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(54) **VENTILATION UNIT WITH CASING**

(57) Ventilation unit configured to be built into a wall of a building, the ventilation unit comprising one or more functional modules and a casing, which casing has a first side which is at least partially open such that the one or more functional modules can be installed in and dismantled from the casing via the first side, which casing has a second side which is configured to lie substantially parallel to the wall, wherein the first side lies substantially at right angles to the second side and is configured to lie substantially parallel to a reveal of an opening in the wall, wherein the first side comprises a cover for covering the opening substantially in line with the reveal.

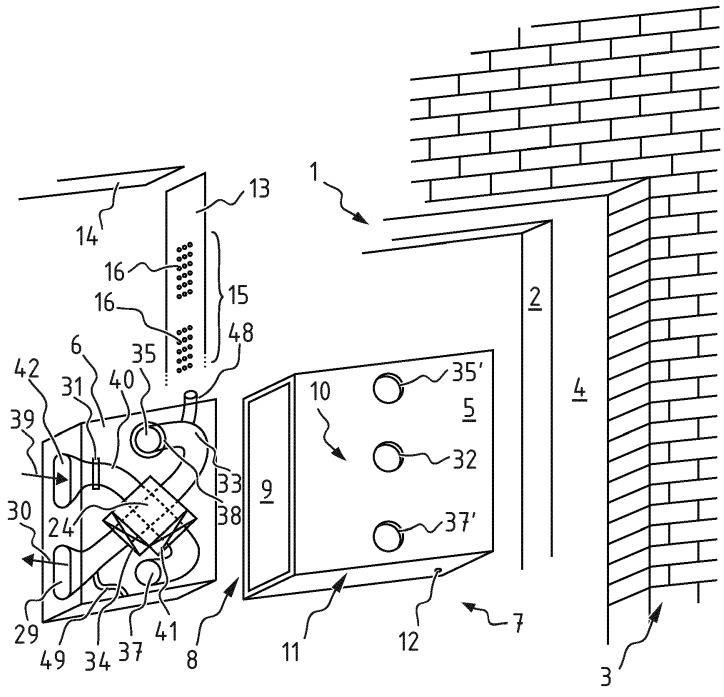

FIG. 1

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Description

[0001] The invention relates to a ventilation unit. The invention further relates to a building with a ventilation unit. The invention further relates to a method for building in a ventilation unit. The method for building in here enables functional modules to be installed and/or dismantled. The invention further relates to an assembly of a screen device and a ventilation unit.

[0002] Home ventilation is becoming increasingly important. In the past, homes were ventilated mainly passively. Ventilation openings were typically provided for this purpose near windows in order to allow fresh air to flow into a space. The ventilation opening can here comprise a flap which can be operated manually or automatically in order to influence the amount of air which can flow through the ventilation channel. Self-regulating flaps thus exist which, depending on the difference between the air pressure outside and the air pressure inside, for instance as a result of wind, open to greater or lesser extent. A known drawback of such ventilation openings is that heat is not recuperated.

[0003] Other ventilation systems have been devised, such as a balanced ventilation system, wherein the ventilation is actively controlled by allowing controlled inflow and outflow of air, wherein the inflow and outflow are held in balance by the balanced ventilation system. Such a balanced ventilation system typically comprises heat exchangers which allow heat exchange between the incoming air and the outgoing air so as to thus ventilate in energy-efficient manner. A drawback of such a system is that a modified pipe network must be provided throughout the whole building in order to ventilate each space correctly. This is time-consuming and expensive, and often impossible for practical reasons in the case of renovation.

[0004] EP1488175 describes a local ventilation unit. With this ventilation unit the airflow can be controlled, heat can be recuperated and it is no longer necessary to provide a modified pipe network throughout the whole building. A drawback is that this ventilation unit is provided as surface-mounted unit and will therefore always be visible in a space. This is often undesirable for aesthetic reasons.

[0005] EP17171461 describes a local ventilation unit which can be built into a cavity. Three openings provide access to filters situated in the ventilation unit. The ventilation unit is provided under a window sill. With this ventilation unit the airflow can be controlled, heat can be recuperated and it is no longer necessary to provide a modified pipe network throughout the whole building. A further advantage is that this ventilation unit is fully concealed in the wall and will therefore not cause any aesthetic disruption in the space. A drawback of this construction is related to maintenance and repairs. It is time-consuming to dismantle the ventilation unit from the cavity.

[0006] It is an object of the invention to provide a local ventilation unit which can be concealed and on which maintenance and repairs can be performed more easily.

[0007] The invention provides for this purpose a method for building a ventilation unit into a wall of a building, wherein the method comprises of:

- determining a zone of the wall adjacently of a functional opening such as a window or door opening;
- mounting a casing of the ventilation unit in the determined zone, with an at least partially open first side of the casing substantially parallel to a reveal of the functional opening and with a second side of the casing substantially parallel to the wall;

wherein the method comprises at least one of the following steps of:

- installing one or more functional modules in the casing via the first side; and
- dismantling one or more functional modules from the casing via the first side.

[0008] The invention also provides a ventilation unit configured to be built into a wall of a building, the ventilation unit comprising one or more functional modules and a casing, which casing has a first side which is at least partially open such that the one or more functional modules can be installed in and dismantled from the casing via the first side, which casing has a second side which is configured to lie substantially parallel to the wall, wherein the casing has a maximum outer dimension, measured transversely of the second side, of a maximum of 300 mm, preferably a maximum of 250 mm, more preferably 210 mm, so as to be placeable between an inner shell and an outer shell of the wall, and wherein the casing has mounting means for connection to the building at a predetermined position in the wall, wherein the first side lies substantially at right angles to the second side and is configured to lie substantially parallel to a reveal of an opening in the wall, wherein the first side comprises a cover for covering the opening substantially in line with the reveal.

[0009] The ventilation unit according to the invention provides functional modules which are removable from a casing, in other words, functional modules can be installed in the casing and dismantled from the casing. This allows the casing to be mounted substantially fixedly in a wall. For this purpose the casing has limited outer dimensions. The method according to the invention enables fixed mounting of a casing in the wall with a first side substantially parallel to and preferably facing toward the reveal and enables functional modules to be installed and dismantled via the first side of the casing.

[0010] The functional modules which ensure the operation of the ventilation unit can be installed in and dismantled from the casing. This greatly increases flexibility for maintenance and repairs. The casing is here configured specifically to be provided in a zone of the wall adjacently of a functional opening such as a window or door

opening of a building. A functional opening is for instance a window opening or a door opening or a gate opening. In modern buildings the thickness of the cavity, this being the distance between the outer shell or outer wall and the inner shell or inner wall of a building, is made significantly greater than 10 or 20 years ago. The cavity is provided with an insulating layer and delays the heat transfer from inside to outside and vice versa. Using the cavity for building in technical elements so they can be dismantled and thereby concealing them from view is already applied for awnings and roller blinds. In order to build in a ventilation unit in reliable and durable manner the present invention provides a casing which has an open side facing toward the reveal of the opening in the wall. The casing is provided with mounting means for connection to the building at a predetermined position in the wall. A cover is further preferably provided which lies in line with the reveal so as to provide a visual finish for the reveal. When the cover is removed, the functional modules can be installed and dismantled without further openings having to be provided in the wall.

[0011] The invention comprises of determining a zone of the wall adjacently of a functional opening such as a window or door opening. The zone is preferably determined adjacently of the functional opening to the left or the right. In other words, the zone is chosen with a height range lying wholly within the height range of the functional opening. This has the result that the first side opens toward an upright part of the reveal. Functional modules can hereby be installed and dismantled by a substantially horizontal movement into and/or out of the casing.

[0012] The method according to the invention preferably further comprises the step, in between determining the zone and mounting the casing, of positioning the whole casing between an outer shell and an inner shell of the wall. By positioning the whole casing between the outer shell and inner shell of the wall the casing is fully concealed from view. The first side opens toward a reveal of an opening in the wall. It is hereby not necessary to provide openings in the outer wall or openings in the inner wall for installation/dismantling of functional modules. If the reveal opening lies on the outer side of the building, only an air channel to the inner wall is provided, which is visually minimal. If the reveal opening lies on the inner side of the building, only an air channel to the outer wall is provided, which is visually minimal.

