination with the other aspects and embodiments of the invention described herein, the invention involves a data processing device comprising a processor configured to execute the steps of the aforementioned method.

[0032] In a sixth aspect of the invention, which may occur in combination with the other aspects and embodiments of the invention described herein, the invention comprises a computer program that contains the instructions to have the aforementioned data processing device execute the steps of the aforementioned method.

[0033] In a seventh aspect of the invention, which may occur in combination with the other aspects and embodiments of the invention described herein, the invention has a computer-readable data storage unit containing the aforementioned computer program.

[0034] In a last aspect of the invention, which may occur in combination with the other aspects and embodiments of the invention described herein, the invention involves a building, such as a residence or apartment, with two or more rooms containing the aforementioned hygienic ventilation system or hybrid ventilation system.

Summary description of the figures

[0035] The invention will be explained in more detail using an embodiment shown in the figure.

Figure 1 shows a cross section of a simplified representation of a residence according to a first embodiment of the current invention;

Figure 2 shows a cross section of the ventilation system shown figure 1;

Figure 3 shows a cross section of a simplified representation of an apartment building according to one embodiment of the current invention, and

Figures 4 and 5A-5E show various flows of the hygienic ventilation system shown in figure 1 during various modes of operation.

Detailed description of the figures

[0036] The current invention will be described with regard to particular embodiments and with reference to certain figures, but the invention is not limited to these and is only determined by the claims. The figures described are only schematic and non-limiting. In the figures, the size of certain element is exaggerated and not drawn to scale for illustrative purposes. The dimensions and the relative dimensions are not necessarily consistent with actual practical designs of the invention.

[0037] Furthermore, the terms first, second, third and the like are used in the description and claims to differentiate between similar elements and not necessarily to describe a sequential or chronological sequence. The terms are interchangeable under fitting circumstances and the embodiments of the invention can be applied in sequences other than those described or illustrated here.

[0038] Moreover, the terms, top, bottom, over, under and the like are used in the description and claims are used for illustrative purposes and not necessarily to describe relative positions. The terms used are interchangeable under fitting circumstances and the embodiments of the invention described can be applied in other orientations than described or illustrated here.

[0039] Furthermore, the various embodiments, even though said "preferred designs" must be considered rather as a manner of example of how the invention can be designed than as a limitation of the range of the invention.

[0040] The term "encompassing", used in the claims, must not be interpreted as being limited to the resources or steps listed after it. The term does not exclude other elements or steps. The term should be interpreted as specifying for the presence of the listed features, elements, steps or components which are referenced, but does not exclude the presence or addition of one or more other features, elements, steps or components or groups thereof. The range of the expression "a design encompassing resources A and B" must thus not be limited to designs that consist only of A and B. The intention is that, with regard to the current invention, only the components A and B of the design are summarized, and the claim must be further interpreted as they also contain equivalents of these components.

[0041] Fig. 1 shows a building 1a in the form of a residence consisting of multiple rooms 11, 12, 21, 22 and traffic area 30, such as a passageway, hallway or landing that provides access to the rooms. The of the building shown in figure 1 has multiple living spaces in the form of rooms 11, 12, such as a living room or a bedroom, into which the supply air SUP can be pumped in via the auxiliary supply (not shown). The building 1a also has functional spaces in the form of rooms 21, 22, for example a toilet room, a bathroom or a kitchen, from which the ETA

exhaust air can be removed via the ancillary exhaust flow passages 4, 5. Each of these auxiliary passages 4, 5 are connected to an auxiliary connection 123-125 of a hygienic ventilation system 100. With one or more distribution pieces (not shown), multiple similar auxiliary passages can be connected to one auxiliary connection. The building also has a main exhaust flow passage 8 for removing the exhaust air EHA from a main exhaust connection 122 of the hygienic ventilation system 100.

[0042] The building 1a also has a decentralized air supply system in the form of a summer night vent 200 for supply of outside air into one of the living spaces. A summer night vent is a vent that thanks to the supply of large ventilation airflows, ensures efficient cooling of the building according to the summer night ventilation principle. Typically, a summer night vent 200 has an anti-burglary, rain resistant and/or insect-proof outside grate that can be opened without any negative consequences. In particular, the summer night vent 200 is designed to be opened through an external signal or for manual opening, to send a signal which can be received by the hygienic ventilation system 100 or another connected ventilation system. In reaction to receiving the signal, the hygienic ventilation system 100 can create a thermal flow Q_{THERM} by upping the flow Q_{ETA} of the exhaust return air ETA to increase the pressure difference over the summer night vent 200. Thus, the same cooling capacity can be achieved (with regard to natural ventilation) with more freedom in the location and dimensions of the summer night vent 200. For example, a summer night vent with a smaller surface and fewer summer night vents placed further apart will have the same air flow.

[0043] One embodiment of the hygienic ventilation system 100 is shown in figure 2. This hygienic ventilation system 100 has a housing shown by 101 with an air supply connection 122 to which the main supply passage 7 is to be connected. On the other end of the housing there are one or more, in the figure three, used ancillary exhaust connections 123-125 and optionally one or more, in the figure one, auxiliary cooling connection 160 with an auxiliary cooling valve 162 for connecting the auxiliary cooling connection 160. The exhaust plenum 120 extends between the auxiliary exhaust connections 123 and the exhaust air connection 122. The output of air takes place using the booster 121 that is placed in the exhaust plenum near the main exhaust connection 122.

[0044] In the basic design of the hygienic ventilation system 100, the air flows depending on the resistance out of the various passages without further options for adjustment toward the various rooms. In connection with offering the option for a desired distribution of the input air, hygienic flow regulator valves 126- 128 are placed in the auxiliary connections. Each flow regulator can be contained in a cassette that is inserted into a cassette chamber that is located at or behind the respective auxiliary supply connection. Each cassette can also have a measurement system that can contain a sensor, for example, for measuring the CO₂ value of the air, relative

humidity and the like. Based on the measurements of this sensor, not only the hygienic ventilation system but also the summer night vent can be controlled.

