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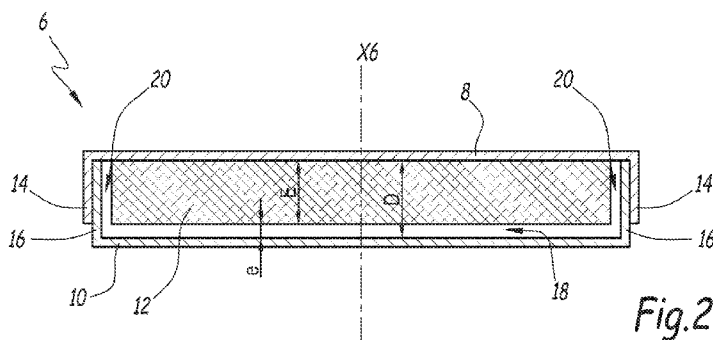


Fig. 2

(57) Abstract: Panel (6) for a module of an air handling unit, the panel defining a main axis (X6) perpendicular to its surface and including an exterior plate (8), an interior plate (10), and a layer (12) made of insulating material arranged between the exterior plate and the interior plate, the plates and the layer being parallel to one another and perpendicular to the main axis of the panel. A gap (18) of thickness (e) parallel to the main axis of the panel is defined between the layer made of insulating material and at least one plate out of the exterior plate and the interior plate, the thickness being greater than or equal to 10 mm.



PANEL FOR AIR HANDLING UNIT MODULE, AIR HANDLING UNIT MODULE INCLUDING SUCH A PANEL, AND AIR HANDLING UNIT INCLUDING SUCH A MODULE

[0001] The present invention relates to a panel for a module of an air handling unit. The present invention also relates to a module of an air handling unit including such a panel as well as to an air handling unit including such a module.

[0002] In the field of air handling, it is known to use an air handling unit consisting of a series of modules, each module including a component pertaining to an air handling function. Each module comprises four, five or six surfaces, each surface consisting of an assembled panel. The panels of a module have to ensure a satisfactory airtightness so as to reduce or eliminate the thermal bridges between the interior and the exterior of the unit.

[0003] On this subject it is known, for example, from EP-A-2 578 959, to use panels comprising an exterior plate, an interior plate, and a layer made of insulating material sandwiched between the plates which are then squeezed against one another with minimal play. However, due to a positive pressure or a negative pressure generated by a ventilation unit which is in the interior of the unit, the interior plate of the panel is capable of undergoing a deformation resulting in the deformation of the insulating layer and of the exterior plate. Such a deformation can cause infiltrations or parasitic air leaks which are detrimental to the proper operation of the air handling unit.

[0004] It is this drawback that the invention more particularly aims to overcome by proposing a novel panel for a module of an air handling unit, whose exterior plate does not undergo deformation and thus ensures the airtightness. In addition, the deformation of the exterior plate is perceived by a user as a defect of the unit. This confers a poor image to the producer of the unit.

[0005] In this spirit, the invention relates to a panel for a module of an air handling unit, the panel defining a main axis perpendicular to its surface and including an exterior plate, an interior plate, and a layer made of insulating material arranged between the exterior plate and the interior plate, the plates and the layer being parallel to one another and perpendicular to the main axis of the panel. According to the invention, a gap with a thickness parallel to the main axis of the panel is defined between the layer made of insulating material and at least one plate out of the exterior plate and the interior plate, the thickness being greater than or equal to 10 mm.

[0006] By means of the gap created by the invention, the deformation of the interior plate caused by a positive pressure or a negative pressure does not result in the deformation of the exterior plate. Such a panel eliminates the infiltrations or parasitic air leaks due to the deformation and improves the perceived quality of the unit.