[0013] In the preferred embodiment wherein the reveal opening is situated on the outer side of the building the method preferably further comprises of providing at least one air passage channel through the inner shell of the wall between the casing and the interior space of the building. One air passage channel suffices if it is successively used to draw air from the space and blow air into the space. One air passage channel also suffices if the channel has segments, for instance by providing concentric pipes or making another subdivision, whereby the one air passage channel can be used for both incoming and outgoing air. It is also possible to provide two air passage channels, one for feeding air into the space and one for discharging air from the space.

[0014] The mounting means are preferably provided on the first side. By providing the mounting means on the first side the casing can be fixedly mounted by manipulation close to the reveal. It is hereby not necessary to perform manipulations deep inside the wall or between the inner wall and outer wall in order to fixedly mount the casing. This simplifies placing of the casing in the wall.

[0015] The one or more functional modules preferably comprise at least:

- a first channel for allowing air to flow inside from outside the building;
- a second channel for allowing air to flow outside from inside the building; and
- a heat exchanger configured to allow the first channel and the second channel to cross.

[0016] The one or more functional modules more preferably further comprise a first air pump in the first channel and/or a second air pump in the second channel. Air ventilation in the space can be achieved via the channels and heat can be exchanged between inflowing fresh air and outflowing contaminated air via the heat exchanger. This enables energy recuperation in order to make the ventilation unit energy-efficient. Such a ventilation unit is therefore also referred to as balanced ventilation unit. Such a ventilation unit can be given a continuous or intermittent form with a heat exchanger which exchanges heat directly between two airflows or which exchanges heat indirectly by absorbing heat from a first flow and relinquishing it to a second flow. In an intermittent system one air pump can be used to intermittently realize an airflow in the one and in the other direction. The amount of inflowing air and the amount of discharged air can be controlled via the air pumps. By controlling these amounts at a predetermined ratio a slight overpressure or a slight underpressure in the space can be obtained, which may be desirable on the basis of circumstances, type of space and safety.

[0017] Preferably, a suction opening of the first channel opens on the first side and an outlet opening of the second channel opens on the first side. More preferably, a suction opening of the second channel opens on the second side and an outlet opening of the first channel opens on the second side. The first side is parallel to the reveal. This means that the openings allow air to flow into and out of the reveal on the first side. In a modern home a window is usually placed on the inner wall. This causes the reveal to lie substantially outside, and an opening at the reveal will also be located on the outer side of the home. In such a situation the second side will be the side which lies against the inner wall and openings in this side will typically carry air through the inner wall via extension pieces, for instance pipe pieces, and so allow air to flow into and out of the space. In a previous, traditional home a window is placed on the outer wall. This causes an opening at

the reveal to be located on the inside. These openings allow air to be carried into and out of the space. In such a situation the second side will be the side which lies against the outer wall, and openings in this side will typically carry air through the outer wall via extension pieces, for instance pipe pieces, and so allow air to flow from and to the outside.

[0018] The reveal finish preferably has perforations to allow an airflow from and to the first and second channel. Perforations prevent or impede entry of dirt, water and/or vermin into the open first side.

[0019] The one or more functional modules further preferably comprise a first filter in the first channel and a second filter in the second channel. Air can be purified via the filter. Dirt and/or vermin can also be prevented from being sucked into the space along with the air. The first filter and the second filter are further preferably replaceable via the second side. The second side, as elucidated above, can lie against the inner wall. This side is therefore easily accessible and can be used for periodically replacing filters. This makes it unnecessary to at least partially remove the reveal in order to gain access to the first side. Because functional modules can however be installed and dismantled via the first side, the openings in the second side can remain limited in size.

[0020] The openings in the second side are preferably defined by edges which are each configured for connection to an external pipe. The external pipe forms an extension of the channel through the wall which lies against the second side. The first filter and the second filter are preferably provided at the position of the openings in the second side.

[0021] The casing preferably has a third side which is configured to form the bottom side of the ventilation unit, which third side has a draining opening. Formation of condensation is possible via a heat exchanger, particularly when air is cooled. Because the invention provides a casing which is typically closed in practice, condensation may accumulate and thereby cause problems when it cannot be discharged adequately. Providing a draining opening in a bottom side enables condensation and other inflowing water to be discharged.

[0022] The casing is preferably formed as a substantially beam-like housing for the functional modules, which beam-like housing has three sets of two sides with substantially the same surface area, wherein the surface area of the second side is greater than the surface area of the first side. The surface area of the second side is preferably greater than the surface area of the third side. The casing is preferably formed integrally. The casing is preferably formed by one of injection moulding and rotation moulding, preferably by rotational moulding. It has been found that this construction of the casing can be manufactured in simple manner and built into a cavity in simple manner. This construction has further been found optimal for installation of functional modules therein.

[0023] An upper side of the casing is preferably configured for connection of an external air channel. Discharge of air from a space not adjacent to an outer wall, for instance a bathroom or toilet area, can be enabled via this air channel.

[0024] With the exception of the first side, second side and optionally the third side, and further optionally the upper side, the casing preferably forms a watertight outer shell of the ventilation unit. By forming a watertight outer shell functional elements are shielded from the surrounding area as it present in the cavity.

[0025] The cover is preferably integrated in, and the cover preferably forms a segment of, the reveal finish. The reveal finish is preferably provided integrally on each reveal side. In practice the ventilation unit rarely covers a whole complete reveal side. By providing the reveal side with an integral finish anyway, wherein the cover is functionally formed by a segment of the one finish, a visually sleek whole is obtained. The cover will here preferably comprise a grating to allow an airflow from and to the plurality of functional modules and to prevent driving rain from entering directly into the casing.

[0026] The first side and the second side are preferably configured to extend upward in the wall. The upward orientation has been found to provide multiple advantages, including the fact that installation of functional modules is simpler than in other orientations, rain and other water which may potentially seep in can be kept out of the casing more easily than in other orientations, and a finish can be provided more easily than in other orientations.

[0027] The invention further relates to an assembly of a screen device and a ventilation unit according to the invention, wherein the screen device comprises a screen roller and a screen which is rollable onto and unreliable from this screen roller and is attached to the screen roller on one of its sides, wherein the screen device comprises at least a protective casing and two lateral guides, wherein the first side of the casing is connected to a first lateral guide of the two lateral guides. The ventilation unit can be integrated in a screen device by connecting one of the lateral guides to the casing. It will be apparent here that one of the lateral guides must not be interpreted as limitative and that a ventilation unit can also be provided on both lateral guides. Connecting the ventilation unit to a lateral guide simplifies several things, such as providing a finish, installation, maintenance and repairs. In this context it will be apparent that the above also comprises that two ventilation units can be connected to a screen device, a first to the first lateral guide and a second to the second lateral guide.

[0028] The first lateral guide preferably comprises at least one rear back profile, wherein the first side of the casing lies substantially in line with a rear wall of the rear back profile and is connected thereto. At the position of the ventilation unit the rear wall of the rear back profile is at least partially interrupted so as to guarantee access to the first side of the casing. The first lateral guide preferably comprises at least one front finishing profile, wherein the cover is formed by at least a segment of the front finishing profile. The ventilation unit preferably com-

prises air guides which are configured to guide air in the first lateral guide. The air guides preferably bridge a distance between the at least one back profile and the at least one front finishing profile. The ventilation unit and the screen device can both work independently of each other. The casing is for this purpose connected to a back profile and the cover formed by a frontal or front finishing profile of the screen guide. Preferably provided between a plane in which the back profile extends and the front finishing profile is an air guide to prevent air from flowing directly from the air outlet to the air inlet via the screen guide. The air guide forms a channel for carrying air from the air outlet to openings in the front profile and to carry air from further openings in the front profile to the air inlet. The air guide will here further preferably take a polarising form, which means that the location where the air is blown out via the front finishing profile lies at a distance from the location where the air is drawn in via the front finishing profile. The air guide can also increase the surface area over which air can be drawn in or blown out through the front finishing profile.