[0045] Fig. 3 shows a building 1b in the form of an apartment building consisting of multiple residential units with rooms 11-13, 21-26 and traffic areas (not shown) such as a passageway, hallway or landing that provides access to the rooms. Each of the residential units shown in figure 3 has residential spaces in the form of rooms, such as a living room or a bedroom, into which the supply air SUP can be pumped in via the auxiliary supply passages 2. Return air, ETA can also be removed through auxiliary exhaust flow passages 4 from the functional spaces 21-26 in the form of rooms, such as a toilet room, bathroom or kitchen. Each of these auxiliary passages 2, 4, 5 are connected to a hygienic ventilation system in the form of a hygienic ventilation assembly 300a-300c. With one or more distribution pieces (not shown), multiple similar auxiliary passages can be connected to one auxiliary connection. The building also contains a main inflow passage 6 for letting in outside air, ODA to a supply connection of a hygienic ventilation assembly 300a-300c and a main exhaust flow passage 7 to expel the exhaust air, EHA from a main exhaust connection of the hygienic ventilation assembly 300a-300c.

[0046] Each residential unit also has a decentralized air supply system in the form of a summer night vent 201-203 for supply of outside air into one of the spaces in the accommodation. In particular, the summer night vent 200 is designed to be opened through an external signal or for manual opening, to send a signal which can be received by the hygienic ventilation system or another connected control system. In reaction to the receipt of the signal, the hygienic ventilation system can create a thermal flow Q_{THERM} by increasing the exhaust Q_{ETA} to increase the pressure difference over the summer night vent 200 so that a smaller vent can be used to achieve the same flow rate.

[0047] In the basic design of the hygienic ventilation assembly 300a-300c, the collectively created air flows through a central control valve 311, 312, 313; 321 and depending on the resistance in the various auxiliary passages 2, 4, 5 without further options for adjustment toward the various rooms, and the air is suctioned out. In connection with offering the option for a desired distribution of the input air, hygienic flow regulators (not shown) are placed in the auxiliary connections or auxiliary passages in zones 322-323 or locally 324-325. Each control valve can be enclosed in a cassette. Each cassette can also have a measurement system that can contain a sensor, for example, for measuring the CO_2 value of the air, relative humidity, temperature and the like. Between the central, zonal or local control valve 311-313, 321-325 and a collective air passage 8, 9, there can be a constant volume regulator 310, 320 for limiting the maximum air flow through the auxiliary air passages. In addition, there can be a fire valve (not shown) between the constant volume regulator 310, 320 and the collective air passage

8, 9.

[0048] The function of the central hygienic ventilation system 100, 300a-300c is illustrated in figures 4 and 5A-5E. An internal or external control unit or processor 150 is set to control the exhaust booster 121 or the one or more exhaust regulation valves 320-325. The control of these elements is dependent on the ventilation mode of the hygienic ventilation system. As is clear in figure 4, which shows the time lapse of the air supply flow the air exhaust flow Q_{ETA} in a hygienic ventilation mode I (left) and a summer night ventilation mode II (right).

[0049] In the hygienic ventilation mode, the hygienic ventilation system functions like a conventional demand-driven ventilation system and the ventilation requirement is adjusted to the air quality between a minimum, set ventilation flow $Q_{SET, MIN}$ and a maximum, set ventilation flow $Q_{SET, MAX}$. The set ventilation flows Q_{SET} are determined based on the legal ventilation standards. The demand-driven ventilation flow Q_{HYG} can be controlled based on CO_2 , humidity, time (day and night as 2-zone system) and any movement. The exhaust flow rate Q_{ETA} will then fluctuate between $Q_{SET, MIN}$ and $Q_{SET, MAX}$ based on the air quality.

[0050] When transitioning to the summer night ventilation mode, the hygienic ventilation system will remove more air than it supplies and thus runs imbalanced to be able to realize the desired supply flows with the summer night vent 200-203. In the figure 4, the air exhaust flow Q_{ETA} will be maximized to a level above the set ventilation range $Q_{SET, MAX}$ and thus use the excess capacity of the hygienic ventilation system to cool the building by ventilation. Thus, the air exhaust flow rate Q_{ETA} will be consistent with the sum of the air supply flow Q_{HYG} and the additional thermal flow Q_{THERM} .

[0051] An alternative function of the central hygienic ventilation system 100 shown in figure 2 is illustrated in figures 5A-5E. Here the exhaust rate is only maximized by zone to a level above the maximum set ventilation rate $Q_{H, SET, MAX}$. As illustrated in fig. 5E, the air exhaust flow Q_{ETA} can be maximized to a level above the set ventilation rate $Q_{SET, MAX}$ but this is not necessary. Figures 5A-5C show the zonal air exhaust rate $Q_{H, ETA, 123} - Q_{H, ETA, 125}$ related to the auxiliary exhaust connections. In the operation illustrated, these zonal air exhaust rates are also consistent with the zonal hygienic, demand-driven ventilation rates $Q_{H, HYG}$ even in the summer night ventilation mode II. The zonal air exhaust rate $Q_{H, ETA, 160}$ related to the auxiliary cooling connection 160 is shown in figure 5D. In the hygienic ventilation mode I, the auxiliary cooling connection 160 remains connected and therefore the zonal air exhaust rate $Q_{H, ETA, 160}$ is equal to zero. No account is taken of some leak rates for the calculation of the air exhaust rates. If ventilative cooling is needed, the auxiliary cooling connection 160 is opened and the zonal air exhaust rate $Q_{H, ETA, 160}$ is maximized to a level above the set ventilation rate $Q_{H, SET, MAX}$, preferably to the ventilation capacity of the auxiliary cooling connection 160 or an auxiliary cooling

passage connected to it.