[0007] According to advantageous but non-obligatory aspects of the invention, such a panel includes one or more of the following features, considered in any technically acceptable combination:

- The gap is defined between the layer made of insulating material and the interior plate.
- The gap is defined between the layer made of insulating material and the exterior plate.
- The exterior plate and the interior plate are each provided with edges, and the edges of at least one plate, out of the exterior plate and the interior plate, are oriented parallel to the main axis of the panel and towards the other plate.
- The edges of the exterior plate are squeezed, perpendicularly to the main axis of the panel, against the edges of the interior plate.
- A gap with a thickness perpendicular to the main axis of the panel is defined between the edges of the exterior and interior plates and the layer made of insulating material.
- The panel includes a joining element made of polymer material arranged around the layer made of insulating material and inserted between the exterior plate and the interior plate along the main axis, the edges of the exterior and interior plates being arranged respectively in a niche of the joining element.
- The exterior plate and the interior plate are made of metal.

[0008] The invention also relates to a module of an air handling unit, the module comprising several surfaces, at least one surface consisting of a panel as described above.

[0009] Finally, the invention also relates to an air handling unit including a plurality of modules and a plurality of components, each module including a component, the component being a ventilation unit, a heating battery and/or a cooling battery, at least one filter, movable slat shutters, a recuperation unit, and a humidifier, the unit being characterized in that at least one module is as described above.

[0010] The invention will be understood better and other advantages of said invention will become clearer in the light of the following description given only as a non-limiting example and in reference to the appended drawings in which:

- Figure 1 is a perspective view of an air handling unit from which some panels have been removed;
- Figure 2 is a diagrammatic cross section of a panel according to a first embodiment of the invention and configured for a module of the air handling unit of Figure 1;
- Figure 3 is a cross section analogous to Figure 2 of a panel according to a second embodiment of the invention;
- Figure 4 is a cross section analogous to Figure 2 of a panel according to a third embodiment of the invention;
- Figure 5 is a perspective view of a portion of a joining element between two panels according to a fourth embodiment of the invention; and
- Figure 6 is a perspective view of two panels according to the fourth embodiment of the invention, in a configuration assembled at right angle.

[0011] In Figure 1, an air handling unit 1 is represented. The unit 1 includes a plurality of modules 2 and a plurality of components. Each module 2 is configured to include at least one component of the unit 1. The components of the unit 1 are, for example, a ventilation unit, a heating battery, a cooling battery, filters, movable slat shutters, a recuperation unit, and a humidifier.

[0012] The ventilation unit is configured to set in motion, or ventilate, the air handled by the unit 1. The ventilation unit functions by means of an electric fan unit including one or more electric motors which are equipped with one or more turbines.

[0013] The heating battery is configured to implement the heating of the air handled by the unit 1. In the heating battery, a heat-exchanging fluid circulates, such as water or a gas, for example. In addition, the heating of the air is ensured, for example, by one or more resistors or by a gas-fired boiler.

[0014] The cooling battery is configured to implement the cooling of the air handled by the unit 1. In the cooling battery, a heat-exchanging fluid circulates, such as, for example, water or refrigerant liquid.

[0015] The filters are configured to implement the filtration of the air handled by the unit 1. The filters used depend on the application of the unit 1.

[0016] The shutters with the movable slats are configured to implement the closing and the opening of one or more air circuits of the unit 1. Their function is to enable or to prevent the passage of the air as needed.

[0017] The recuperation unit is configured to recuperate the thermal energy of the air handled by the unit 1. The recuperation unit then includes a recuperator such as, for example,

a plate recuperator, a rotary recuperator, a thermodynamic recuperator, a heat pipe, or glycolated water batteries.

[0018] The humidifier is configured to regulate the humidity of the air handled by the unit 1. The humidifier includes, for example, a system for injecting water in the form of drops or steam in order to ensure the humidification of the air.

[0019] The modules 2 of the air handling unit 1 comprise several surfaces 4. In particular, the modules 2 represented in Figure 1 comprise four or five surfaces 4 depending on their position in the unit 1. The surfaces 4 each consist of a panel 6.

[0020] As shown in Figure 2, each panel 6 defines a main axis X6 perpendicular to its surface. In addition, each panel 6 includes a first plate 8, a second plate 10, and a layer 12 made of insulating material.

[0021] The plate 8 is also referred to as exterior plate since it is positioned outside of the air handling unit 1. The plate 10 is also referred to as interior plate since it is positioned inside the unit 1.