[0029] The first lateral guide preferably has a width which is substantially equal to the depth of the protective casing. The width of the first side, which is substantially equal to the one of the outer dimensions of the ventilation unit, is preferably substantially equal to the depth of the protective casing. The screen guide with its protective casing and its lateral guides thereby have together with the ventilation unit one substantially constant thickness for building into a cavity. This simplifies finishing of the wall and the cavity.

[0030] The invention further relates to a building wherein at least one wall is provided with an opening having a reveal, wherein a ventilation unit according to the invention is built into the wall with the first side substantially parallel to the reveal.

[0031] The invention will now be further described with reference to an exemplary embodiment shown in the drawing.

[0032] In the drawing:

figure 1 shows an exploded view of a first embodiment of the invention;
figures 2A and 2B show an intermediate position and a built-in position of the embodiment of figure 2;
figure 3 shows a schematic view of a second embodiment of the invention;
figure 4 shows a cross-section of parts of the second embodiment;
figure 5 shows a side and front view of the second embodiment; and figure 6 shows a lying cross-section of a wall at the position of the ventilation unit.

[0033] The same or similar elements are designated in the drawing with the same reference numerals.

[0034] Figure 1 shows a wall 1 of a building in which an opening is provided for fitting a window. Windows are typically provided in order to allow light into a building. A window is an example of a functional opening in a building. Other functional openings comprise doors, gates, sliding windows and other similar openings. Functional openings are therefore typically provided in a wall 1 which has an inner wall 2 adjoining an interior space of the building, and has an outer wall 3 provided on an outer side of the building. In order to limit heat loss a cavity 4 is typically provided between inner wall 2 and outer wall 3. The cavity is defined by a space between inner wall 2 and outer wall 3, this space being filled with air or with an insulating material. A thermal barrier is hereby created between inner wall 2 and outer wall 3 so that energy can be retained in the building. Reference is made in this description to inner wall 2, outer wall 3 and cavity 4, although it will be apparent here that this does not imply a traditional way of building. An outer wall 3 is defined as the outer shell of a building. Inner wall 2 is defined as the elements forming an inner shell of a building, wherein the inner shell is thermally insulated from the outer shell. The cavity 4 is defined as the space and/or the elements thermally separating the inner shell and the outer shell at least partially from each other. The outer wall can be formed from stone, brick metal, wood, plasterwork or other material suitable for forming an outer shell of a building. The cavity can be formed by insulating plates or foam fixedly connected to inner and/or outer wall. The cavity can alternatively be formed by a layer of air. The outer wall 3 is not necessarily self-supporting, and can be structurally connected to the inner wall via the cavity 4.

[0035] Recent legislation and modern techniques go a step further than creating a thermal barrier between outer wall 3 and inner wall 2 and also provide an airtight membrane in wall 1 with the theoretical purpose of airtight enclosing of the interior space. Because of this airtight membrane there is negligible, or at least no uncontrolled and appreciable exchange of air inside the building with air outside the building. This can further limit energy loss. This airtight membrane has to be connected to the window when the window is placed in the opening.

[0036] It has been known for years to provide window profiles with which windows are constructed with a thermal barrier such that the profiles comprise an outer part and an inner part, wherein the outer part is configured to lie on the outside of the building and the inner part is configured to lie on the inner side of the building. Such window profiles are then mounted either with their outer part against outer wall 3 or with their inner part against inner wall 2. The thermal barrier provided between outer wall 3 and inner wall 2 can hereby be extended to the window. The thermal barrier can in this way take a continuous form so that cold bridges facilitating energy exchange from outside to inside the building, and vice versa, do not occur. It will be apparent here to the skilled person that, if both inner part and outer part of a window are placed on one of an outer wall 3 or inner wall 2, an undesirable heat exchange would be facilitated between either outer wall and inner part of the window profile or inner wall and outer part of the window profile so that a

cold bridge occurs. The airtight membrane provided in wall 1 is adhered against an edge of the window profile and connects airtightly against the window profile. A building with a window can be energy-optimized by providing a window in an opening of a building while making allowance for the aspects described above.

[0037] When an opening is provided in a wall 1, a so-called reveal is also formed. The reveal is defined as a straight, chamfered or profiled inner side of a window opening, gate opening or arch opening, which inner side preferably lies transversely or substantially transversely of the wall. The reveal is preferably always perpendicular to the wall. The reveal shows the thickness of inner wall 2, the thickness of cavity 4 and the thickness of outer wall 3. Figure 1 shows a portion of the upright reveal and a portion of the upper reveal of a window opening.

[0038] Figure 1 further shows a ventilation unit 7. The ventilation unit preferably forms part of a ventilation system and allows a forced controlled airflow from inside to outside and from outside to inside through wall 1. A plurality of such ventilation units can be placed in a plurality of respective rooms of a building in order to together form the ventilation system of the building. Because each ventilation unit of the ventilation system operates individually, the ventilation system can be explained in this description by describing the operation of one ventilation unit. It will be apparent here that, while a plurality of ventilation units can operate independently, the skilled person can couple them operationally in order to obtain a predetermined operational interaction between the different ventilation units in the ventilation system.

[0039] The ventilation unit of the ventilation system is constructed with a casing 5 and one or more modules which are provided with a heat exchanger for energy exchange between the inflowing and outflowing air. The ventilation system can be deemed a local ventilation system. This is because a plurality of such ventilation units 7 can be provided in a building, for instance at a plurality of window openings in a plurality of rooms of the building, the operation of which is controllable separately of each other.

[0040] Figure 1 shows the casing 5 of ventilation unit 7. Casing 5 is formed such that it can be provided fixedly in the cavity of a building. Provided fixedly is understood to mean that the casing 5 cannot be removed without carrying out extensive work. Such extensive work is often at least partly destructive and requires for instance demolition of a part of a wall. Casing 5 is for this purpose provided on an outer side with mounting means. These mounting means are preferably provided at the position of, i.e. in the vicinity of, the first side 8. Casing 5 has a first side 8 which preferably has an upright orientation. In mounted state the first side 8 is oriented parallel to the reveal. The first side 8 is also directed toward the reveal, i.e. of all sides, first side 8 lies closest to the reveal. In practice the first side 8 lies according to a first embodiment as shown in figures 1 and 2 substantially in line with the reveal or the first side 8 lies according to a second embodiment as shown in figures 3-5 parallel to and at a distance from the reveal, wherein the distance is preferably smaller than 15 cm, more preferably smaller than 10 cm. The first side 8 of casing 5 is provided with an opening 9. In the shown embodiment opening 9 extends over substantially the whole first side 8.

[0041] Casing 5 has a second side 10 configured to lie parallel to the wall. The second side 10 has a plurality of openings 35' and 37', further elucidated below. Second side 10 preferably lies against the inner wall when the window is mounted in or at the inner wall, and preferably lies against the outer wall when the window is mounted in or at the outer wall. Hereby, one of the first side and second side will in each case face outward and another of the first side and second side will face inward. The casing has a maximum outer dimension, measured transversely of the second side, of 30 cm, preferably 25 cm, more preferably 21 cm, in order to enable the whole casing to be built into the wall. This means that the whole casing is situated between an inner shell and outer shell of the wall after being mounted in the wall.

[0042] Casing 5 further has a third side 11 which preferably forms the bottom side of casing 5. The third side 11 has a draining opening 12 for discharging condensation and other water that has entered casing 5. This will be discussed further hereinbelow.

[0043] Casing 5 is preferably beam-shaped. This means that opposite the first side lies a further first side with a surface area substantially equal to that of the first side. Opposite the second and the third side also lie respectively further second and further third sides, these having substantially the same surface areas as respectively the second and third side. The thus obtained beam-shaped casing can be built into a cavity 4 in simple manner. The first side 8 is preferably smaller than the second side 10. First and second side 8 and 10 preferably have an upward orientation. The third side 11 is preferably smaller than the first side 8. The overall depth for functional modules 6 is hereby smaller than the overall height via first side 8. Third side 11 preferably extends in lying orientation as bottom surface.