[0052] In an alternative function, when no auxiliary cooling connection 160 is present, then one or more of the zonal air exhaust rate $Q_{H_ETA_123}$ - $Q_{H_ETA_125}$ related to the auxiliary exhaust connections can be maximized to a level above the maximum set zonal ventilation flow rate $Q_{H_SET_MAX}$, preferably to the ventilation capacity of the auxiliary connection or the auxiliary cooling passage connected to it.

List with reference numbers

[0053]

1a, 1b.	Building	15
2, 3.	Auxiliary supply passage	
4, 5.	Auxiliary exhaust flow passage	
6.	Main supply passage	
7.	Main exhaust flow passage	
8.	Collective supply passage	20
9.	Collective exhaust flow passage	
11-13.	Living areas	
21-26.	Functional areas	
100.	Hygienic ventilation system	25
101.	Housing	
110.	Supply flow passage	
111.	Supply booster	
112.	Main supply connection	
113-114.	Auxiliary supply connection	30
120.	Exhaust flow passage	
121.	Exhaust booster	
122.	Main exhaust connection	
123-125.	Auxiliary exhaust connection	
126-128.	Hygienic control valve	35
150.	Processor	
160.	Auxiliary cooling connection	
162.	Auxiliary cooling valve	40
200-203.	Summer night vent	
300a-300c.	Hygienic ventilation assembly	
310.	Constant supply volume regulator	
311-313.	Supply control valve	45
320.	Constant exhaust volume regulator	
321-325.	Exhaust control valve	
400.	Collective supply ventilator	
500.	Collective exhaust ventilator	50
ETA.	Exhaust air from the residence to the ventilation system	
EHA.	Exhaust air from the ventilation system to the outside	
ODA.	Supply air from the outside to the ventilation system	55
SUP.	Supply from the ventilation system to the residence	

Claims

- Method for controlling a hygienic ventilation system for ventilation and ventilative cooling of a building, said hygienic ventilation system, comprising an exhaust flow passage that extends between a main exhaust connection and at least one auxiliary exhaust connection and exhaust flow regulators to ensure an air exhaust flow via the exhaust flow passage to the main exhaust connection, the method comprising the step of controlling the exhaust flow regulators on the basis of one or more parameters related to the ventilation mode of the hygienic ventilation system, such that:
 - when the hygienic ventilation system is in a hygienic ventilation mode, there is exhaust air flowing through each auxiliary exhaust connection at the air exhaust rate Q_{H_ETA} that corresponds to a hygienic air exhaust flow rate Q_{H_HYG} related to the air quality in one or more rooms of the building connected to the respective auxiliary exhaust connection, wherein each zonal hygienic exhaust air flow rate Q_{H_HYG} lies in a respective pre-set hygienic ventilation range between a minimum set zonal ventilation flow rate Q_{SET_MIN} and a maximum set zonal ventilation flow rate $Q_{H_SET_MAX}$, and
 - when the hygienic ventilation system is in a summer night ventilation mode, for at least one of the auxiliary exhaust connections the air exhaust flow rate Q_{H_ETA} corresponds to the sum of the hygienic air exhaust flow rate Q_{H_HYG} and a thermal flow rate Q_{H_THERM} , wherein the zonal exhaust air flow rate Q_{H_ETA} is higher than the maximum set zonal ventilation rate $Q_{H_SET_MAX}$.
- Method according to claim 1, involving of controlling the exhaust flow regulators based on the basis of one or more parameters related to the ventilation mode of the hygienic ventilation system, such that:
 - when the hygienic ventilation system is in a hygienic ventilation mode, the air supply Q_{ETA} corresponds to a hygienic air exhaust flow rate Q_{HYG} related to the air quality in one or more rooms of the building, wherein the hygienic exhaust air flow rate Q_{HYG} lies in a respective pre-set hygienic ventilation range between a minimum set ventilation flow rate Q_{SET_MIN} and a maximum set ventilation flow rate Q_{SET_MAX} ,
 - when the hygienic ventilation system is in a summer night ventilation mode, the air exhaust flow rate Q_{ETA} corresponds to the sum of the hygienic air exhaust flow rate Q_{HYG} and a thermal flow rate Q_{THERM} .

wherein the exhaust air flow rate Q_{ETA} is higher than the maximum set ventilation rate $Q_{SET, MAX}$.

3. Method according to claim 1, the hygienic ventilation system comprising an exhaust flow passage that extends from one of the auxiliary exhaust connections, and the method further comprises the steps of:

- determining of the ventilation capacity of the exhaust flow passage and,
- controlling the exhaust flow regulators such that, when the hygienic ventilation system is in summer night ventilation mode, the zonal air exhaust flow Q_{H_ETA} lies between the maximum set zonal ventilation rate $Q_{H_SET, MAX}$ and the ventilation capacity of the exhaust flow passage.

4. Method according to claim 3, the method further comprising the steps of controlling the exhaust flow regulators such that when the hygienic ventilation system is in summer night ventilation mode, the zonal air exhaust rate Q_{H_ETA} corresponds to the ventilation capacity of the exhaust flow passage.

5. Method according to one of the preceding claims, wherein the exhaust flow regulators are formed by an exhaust booster for creating an air exhaust flow from the main supply connection via the exhaust flow passage to the at least one auxiliary exhaust connection, the method comprising the step of ensuring the air exhaust flow by creating the air exhaust flow with the exhaust booster.