[0022] The exterior plate 8 is provided with folded-over edges 14. In particular, the folded-over edges 14 of the plate 8 are oriented parallel to the main axis X6 of the panel 6 and towards the interior plate 10.

[0023] The interior plate 10 is provided with folded-over edges 16. The folded-over edges 16 are oriented parallel to the main axis X6 of the panel 6 and towards the exterior plate 8. In addition, the folded-over edges 16 comprise a folded-over portion 33, which is oriented perpendicularly to the main axis X6 of the panel 6 and towards the center of the interior plate 10.

[0024] In practice, the edges 14 of the exterior plate 8 are squeezed, perpendicularly to the main axis X6 of the panel 6, against the edges 16 of the interior plate 10.

[0025] In a variant not shown in the figures, the edges 14 or 16 of a single plate, out of the exterior plate 8 and the interior plate 10, are oriented parallel to the main axis X6 of the panel 6 and towards the other plate.

[0026] The plates 8 and 10 and the layer made of insulating material 12 are parallel to one another and perpendicular to the main axis X6 of the panel 6. The exterior plate 8 and the interior plate 10 are made of metal.

[0027] In a variant, the exterior plate 8 and the interior plate 10 are made of polymer material.

[0028] The layer made of insulating material 12 is configured to thermally insulate the panel 6. In practice, the layer 12 is configured to reduce the passage of heat from the

interior towards the exterior or from the exterior towards the interior. For this purpose, the layer 12 consists, for example, of a block of fibers, of mineral, plant-based or synthetic foam.

[0029] The layer made of insulating material 12 is arranged between the exterior plate 8 and the interior plate 10. The layer made of insulating material 12 is firmly connected, for example, by means of a self-adhesive band, to the exterior plate 8.

[0030] A gap 18 with a thickness e parallel to the main axis X6 of the panel 6 is defined between the layer made of insulating material 12 and the interior plate 10.

[0031] D is used to designate the internal distance between the plates 8 and 10, measured parallel to the main axis X6. The distance D is between 25 and 85 mm and preferably equal to 50 mm. Moreover, E is used to designate the thickness of the layer made of insulating material 12, measured parallel to the main axis X6 of the panel 6. In particular, the thickness E is less than the distance D and preferably equal to 40 mm. The thickness e of the gap 18 is measured parallel to the axis X6 and is greater than or equal to 10 mm. The distance D is equal to the sum of the thickness E and the thickness e .

[0032] In addition, a gap 20 with a thickness perpendicular to the main axis X6 of the panel 6 is also defined between the edges 14 and 16 of the plates 8 and 10 and the layer of insulating material 12. In other words, the gap 20 is defined perpendicularly to the main axis X6 on both sides of the layer made of insulating material 12.

[0033] The layer made of insulating material 12 thus has a reduced thickness compared to the products of the prior art and it can be described as a "thin insulant."

[0034] In a variant not shown in the figures, the gap 20 is defined exclusively on an edge of the layer of insulating material 12.

[0035] According to the second embodiment of the invention, shown in Figure 3, the layer made of insulating material 12 is firmly connected, for example, by means of a self-adhesive band, to the interior plate 10. Consequently, the gap 18 with a thickness parallel to the main axis X6 of the panel 6 is defined between the layer made of insulating material 12 and the exterior plate 8.

[0036] According to the third embodiment of the invention, shown in Figure 4, the layer made of insulating material 12 is firmly connected to the exterior plate 8 by means of tabs 21. Consequently, in addition to the gap 18, a gap 19 with a thickness e parallel to the main axis X6 of the panel 6 is defined between the layer made of insulating material 12 and the exterior plate 8. In practice, the positioning of the layer 12 defines, parallel to the main axis X6, two gaps 18 and 19.

[0037] In a variant not shown in the figures, the layer made of insulating material 12 is firmly connected to the interior plate 10 by means of the tabs.

[0038] According to the fourth embodiment of the invention, shown in Figures 5 and 6, each panel 6 includes a joining element 22 made of polymer material, arranged around the layer made of insulating material 12 and inserted between the exterior plate 8 and the interior plate 10 along the main axis X6.