[0044] Figure 1 shows schematically one or more functional modules 6 of a ventilation unit 7. The functional modules 6 can be built into casing 5 via the opening 9 in first side 8. The functional modules 6 can also be dismantled from casing 5 via the opening 9 in first side 8. For the sake of simplicity, figure 1 shows one functional module comprising all functions.

[0045] The functional modules 6 comprise a heat exchanger 24, a first channel 40 and a second channel 33 for allowing air to flow respectively from outside to inside and from inside to outside, a first air pump 41 and a second air pump 34, these together forming the functional modules 6 of ventilation unit 7. The second channel 33 extends between a first opening 29 and a second opening 35. First opening 29 is formed in a side of housing 23 which adjoins an outer side of wall 1 when the housing is built into the wall. First opening 29 is provided for the

purpose of allowing flow of inside air to the outside, this being illustrated in figure 1 with arrow 30. Provided in first channel 40 is a filter 31 for filtering the inflowing outside air, which is preferably placed to filter the air before the inflowing air 39 flows through heat exchanger 24.

[0046] Heat exchanger 24 is of the air-air type, so that a heat exchange is possible between a first and a second airflow. Heat exchanger 24 is configured for this purpose to allow crosswise flow of the airflows relative to each other in a manner such that heat exchange between the flows is optimized. Air-air heat exchangers are known and the details of this heat exchanger are therefore not described in further detail in this description. In heat exchanger 24 energy is exchanged between the air flowing in first channel 40 on the one hand and the air flowing in second channel 33 on the other. Heat or cold can thus be recuperated. The heat exchanger can be configured to exchange only heat, but can also be a so-called recuperator. A recuperator not only exchanges heat, but also recuperates moisture. This is also referred to as an enthalpy heat exchanger. Alternatively, only one channel is provided for allowing alternating flows of air from outside to inside and from inside and outside. A heat exchanger can be provided here to temporarily store heat energy when the air flows in one direction and to relinquish the heat energy again when the air flows in the other direction.

[0047] The flow of air through second channel 33 is driven by a second air pump 34. The flow of air through first channel 40 is driven by a first air pump 41. Second air pump 34 and first air pump 41 are preferably identical air pumps and can be driven synchronously or individually depending on the operational preferences for ventilation unit 7. Each air pump 34, 41 is preferably formed by an air pump producing minimal sound. An air pump is preferably chosen herefor which operates at a low rotation speed. A low rotation speed is defined here as a rotation speed lower than 1000 revolutions per minute (rpm), preferably lower than 500 rpm, more preferably lower than 300 rpm. Air pumps 34, 41 can be selected from air pumps which move air in an axial direction or in a radial direction, axial and radial being understood to mean relative to the primary rotation axis of the fan. Air pumps 34, 41 are preferably configured for radial displacement of air. Air pumps, including fans with radial or axial blades, are known and therefore not described in further detail in this description.

[0048] The second channel 33 starts at a second opening 35 provided in a second side of the ventilation unit which, when ventilation unit 7 has been built into the wall, adjoins an interior space of the building.

[0049] Second channel 33 has a similar construction to first channel 40. First channel 40 extends between third opening 37, which is preferably formed in the same wall of housing 23 as second opening 35. The third opening is more preferably positioned at a distance from second opening 35 which is greater than the sum of the diameters of second opening 35 and third opening 37, more preferably greater than twice the sum of the diameters of second opening 35 and third opening 37.

[0050] The third opening 37 is provided for the purpose of allowing outflow of air to the space from outside to inside via first channel 40, this being designated in figure 1 with arrow 39. Second opening 35 is further provided with a filter 38 for filtering the air flowing into the second channel 33. This filter 38 is easily accessible via opening 35. The air which flows via third opening 37 out of first channel 40 first flows through heat exchanger 24 via first air pump 41, coming from a fourth opening 42. The fourth opening 42 is preferably placed in the same wall as first opening 29. Via fourth opening 42 the air coming from outside can flow inside.

[0051] Ventilation unit 7 further optionally comprises a fifth opening 32 which is preferably formed in the same side as second opening 35 and third opening 37. This fifth opening 32 is optionally positioned (not shown) at the location of filter 31 for filtering the inflowing outside air. An advantage hereof is that this filter 31 is accessible via the fifth opening 32. Fifth opening 32 is preferably positioned between second opening 35 and third opening 37. As a result of this positioning of the openings, in particular the positioning of third opening 37 and fifth opening 32, all filters present in ventilation unit 7, more specifically the filter for filtering the air flowing from inside to outside, i.e. filter 38, and the filter provided for filtering the air flowing from outside to inside, i.e. filter 31, can be replaced via inner wall 2. Filter 31 preferably comprises a carbon filter, more preferably an active carbon filter, which cleans incoming air. This makes maintenance of ventilation unit 7 extremely simple.

[0052] Figure 1 shows that first opening 29 and fourth opening 42 are located on a first side of casing 5 when the functional modules are built into casing 5. These openings can alternatively be formed in a rear wall, the rear wall being the wall which, in the installed state of the ventilation unit, lies parallel to and adjacently of outer wall 3. Figure 1 further shows that the casing has a second side 10 which has openings 35' and 37' corresponding to the above-described openings 35 and 37 of the functional module 6. For aesthetic reasons the second 35, third 37 and fifth 32 opening are preferably formed substantially symmetrically around an upright axis of symmetry.

[0053] Further connections 48 can optionally be provided for the purpose of connecting for instance an additional space for ventilating. For instance spaces not adjoining an outer wall, for instance a bathroom or storage space, can be ventilated by connecting these spaces to the further connections. The use of these additional connections 48 is optional and provides the possibility of further extending the functionality of ventilation unit 7. Spaces not directly adjoining an outer wall or spaces not having their own ventilation unit can still be ventilated via pipes in the cavity wall and/or inner wall of the building.

[0054] Figure 1 further shows the condensation outlet 49 which allows condensation from the cooled air coming

from inside to be discharged downward in casing 5, from where the condensation can then be discharged further via draining opening 12.

[0055] Figure 1 further shows a reveal finish 13 for the upright reveal and a finish 14 for the upper reveal. When the reveal finish is mounted, a segment of the reveal finish 13 comes to lie in front of the opening 9 in first side 8 of casing 5. This segment therefore functions as cover 15 for the opening 9 in first side 8. It is particularly when airflow openings of the functional modules 6 open on the first side 8 that the cover 15 is provided with perforations 16 to allow the airflow through cover 15.

[0056] Figure 2A shows an embodiment similar to figure 1, wherein the casing 5 is built into the cavity 4. The casing lies wholly between the outer shell 3 and the inner shell 2 of the wall. The casing is preferably also mounted fixedly on the wall via mounting means. The figure shows that insulating material 17 can be provided in the cavity around casing 5. When the cavity is thicker than the width of casing 5, insulating material is typically also provided between the casing and the inner wall. In figure 2A a window (not shown) is provided at or close to inner wall 2. As seen in the transverse direction of the wall, this window lies adjacently of casing 5, with no or only minimal overlap with casing 5. The window hereby forms no obstruction at the opening 9 of casing 5, which allows functional modules 6 to be installed in and dismantled from casing 5. In the embodiment of figure 2 the second side of casing 6 lies toward inner wall 2 and the second opening 35 and third opening 37 are thus concealed in the perspective view. These openings are coupled to an external pipe segment which extends through the inner wall so as to enable an airflow from and to the interior space.

[0057] In figure 2A the first side 8 of casing 5 lies on the outer side of the building because the window is situated on inner wall 2. The openings opening toward first side 8, these being the first opening 29 and fourth opening 42, therefore respectively allow outside air to be drawn in and air to be blown out. Figure 2A further illustrates the external air connection 48.