6. Method according to one of the preceding claims, wherein the exhaust flow regulators are formed by one or more exhaust control valves for creating an air exhaust flow from the main exhaust connection via the exhaust flow passage to the at least one auxiliary exhaust connection, the method further comprising the step of ensuring the air exhaust flow by adjusting the flow of the exhaust regulation valves.

7. Hygienic ventilation system for ventilation and ventilative cooling of a building, configured to execute a method according to one of the preceding claims, the named hygienic ventilation system comprising an exhaust flow passage that extends between a main exhaust connection and at least one auxiliary exhaust connection and exhaust flow regulators to ensure an air exhaust flow from the at least one auxiliary exhaust connection via the exhaust flow passage to the main exhaust connection.

8. Hygienic ventilation system comprising a hygienic ventilation system for ventilating and cooling of a

building configured to execute a method according to one of the preceding claims, the named hygienic ventilation system comprising a housing containing an exhaust flow passage that extends between a main exhaust connection and at least one auxiliary exhaust connection and exhaust flow regulators to ensure an air exhaust flow from the at least one auxiliary exhaust connection via the exhaust flow passage to the main exhaust connection.

9. Hybrid ventilation for ventilation and ventilative cooling of a building, comprising:

- a central hygienic ventilation system according to one of the previous claims 7-8; and
- a decentralized air supply system for the supply of outside air via an opening in an outside facade of the building.

10. Building containing a hybrid ventilation system according to one of the preceding claims 9.

11. Computer-implemented method for ventilation and ventilative cooling of a building, comprising the steps of:

- developing, by a processor, a control signal for controlling the exhaust flow control elements of a hygienic ventilation system according to one of the preceding claims 7-8;
- providing by the processor a control signal to the exhaust flow control elements; and
- controlling the exhaust flow regulator in reaction to the control signal to adjust the exhaust rate to the zonal air exhaust rate Q_{H_ETA} for at least one of the auxiliary connections consistent with the sum of the zonal hygienic exhaust rate Q_{H_HYG} and a zonal thermal rate Q_{H_THERM} , wherein the zonal air exhaust rate Q_{H_ETA} is higher than the maximum set ventilation rate $Q_{H_SET, MAX}$.

12. Computer-implemented process according to claim 11, wherein controlling the exhaust flow regulators, in reaction to the control signal to control the exhaust flow regulators in reaction to the control signal adjust the exhaust rate to an air exhaust rate Q_{ETA} that corresponds to the sum of a hygienic air exhaust rate Q and a thermal flow rate Q_{THERM} , wherein the air exhaust rate Q_{ETA} is higher than a maximum set ventilation rate $Q_{SET, MAX}$.

13. Computer-implemented method according to claim 12, further involving the step of:

- developing by the processor of a control signal for controlling a decentralized air supply system for supply of outside air via an opening in an

exterior facade of the building;

- providing by the processor of a control signal to the decentralized air supply installation; and
- controlling the exhaust flow regulators in reaction to the control signal to increase the decentralized supply rate of outside air.

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- 14.** Data processing device comprising a processor configured to execute the steps of the method according one in the preceding claims 11-13.

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- 15.** Assembly comprising a hygienic ventilation system according to one of the preceding claims 7-8 and a data processing device according to claim 14.

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- 16.** A computer program that contains instructions to trigger the data processing device according to claim 15 execute the steps of the method according to one of the preceding claims 11-13.

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- 17.** A computer-readable storage medium containing the computer program according to claim 16.