[0039] The joining element 22 comprises four profiles 24 of identical cross section but of different lengths. The length of the profiles 24 depends on the panel 6 for which they are configured.

[0040] The four profiles 24 are thus arranged in the form of a rectangle, and four corners are provided to fit ends of the profiles 24 together so as to immobilize the profiles 24 and construct the joining element 22. In this case, the panels 6 are rectangular, as can be seen in Figure 1. In practice, the panels 6 can be rectangular or square.

[0041] As shown in Figure 5, each joining element 22 comprises an external periphery 26 which defines a closed volume V of the joining element 22. The joining element 22 also comprises stiffening ribs 28 arranged inside the closed volume V.

[0042] The periphery 26 of the joining element 22 defines a first niche 30 and a second niche 32. The first niche 30 receives the folded-over edges 14 of the exterior plate 8. The second niche 32 is perpendicular to the first niche 30 and partially receives the folded-over edges 16 of the interior plate 10. In particular, the folded-over portion 33 of the folded-over edges 16 is arranged in the second niche 32 of the joining element 22.

[0043] In addition, the joining element 22 comprises both a male assembly device 34 and a female assembly device 36. The male assembly device 34 is formed by a protruding rib, while the female assembly device 36 is formed by a hollow groove.

[0044] As shown in Figure 6, the protruding rib 34 of the joining element 22 is configured to engage in the hollow groove 36 of another joining element 22 of identical cross section, belonging to another panel 6. In particular, the hollow groove 36 of the joining element 22 of the panel 6 of a first surface 4 receives the protruding rib 34 of the joining element 22 of the panel 6 of a second surface 4 adjacent to the first surface 4 and perpendicular to it.

[0045] The embodiment and variants considered above can be combined to generate new embodiments.

CLAIMS

1. Panel (6) for a module (2) of an air handling unit (1), the panel defining a main axis (X6) perpendicular to its surface and including:

- an exterior plate (8),
- an interior plate (10), and
- a layer (12) made of insulating material arranged between the exterior plate and the interior plate,

the plates and the layer being parallel to one another and perpendicular to the main axis of the panel, the panel being characterized in that a gap (18) with a thickness (e) parallel to the main axis (X6) of the panel (6) is defined between the layer made of insulating material (12) and at least one plate out of the exterior plate (8) and the interior plate (10), the thickness (e) being greater than or equal to 10 mm.

2. Panel according to Claim 1, characterized in that the gap (18) is defined between the layer made of insulating material (12) and the interior plate (10).

3. Panel according to Claim 1, characterized in that the gap (18) is defined between the layer made of insulating material (12) and the exterior plate (8).

4. Panel according to any one of the preceding claims, characterized in that the exterior plate (8) and the interior plate (10) are each provided with edges (14, 16) and in that the edges of at least one plate, out of the exterior plate and the interior plate, are oriented parallel to the main axis (X6) of the panel (6) and towards the other plate.

5. Panel according to Claim 4, characterized in that the edges (14) of the exterior plate (8) are squeezed, perpendicularly to the main axis (X6) of the panel (6), against the edges (16) of the interior plate (10).

6. Panel according to Claim 5, characterized in that a gap (20) of thickness perpendicular to the main axis (X6) of the panel (6) is defined between the edges (14, 16) of the exterior and interior plates (8, 10) and the layer made of insulating material (12).

7. Panel according to Claim 4, characterized in that it includes a joining element (14) made of polymer material arranged around the layer made of insulating material (12) and inserted between the exterior plate (8) and the interior plate (10) along the main axis (X6), the edges (14, 16) of the exterior and interior plates being arranged in a niche (30, 32), respectively, of the joining element.