[0058] In figure 2B the reveal finish 13 has further been mounted, this relative to the situation as shown in figure 2A. The reveal finish forms at least a covering for cavity 4. The reveal finish thereby forms the visual finish of the reveal of the window. Reveal finish 13 integrates the cover 15. It is not necessarily visible here where cover 15 begins and ends in the reveal finish. The segment of reveal finish 13 having the function of covering the opening 9 of first side 8 of casing 5 is deemed the cover 15. Perforations 16 are provided in cover 15 in order to allow airflow from and to the functional modules 6. Figure 2 shows that a neat, clean finish can be obtained while a complex unit is fully integrated into the cavity. This complex unit is fully accessible by removing reveal finish 13. Removal of reveal finish 13 is typically seen as minor work, which is typically not destructive. This allows the functional modules 6 to be dismantled from casing 5, whereby maintenance can be performed, functional elements can be replaced, hardware and/or software updates can be performed, and so on.

[0059] Figure 3 shows a second embodiment wherein a screen device for installing in cavity 4 is provided. A screen device which can be built fully into a cavity on one hand and which can be easily installed and dismantled for maintenance on the other is described in EP2725181, incorporated herein by way of reference to elucidate the components and operation of the screen device. When such a screen device is provided at a window, at least a part of reveal finish 13 will be formed by the screen device.

[0060] Figure 3 shows that the screen device comprises a protective casing, a first lateral guide 19 and a second lateral guide 20. Each lateral guide preferably has at least a rear profile and at least one and preferably two further profiles, these typically forming the most visible part of the lateral guide and typically forming the rail or chamber for guiding of the lateral sides of the screen when the screen is rolled up and unrolled. The rear profile is provided with a channel which allows the screen roller to be dismantled from the protective casing via the channel.

[0061] Figure 3 shows that casing 5 is connected to the first lateral guide 19. In an embodiment the opening 9 of casing 5 thereby does not lie in line with the reveal finish, but at a distance therefrom determined by the overall depth of lateral guide 19. The rear profile of a lateral guide typically comprises a back wall and at least one and preferably two side walls. This profile can be formed integrally or can be assembled. The back wall of the lateral guide is interrupted at the position of casing 5. The two side walls of the rear profile preferably extend integrally over the whole length of the lateral guide. A segment of back wall is hereby placed above and/or below the protective casing. Figure 3 shows an upper segment back wall 21 and a lower segment back wall 22. The figure likewise shows a side wall 23 extending integrally over the whole length. Figure 3 shows that the upper side of casing 5 can be provided with an opening 48 which forms a connection for an external air channel.

[0062] Figure 4 shows a cross-section of an embodiment of the components of lateral guide 19. Figure 4 shows here a back wall 21, 22 which can be connected to side walls 23. For this purpose back wall 21, 22 and side walls 23 are provided with a complementary tongue and groove 25. In practice the side walls 23 will typically be manufactured from metal because a portion of the side walls is visible in the whole placed in cavity 4. Back wall 21, 22 is typically manufactured from plastic because the back wall is concealed entirely from view in the whole placed in cavity 4. Side walls 23 will therefore preferably be provided with the tongue and back wall 21, 22 will preferably be provided with the groove. The tongue and groove connection can be designed such that back wall 21, 22 can be snapped over the tongue or back wall 21, 22 can be slid with its groove over the tongue of the side wall. The back wall with at least one side wall, preferably

with two side walls, is deemed the rear profile.

[0063] Figure 4 also shows a section of casing 5 on first side 8, under back wall 21, 22. Edges of the first side 8 are provided with a corresponding groove 25' so that this groove can also be snapped and/or slid over the tongue of side walls 23. This groove 25' is deemed the mounting means provided on first side 8. This illustrates how both back wall 21, 22 and casing 5 can be connected to the side walls 23 of first lateral guide 19. The groove 25' can be provided directly in the casing (as shown) or can be provided in a connecting strip (not shown), this connecting strip being connected to the casing. The connecting strip can be connected to the casing via welding, glueing, screws, bolts, rivets or other techniques. Because the connecting strip only provides a finish for the edge of opening 9 on first side 8, casing 5 will still be deemed integrally manufactured, even with the connecting strip fastened thereto. This is because the connecting strip functions only to form the connection to the side walls 23 of the lateral guide and has a negligible encasing and/or bounding function for the functional modules 6. The connecting strip will then be deemed the mounting means provided on the first side.

[0064] Figure 4 further shows that a first further profile 26 and a second further profile 27 can be mounted at least partially in the rear profile of lateral guide 19. In a preferred embodiment the two further profiles 26 and 27 can be mounted substantially wholly between the two side walls 23 of lateral guide 19. In another embodiment, when the rear profile has a back wall and only one side wall, the two further profiles 26 and 27 extend inside the imaginary beam of which the back wall and the one side wall form a wall. Together with segments of side walls 23, the two further profiles 26 and 27 form the primary part of the frontal visible side of lateral guide 19. When they are connected to the rear profile, the two further profiles 26 and 27 together also form the guide for guiding a lateral side of the screen. The screen can be formed by a reflective cloth with a zip guide, wherein an auxiliary profile is typically provided in the guide in order to hold the zip which is attached to the reflective cloth. The screen can alternatively be formed by roller blind slats.

[0065] The two further profiles 26 and 27 preferably each have connecting means 28 whereby the further profiles 26 and 27 can be connected to the rear profile. The further profiles 26 and 27 are preferably held between the two side walls 23 of the rear profile. The connecting means are shown as snap connecting means which are compatible with a mounting bracket (not shown) which can be secured at different heights in the guide. One or more mounting brackets can be provided at the position of upper segment back wall 21 and at the position of lower segment back wall 22. The principle of mounting brackets is known and will therefore not be further shown and elucidated in this description. The connecting means 28 are preferably both provided on one side of the guide, as seen in the width direction of the lateral guide. This means that connecting means 28 are located in one half, preferably at one third of the width, most preferably at one quarter of the width and adjacently of a side wall 23. The result is that one of the two further profiles, in the figure the further profile 27, can extend largely in the manner of a plate inside the two side walls 23 at the position of the reveal. In other words, one of the two further profiles, in the figure the further profile 27, can extend largely in the manner of a plate parallel to and at a distance from the rear wall of the rear profile. The result is that an open space 36 is formed between back walls 21 and 22 and the second further profile 27, which open space 36 provides space for mounting of an air guide, further elucidated below. There are no elements in open space 36 that prevent or impede installation of an air guide.

[0066] Figure 5A shows a cross-sectional side view of a lateral guide 19 and illustrates that air guide 43 is configured to guide an airflow through lateral guide 19. Through lateral guide 19 is defined here as between a plane substantially coinciding with the rear wall of the lateral guide and a plane substantially coinciding with the front wall of the lateral guide. Air guide 43 bridges the distance between the back wall and the front profiles 26 and 27. More specifically, air guide 43 bridges the distance between the edges of openings 29 and 42 on one side and the perforations 16 in the cover, formed by second further profile 27, on the other.

[0067] Figure 5B shows a front view of the lateral guide 19 of figure 5A. Figure 5 shows that an upper segment of back wall 21 is provided above casing 5 and a lower segment of back wall 22 is provided under casing 5. The first side 8 of casing 5 is positioned substantially in line with rear walls 21 and 22. Openings 29 and 42 are thereby preferably also formed at the position of or in the plane of back wall 21. An air guide 43 is placed in lateral guide 19 at the position of casing 5, in the open space 36. The air guide comprises two air channels 44 and 45 for guiding the air flowing to and from openings 29 and 42 to the perforations 16 in second further profile 27. Because guide 19 takes an asymmetrical form in the width direction, air guide 43 is also placed in guide 19 asymmetrically in the width direction. Air guide 43 prevents air from flowing inside guide 19 from fourth opening 42 to first opening 29. This would render impossible a proper operation of the ventilation unit. Air guide 43 is formed such that it does not prevent the placing of further profiles 27 and 26. The air channels 44 and 45 can further be formed such that they enlarge the outflow and inflow opening at the position of the second further profile and thus reduce the airflow velocity. The air guide preferably lies substantially against the second further profile 27, typically at the position of perforations 16.