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Fig. 1

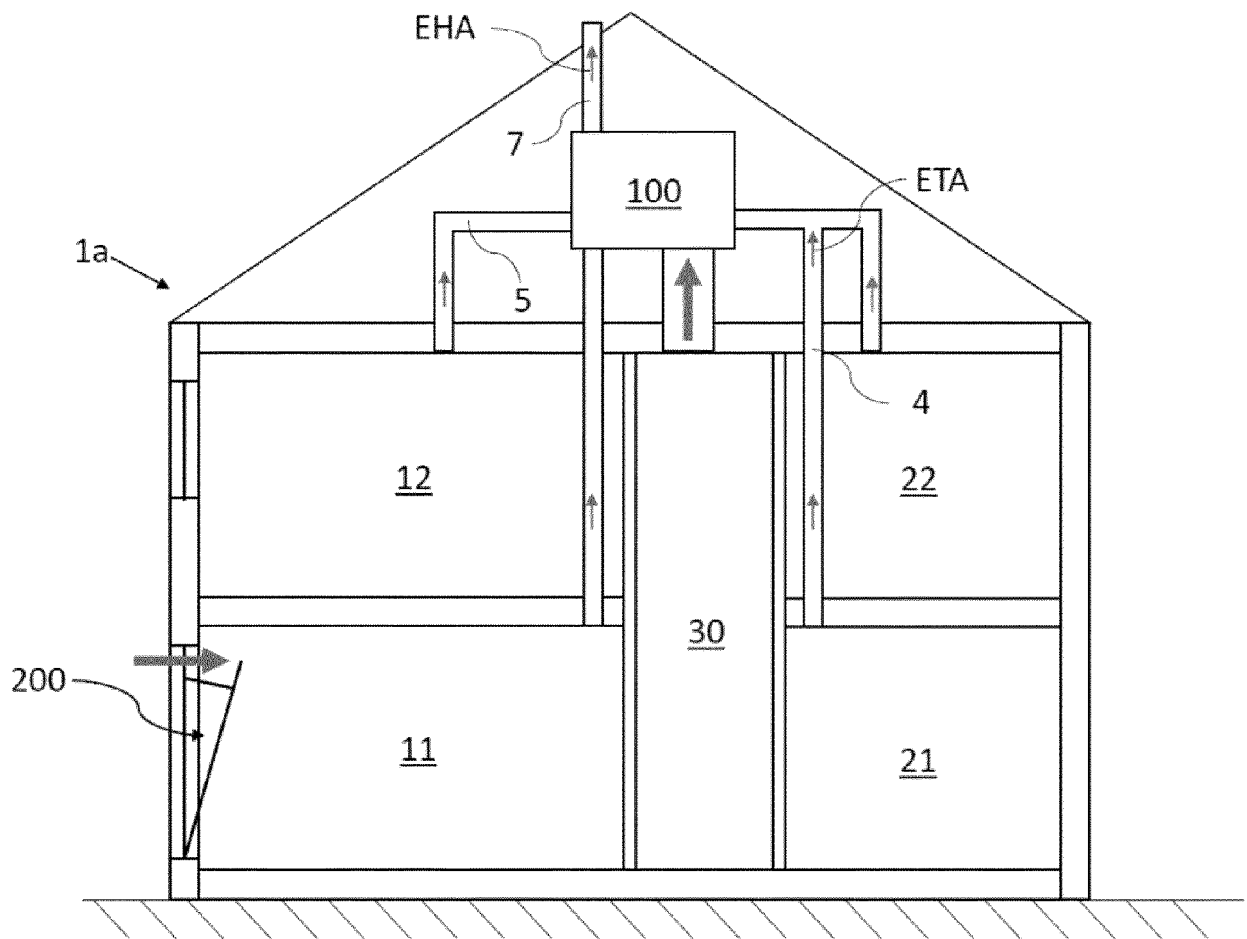


Fig. 2

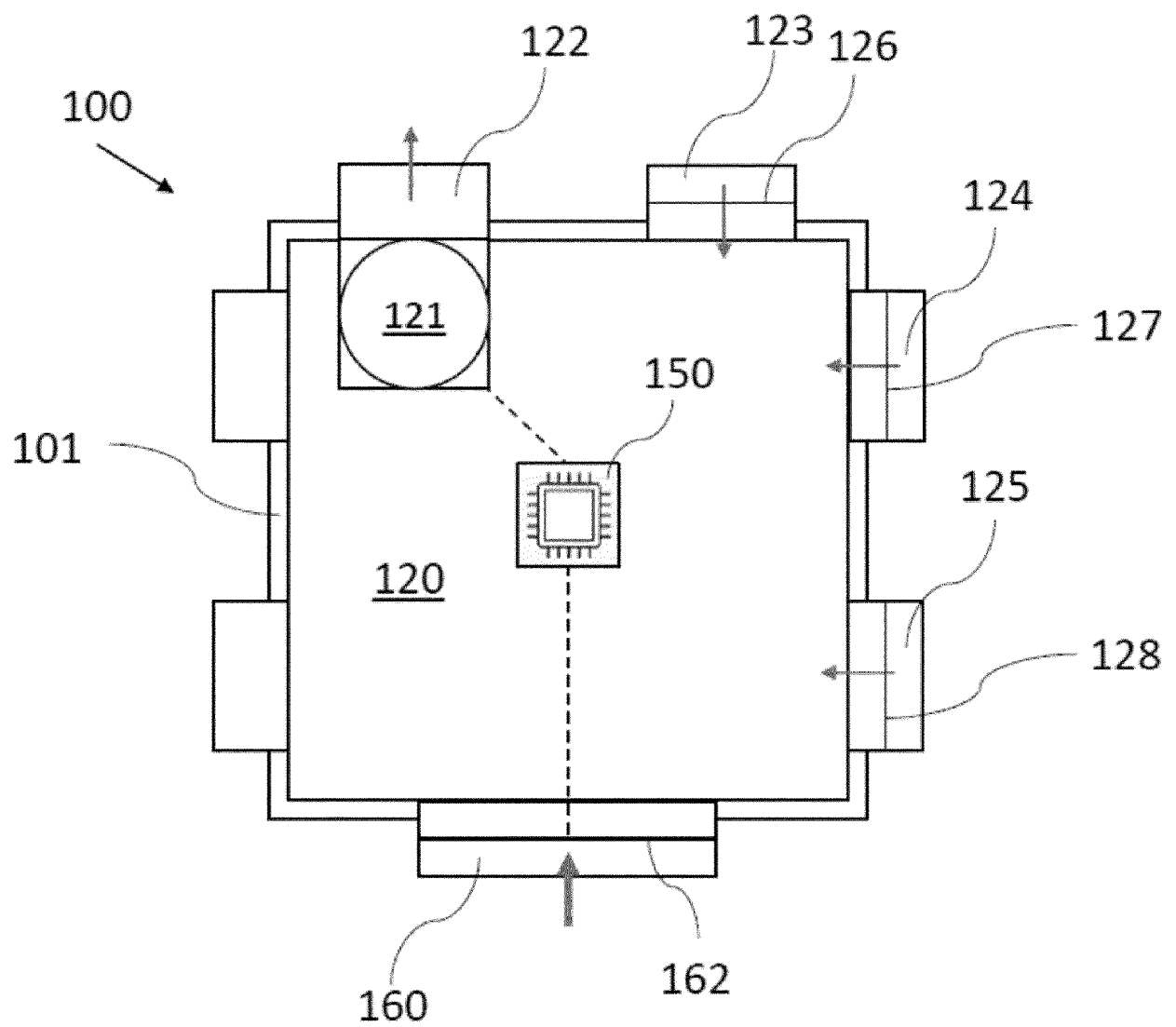


Fig. 3

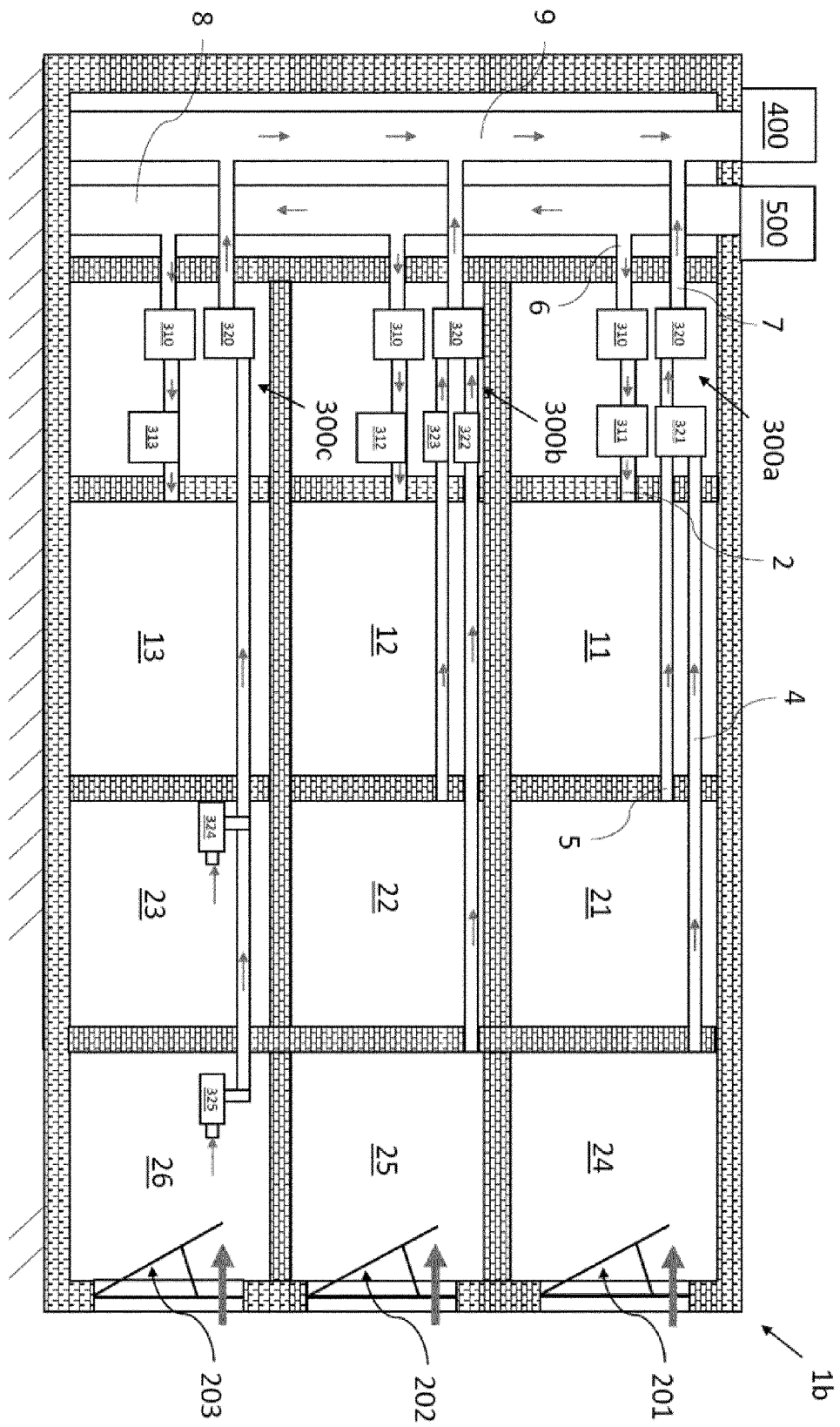


Fig. 4

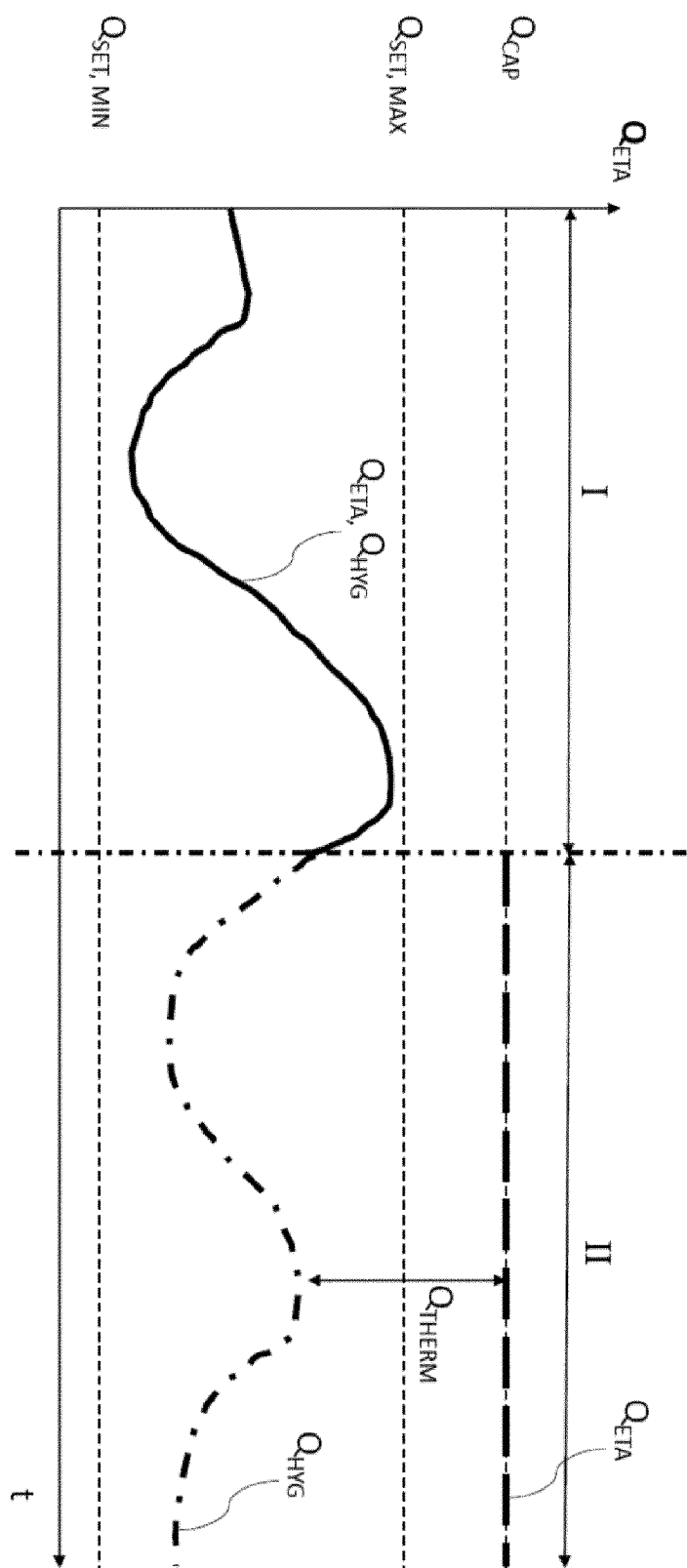