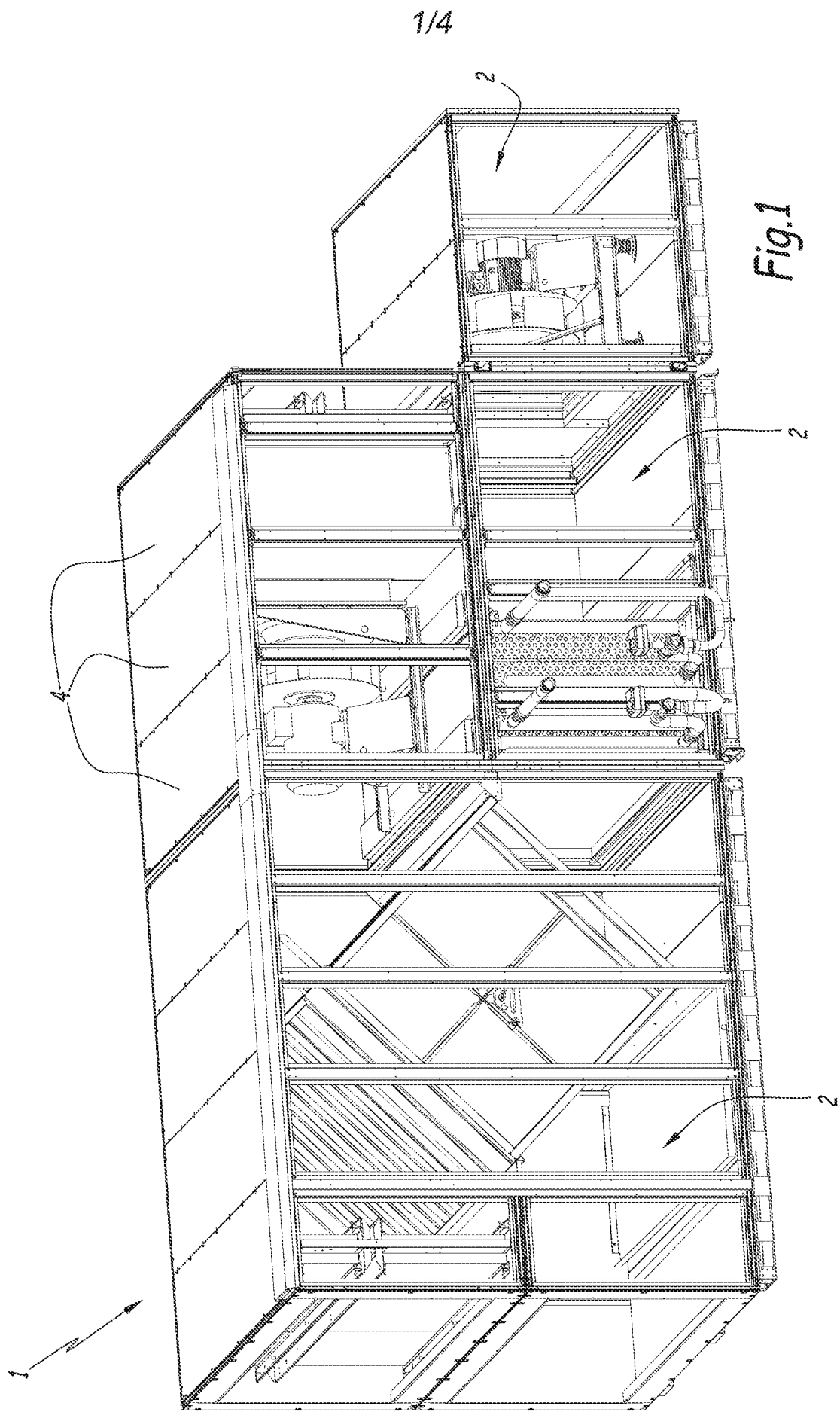
8. Panel according to any one of the preceding claims, characterized in that the exterior plate (8) and the interior plate (10) are made of metal.

9. Module (2) of an air handling unit (1), the module comprising several surfaces (4), at least one surface consisting of a panel (6) according to any one of Claims 1 to 8.