[0068] Figure 5A further illustrates that a filter can be configured not only to filter the air flowing directly into opening 35, but also to filter air flowing in via external air channel 48. Provided for this purpose is a filter element 50 with a filter cloth 51 which extends transversely of the external air channel 48 so that the air flowing in via this channel 48 passes the filter cloth 51. The filter for filtering

air which flows through opening 35 (not shown in figure 5A) can also be integrated in the filter element 50. These filters can both be replaced via opening 35.

[0069] Figure 5B further shows that an external pipe 46 can be provided at the location or at the position of the third opening 37 and the second opening 35 (visible in figure 5A). The external pipe can preferably be connected to casing 5 at the position of openings 37 and 35. The external pipe 46 forms the air channel through the inner wall (or the outer wall as described above). Inside the space the external pipe can be visually covered by finishing means which allow the airflow from and to the ventilation unit. In figure 5 the fifth opening is not shown because this is merely an optional opening.

[0070] Figure 5A further shows that a water discharge hose 47 is connected to draining opening 12 on one side and to the rear wall 22 of the lateral guide on the other. The lateral guide is provided at the bottom to discharge water in a correct manner, typically via a window sill. A correct manner is particularly understood to mean that the water should not find its way directly into cavity 4, since this is disadvantageous for the insulation. Connecting draining opening 12 via a water discharge hose 47 to the lateral guide enables discharge from casing 5 of water which has found its way into the casing by seeping in or through condensation, or in other ways.

[0071] Figure 6 shows a cross-section of a wall at the position of the ventilation unit. Figure 6 thereby shows the above-described components including the outer wall 3, the cavity 4 with insulation 17, the inner wall 2, the casing 5 and the lateral guide 19. Figure 6 further shows particularly that, at the position of casing 5, a piece of insulating material 17' is provided between the inner wall 2' and casing 5. The piece of insulating material 17' forms a barrier between casing 5 and inner wall 2. Figure 6 further shows that a window 53 is provided at the position of an inner wall 2. This window 53 is connected via a thermal plate 52 to the inner wall in order to prevent cold bridges. The piece of insulating material 17' and the thermal plate 52 are deemed part of the inner shell of the building since insulating material 17' and thermal plate 52 at least partially define the form and position of the inner wall. In the embodiment as shown in figure 6 the whole casing 5 will therefore also fall between the outer shell 3 and the inner shell 2, 2', 17' and 52.

[0072] A piece of insulating material 17' can be provided between casing 5 and inner wall 2 in two ways. The figure shows an embodiment wherein inner wall 2 has been made narrower at the position of the casing so that the piece of insulating material 17' fits between the narrower inner wall and the casing 5 (narrower as seen in a direction transversely of the wall). In this embodiment the casing 5 can be embodied with the same width as cavity 4, as seen in the direction transversely of the wall. In an alternative embodiment casing 5 is narrower than cavity 4 and the difference in width is filled up with the piece of insulating material 17'. There is in any case preferably an overlap of the piece of insulating material 17' and insulating material 17 in order to prevent cold bridges and to obtain a good insulation. A combination of the above-described embodiments is of course also possible.

[0073] The skilled person will appreciate on the basis of the above description that the invention can be embodied in different ways and on the basis of different principles. The invention is not limited to the above described embodiments. The above described embodiments and the figures are purely illustrative and serve only to increase understanding of the invention. The invention will not therefore be limited to the embodiments described herein, but is defined in the claims.

Claims

1. Method for building a ventilation unit into a wall of a building, wherein the method comprises of:

    - determining a zone of the wall adjacently of a functional opening such as a window or door opening;
    - mounting a casing of the ventilation unit in the determined zone, with an at least partially open first side of the casing substantially parallel to a reveal of the functional opening and with a second side of the casing substantially parallel to the wall;

    wherein the method comprises at least one of the following steps of:

    - installing one or more functional modules in the casing via the first side; and
    - dismantling one or more functional modules from the casing via the first side.

2. Method according to claim 1, further comprising the step, in between determining the zone and mounting the casing, of positioning the whole casing between an outer shell and an inner shell of the wall.

3. Method according to the foregoing claims, wherein the method further comprises of: providing at least one air passage channel through the inner shell of the wall, wherein the at least one air passage channel is configured to allow an airflow between the casing and an interior space of the building.

4. Ventilation unit configured to be built into a wall of a building, the ventilation unit comprising one or more functional modules and a casing, which casing has a first side which is at least partially open such that the one or more functional modules can be installed in and dismantled from the casing via the first side, which casing has a second side which is configured to lie substantially parallel to the wall, wherein the casing has a maximum outer dimension, measured

transversely of the second side, of a maximum of 300 mm, preferably a maximum of 250 mm, more preferably 210 mm, so as to be placeable between an inner shell and an outer shell of the wall, and wherein the casing has mounting means for connection to the building at a predetermined position in the wall, wherein the first side lies substantially at right angles to the second side and is configured to lie substantially parallel to a reveal of an opening in the wall, wherein the first side comprises a cover for covering the opening substantially in line with the reveal.

5. Ventilation unit according to claim 4, wherein the mounting means are provided on the first side.

6. Ventilation unit according to any one of the claims 4-5, wherein the one or more functional modules comprise at least:

- a first channel for allowing air to flow inside from outside the building;
- a second channel for allowing air to flow outside from inside the building; and
- a heat exchanger configured to allow the first channel and the second channel to cross;
- preferably a first air pump in the first channel; and
- preferably a second air pump in the second channel.

7. Ventilation unit according to claim 6, wherein a suction opening of the first channel opens on the first side and wherein an outlet opening of the second channel opens on the first side, wherein the cover has means, preferably perforations, for allowing an airflow from and to the first and second channel.

8. Ventilation unit according to any one of the foregoing claims 6-7, wherein a suction opening of the second channel opens on the second side and wherein an outlet opening of the first channel opens on the second side, wherein the second side preferably comprises openings with edges which are each configured for connection to an external pipe.

9. Ventilation unit according to any one of the foregoing claims 4-8, wherein the casing has a third side which is configured to form the bottom side of the ventilation unit, which third side has a draining opening.

10. Ventilation unit according to any one of the foregoing claims 4-9, wherein the casing is preferably formed integrally and is formed as a substantially beam-like housing for the functional modules, which beam-like housing has three sets of two sides with substantially the same surface area, wherein the surface area of the second side is greater than the surface area of the first side, wherein the surface area of the second side is preferably greater than the surface area of the third side.

11. Ventilation unit according to any one of the foregoing claims 4-10, wherein the cover is integrated in and forms a segment of the reveal finish, wherein the cover preferably comprises a grating to allow an airflow from and to the plurality of functional modules and to prevent driving rain from entering directly into the casing.

12. Assembly of a screen device and a ventilation unit according to any one of the foregoing claims 4-11 and claim 5, wherein the screen device comprises a screen roller and a screen which is rollable onto and unreliable from this screen roller and is attached to the screen roller on one of its sides, wherein the screen device comprises at least a protective casing and two lateral guides, wherein the mounting means can be connected to a first lateral guide of the two lateral guides.

13. Assembly according to claim 12, wherein the first lateral guide comprises at least one front finishing profile, wherein the cover is formed by at least a segment of the front finishing profile.

14. Assembly according to any one of the claims 12-13, wherein the ventilation unit comprises air guides which are configured to guide air in the first lateral guide, wherein the air guides preferably bridge a distance between a rear back profile of the lateral guide and the at least one front finishing profile.

15. Building wherein at least one wall is provided with an opening having a reveal, wherein a ventilation unit according to any one of the claims 4-11 is built into the wall with the first side substantially parallel to the reveal.