Fig. 5A

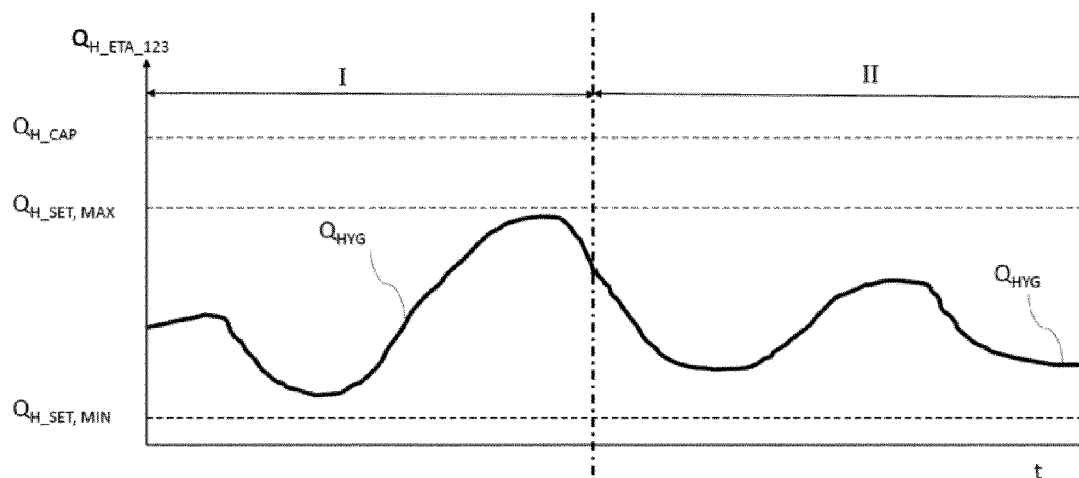


Fig. 5B

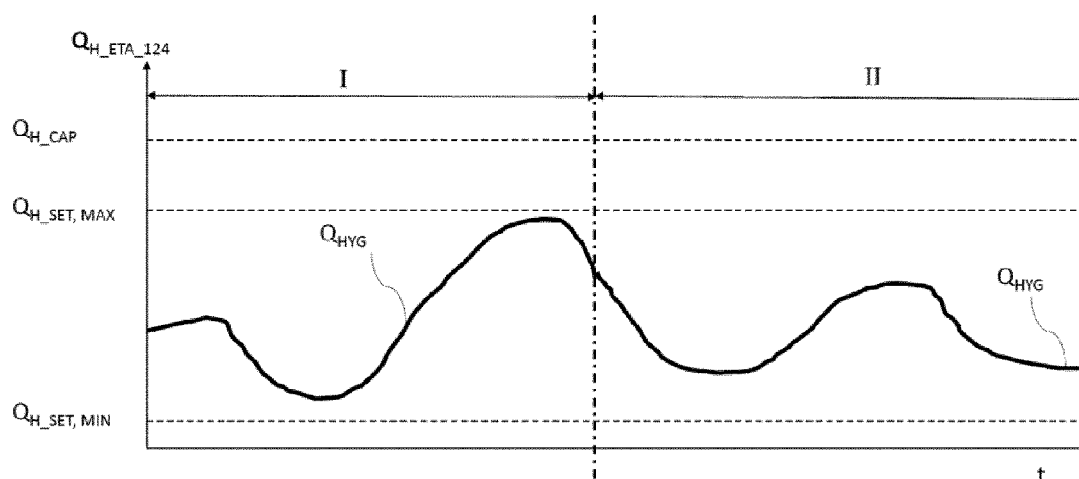


Fig. 5C

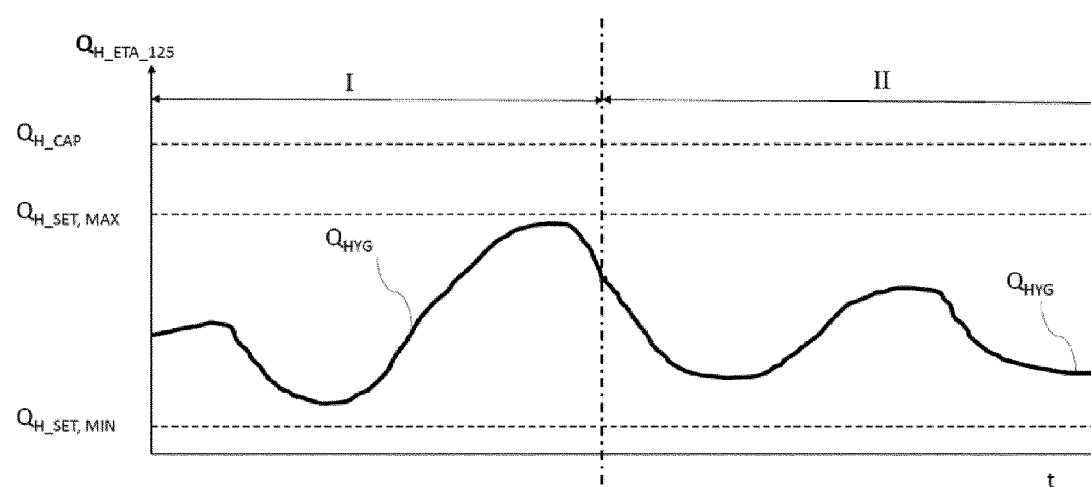


Fig. 5D

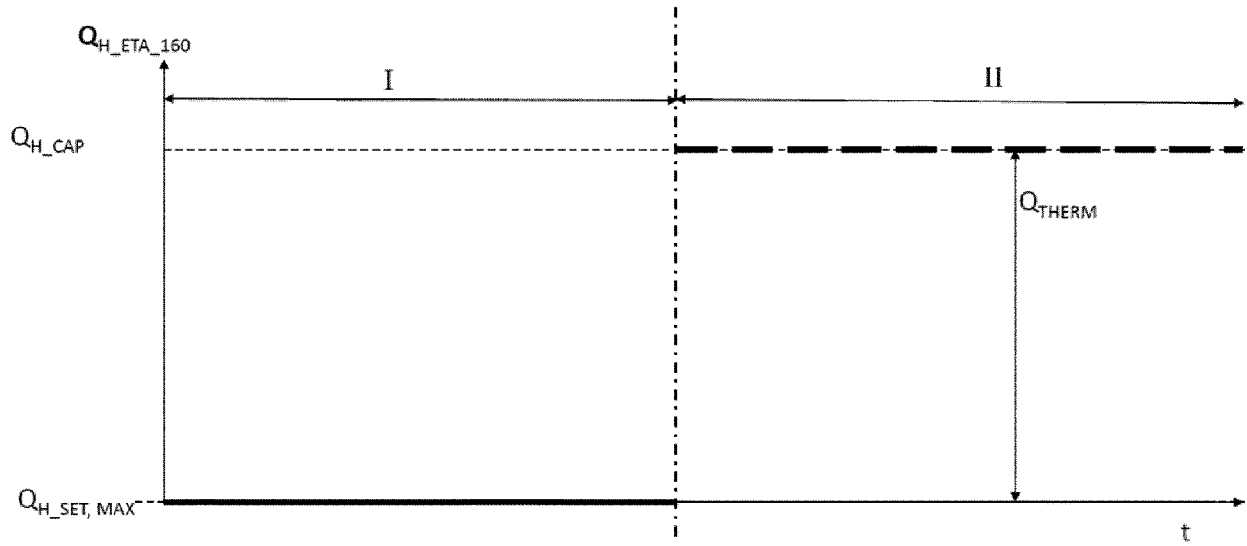
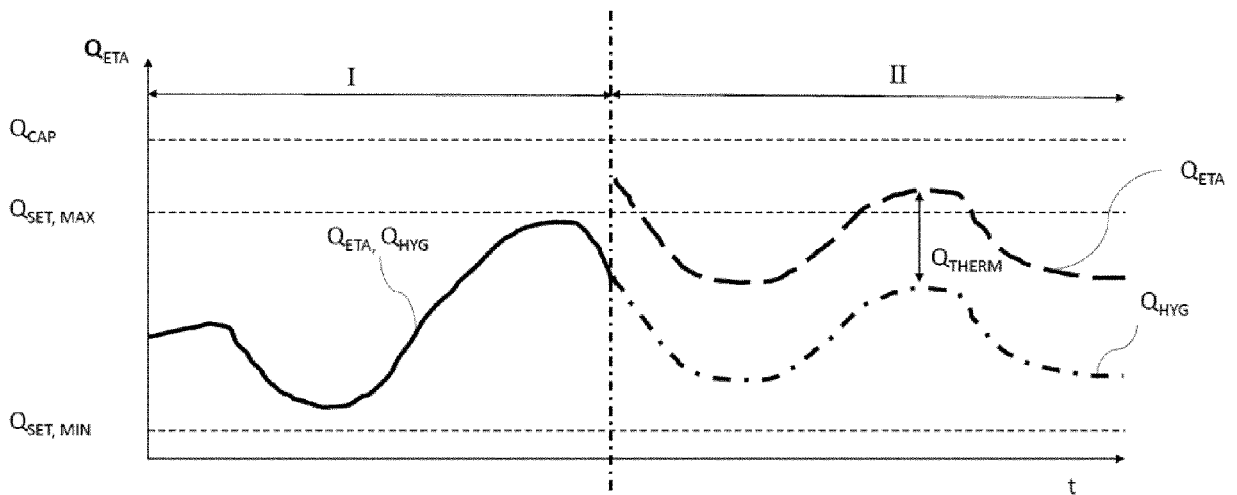


Fig. 5E





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Application Number

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X	EP 4 036 486 A1 (DAIKIN IND LTD [JP]; DAIKIN EUROPE NV [BE]) 3 August 2022 (2022-08-03) * paragraph [0013] - paragraph [0036] * * paragraph [0054] - paragraph [0069] * * abstract; figures *	1	
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Place of search Munich		Date of completion of the search 18 February 2024	Examiner Mattias Grenbäck
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