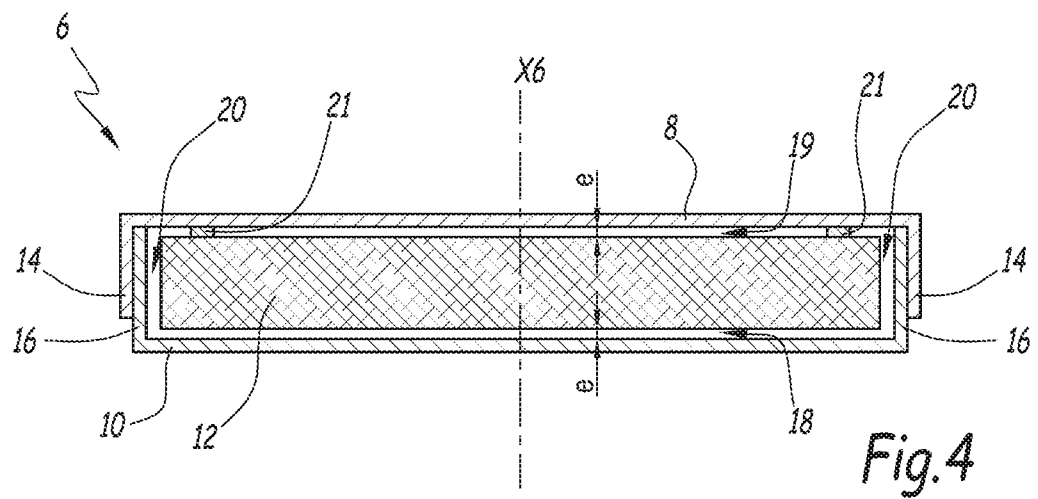
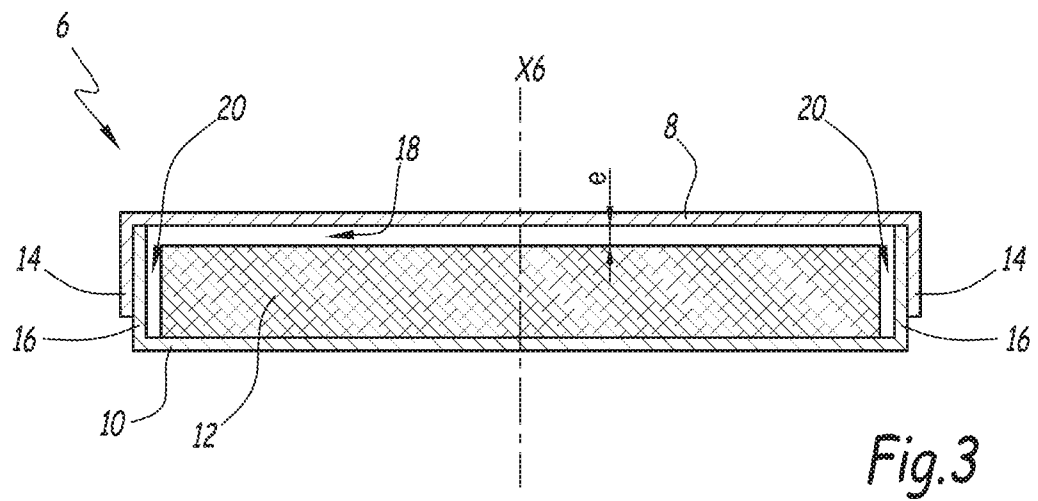
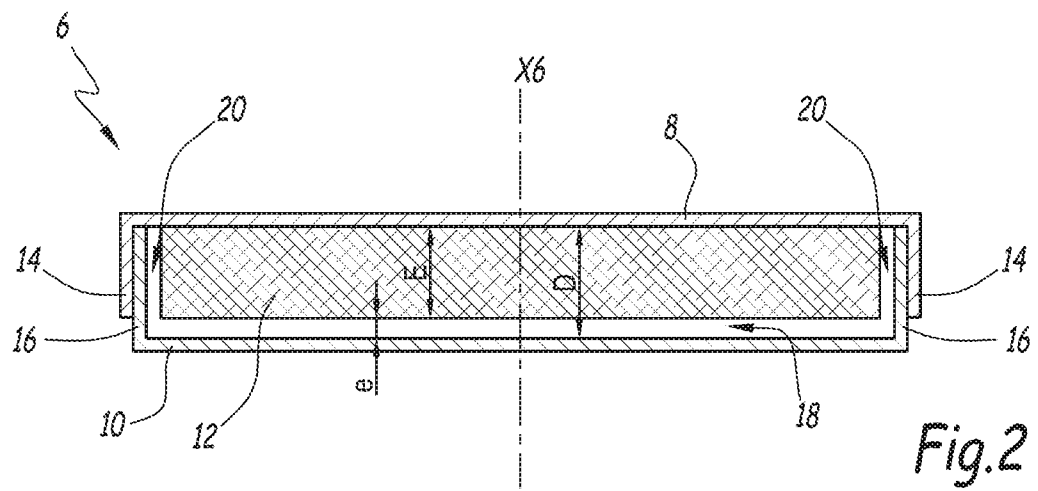
10. Air handling unit (1) including a plurality of modules (2) and a plurality of components, each module including a component, the component being:

- a ventilation unit,
- a heating battery and/or a cooling battery,
- at least one filter,
- movable slat shutters,
- a recuperation unit, and
- a humidifier,

the unit being characterized in that at least one module (2) is according to Claim 9.



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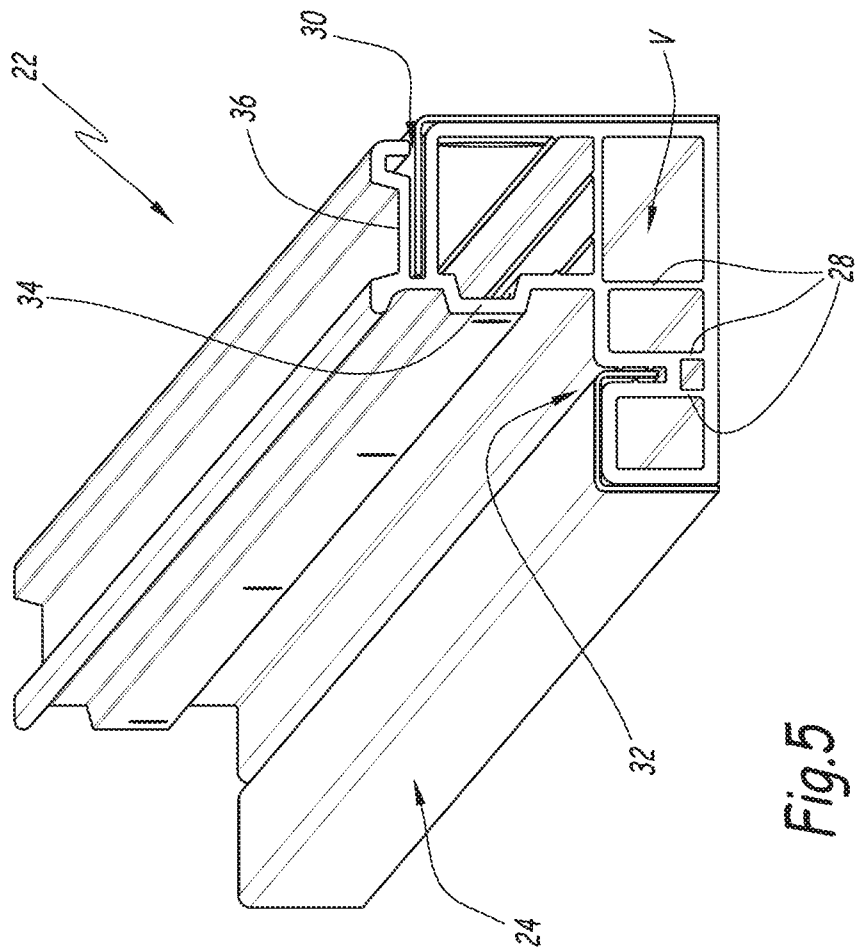