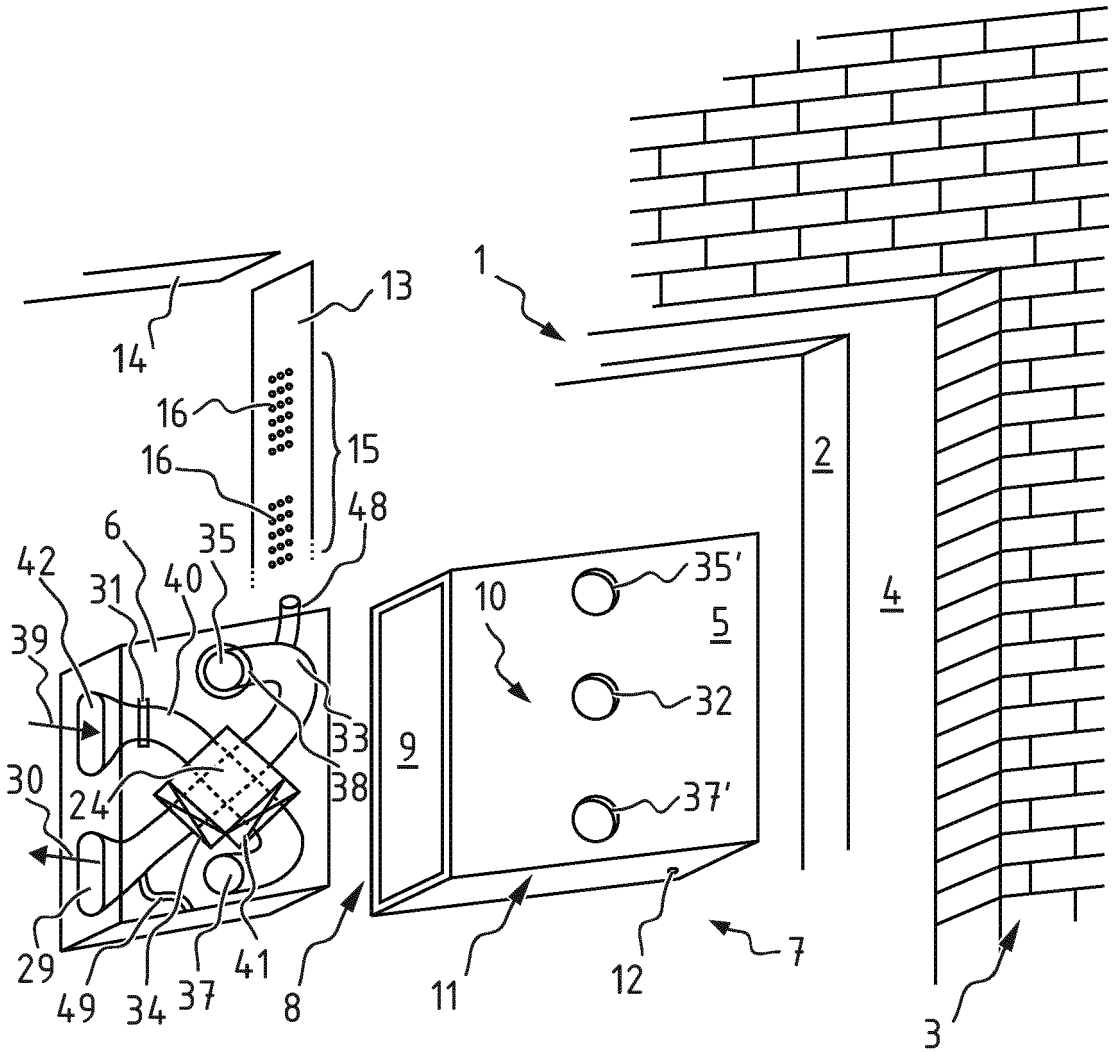
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FIG. 1

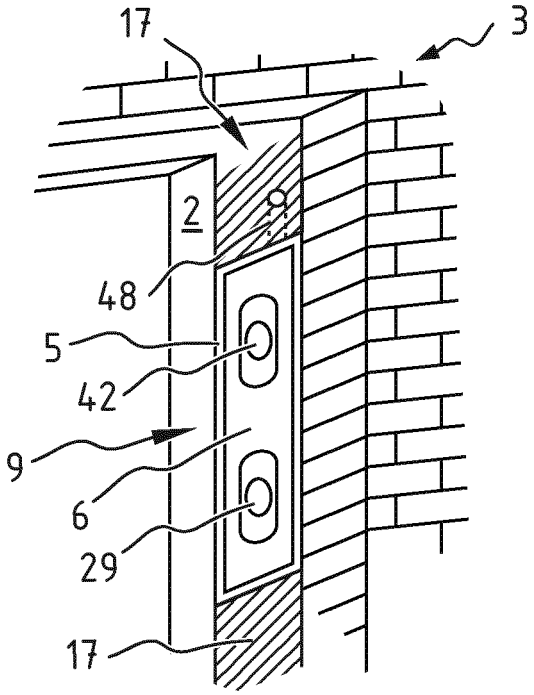


FIG. 2A

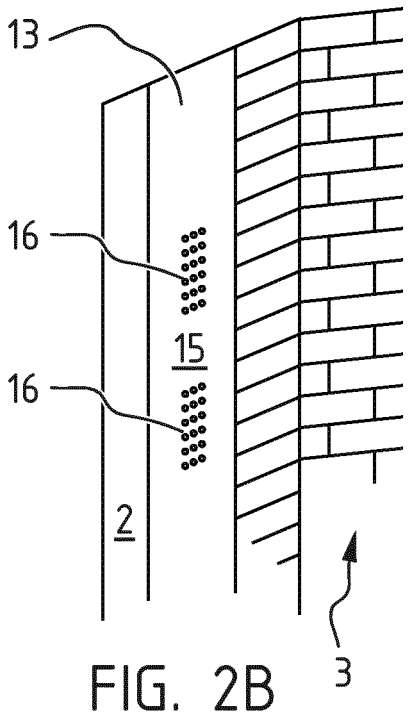


FIG. 2B

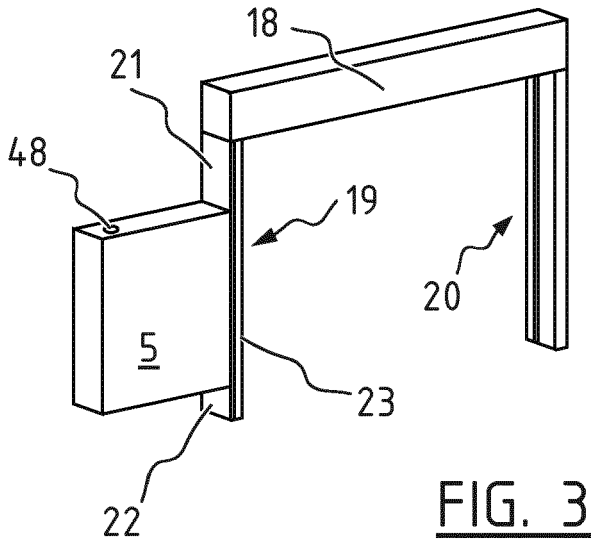


FIG. 3

FIG. 4

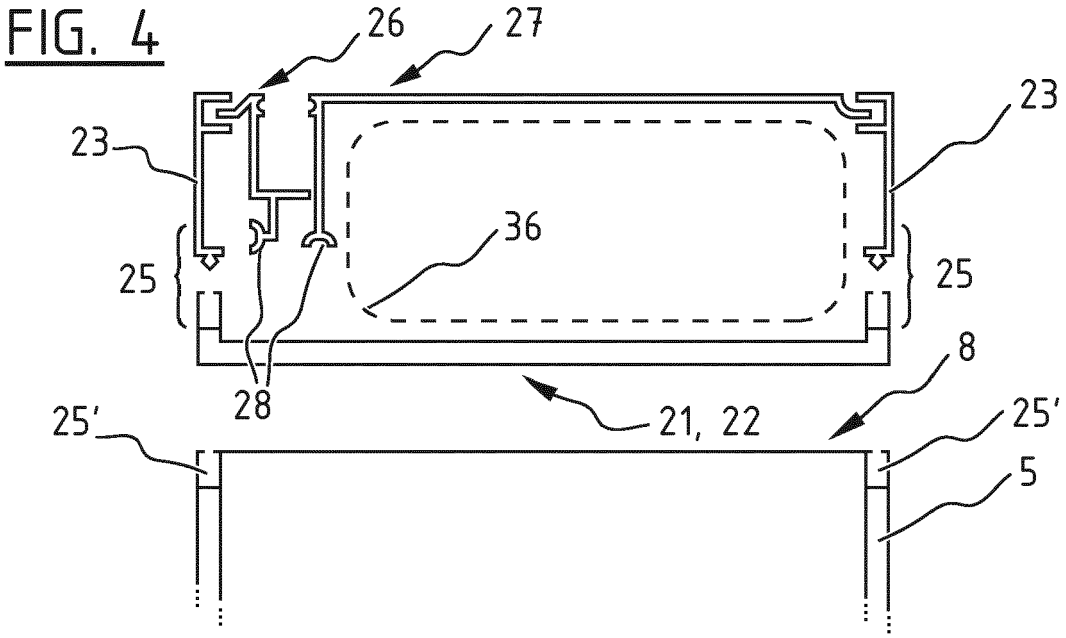


FIG. 5A

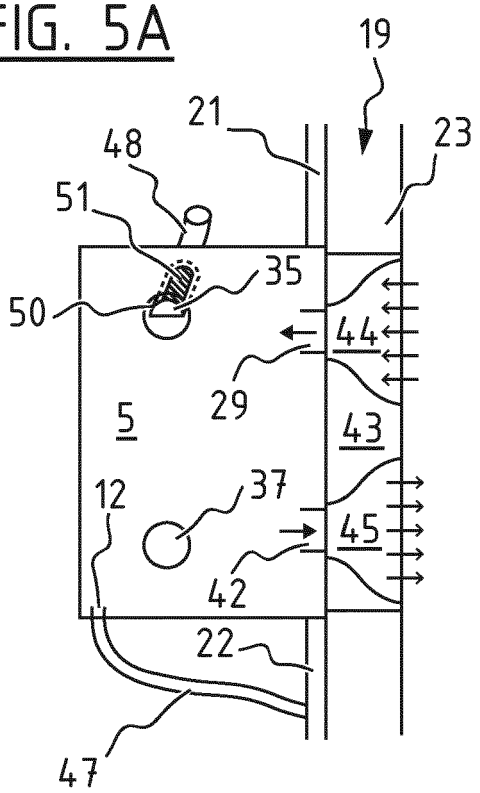
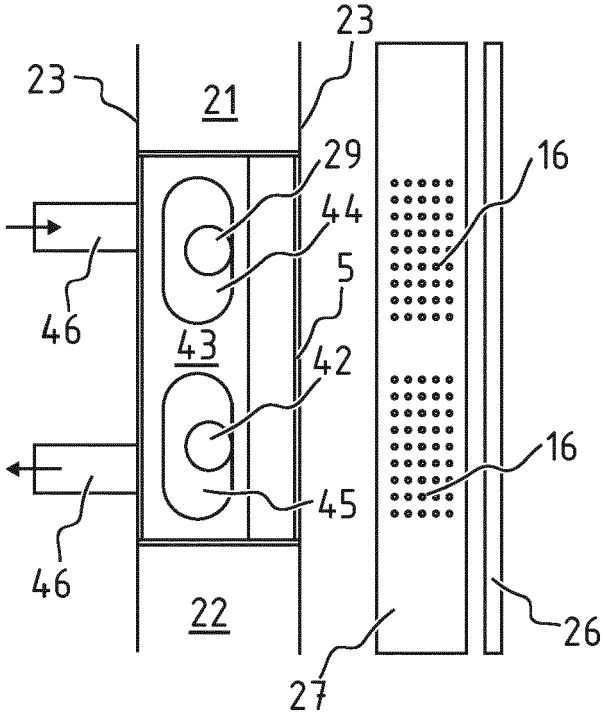


FIG. 5B



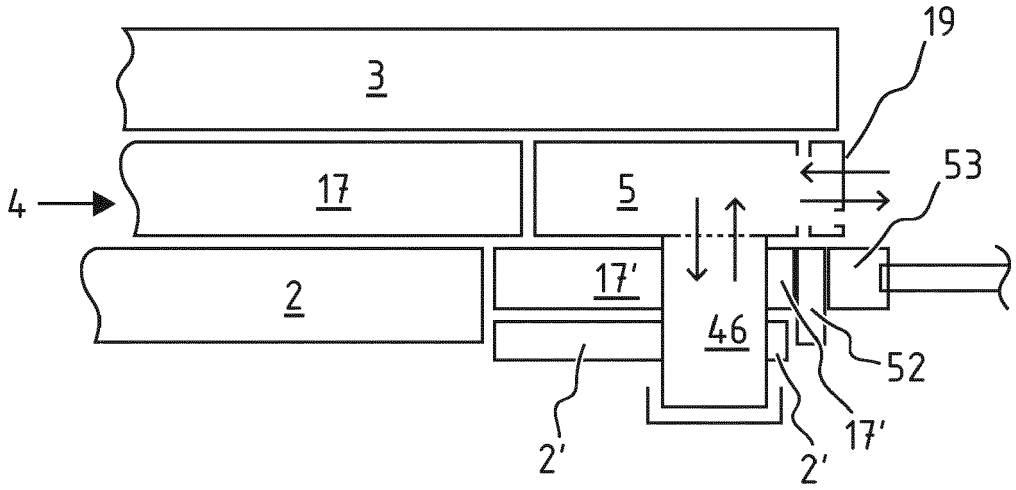


FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 1985

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	KR 101 434 191 B1 (CENDORI CO LTD [KR]) 27 August 2014 (2014-08-27) * paragraph [0001] - paragraph [0007] * * paragraph [0016] - paragraph [0038] * * figures *	1-10, 12-15	INV. F24F12/00
X	DE 10 2012 104198 A1 (HAUTAU GMBH [DE]) 14 November 2013 (2013-11-14) * paragraph [0013] - paragraph [0046] * * paragraph [0077] - paragraph [0113] * * figures *	1,4,11	
X	EP 2 829 682 A1 (THESAN S P A [IT]) 28 January 2015 (2015-01-28) * paragraph [0008] - paragraph [0020] * * figures *	1,4	
A	EP 1 486 637 A2 (LIDARTECH CO LTD [KR]) 15 December 2004 (2004-12-15) * paragraph [0026] - paragraph [0074] * * figures *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
A	DE 10 2012 200571 A1 (PROFINE GMBH [DE]) 19 July 2012 (2012-07-19) * abstract; figures *	1-15	F24F
A	US 2001/018964 A1 (DEGREGORIA ANTHONY J [US] ET AL) 6 September 2001 (2001-09-06) * paragraph [0023] - paragraph [0073] * * figures *	1,4	
A	KR 2011 0111684 A (LG HAUSYS LTD [KR]) 12 October 2011 (2011-10-12) * paragraph [0001] - paragraph [0008] * * paragraph [0018] - paragraph [0040] * * figures *	1,4	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 April 2022	Mattias Grenbäck

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 21 1985

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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04-04-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 101434191 B1	27-08-2014	NONE	
DE 102012104198 A1	14-11-2013	DE 102012104198 A1	14-11-2013
		EP 2850272 A2	25-03-2015
		PL 2850272 T3	30-06-2017
		WO 2013171677 A2	21-11-2013
EP 2829682 A1	28-01-2015	CN 104343361 A	11-02-2015
		EP 2829682 A1	28-01-2015
		PE 20150292 A1	19-02-2015
EP 1486637 A2	15-12-2004	CN 1573007 A	02-02-2005
		EP 1486637 A2	15-12-2004
		HK 1073347 A1	30-09-2005
		JP 2005003348 A	06-01-2005
		US 2004253917 A1	16-12-2004
		US 2006270334 A1	30-11-2006
DE 102012200571 A1	19-07-2012	NONE	
US 2001018964 A1	06-09-2001	CA 2294335 A1	25-11-1999
		US 6289974 B1	18-09-2001
		US 2001018964 A1	06-09-2001
		WO 9960307 A1	25-11-1999
KR 20110111684 A	12-10-2011	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1488175 A **[0004]**
- EP 17171461 A **[0005]**
- EP 2725181 A **[0059]**