Fig. 5

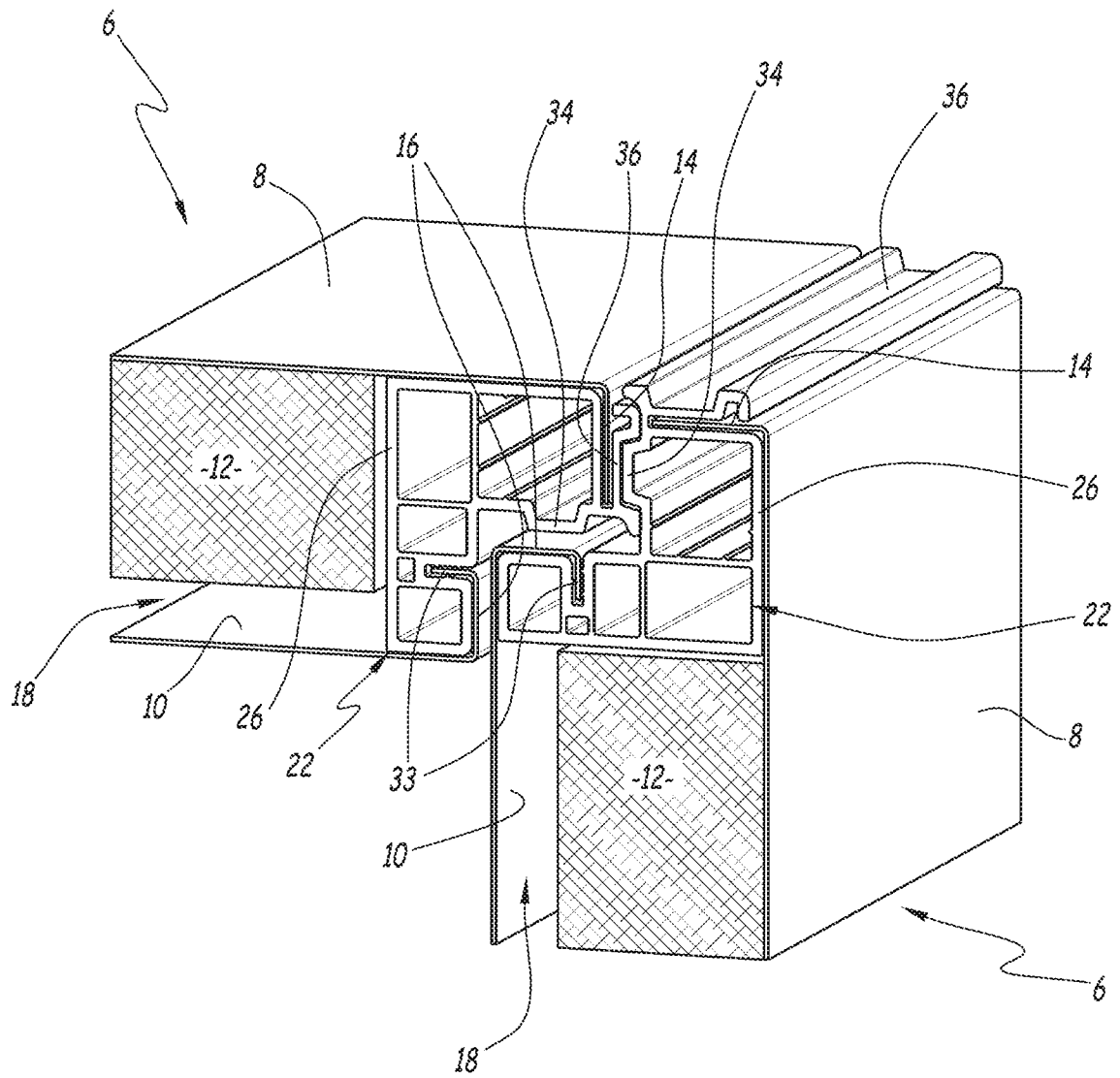


Fig.6

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. F24F13/20 F24F13/02 E04B1/76 E04C2/292
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24F E04B E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	----- BE 627 910 A (ÉMAILLERIES J.CRAHAIT) 29 May 1963 (1963-05-29) page 5, lines 3-14; figure 2	1-10
X	----- FR 1 181 352 A (ERNST KOLLER) 15 June 1959 (1959-06-15) page 1, line 38 - page 2, line 32; figure 2 ----- -/-	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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