



(11) **EP 3 636 843 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.04.2020 Bulletin 2020/16

(51) Int Cl.:
E04B 1/94 (2006.01) **E04B 1/80 (2006.01)**
E04B 1/86 (2006.01)

(21) Application number: **19203119.3**

(22) Date of filing: **14.10.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

- **Knauf Insulation Operation GmbH**
84359 Simbach am Inn (DE)
- **Knauf Insulation SPRL**
4600 Visé (BE)

(72) Inventors:
• **DENK, Josef**
1435 Mont Saint Guibert (BE)
• **GRÄF, Gerhard**
1435 Mont Saint Guibert (BE)

(30) Priority: **12.10.2018 GB 201816679**

(71) Applicants:
• **Knauf Insulation GmbH**
9586 Fürnitz (AT)

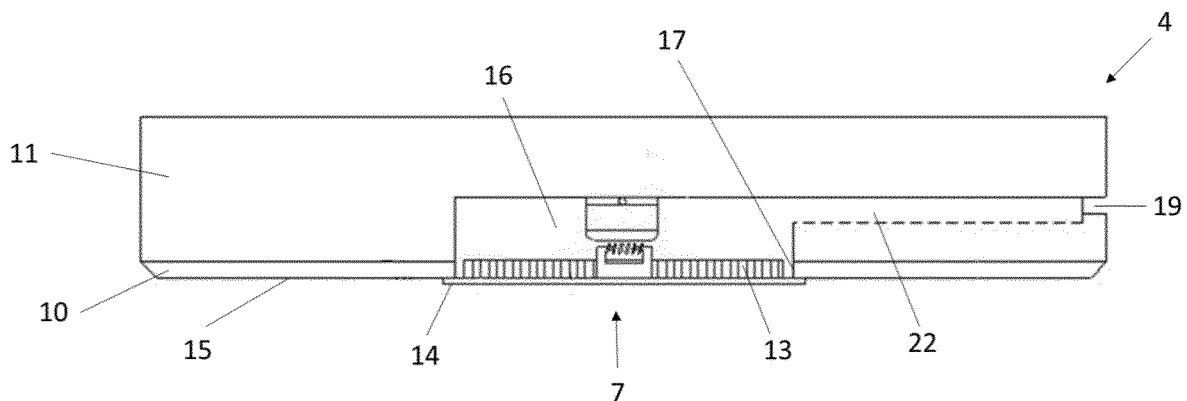
(74) Representative: **ARC-IP**
ARC-IP sprl
Rue Emile Francqui 4
1435 Mont-Saint-Guibert (BE)

(54) **INSULATING PANEL SYSTEM**

(57) An insulating panel attached to a building structure comprises a facing layer, notably a wood wool layer, and a thermal insulating layer, notably a mineral wool layer. The insulating panel comprises a component cavity configured to house an electrical component, for example a light fitting, the component cavity comprising i) a cavity portion within the thermal insulating layer and ii) an opening which passes through the facing layer from the first major surface of the insulating panel to the cavity portion within the thermal insulating layer. An electrical compo-

nent is housed within the component cavity, the electrical component comprising i) a portion projecting through the facing layer and ii) an electrical connector positioned within the component cavity. An electrical wire connected to the electrical connector runs through a wire channel provided along the entire length of a side surface of the insulating panel and into the component cavity via a wire passage connecting the component cavity and the wire channel.

Fig 5



EP 3 636 843 A1

Description

[0001] This invention relates to an insulating panel system, particularly but not exclusively an insulating panel system for car park ceilings having a plurality of spaced lights or other electrical components arranged in the ceiling, and to associated insulating panels and methods.

[0002] Insulating panels having a facing layer of wood wool and a backing layer of thermal insulating material, for example of mineral wool or insulating foam, provide an advantageous combination of visual, acoustic and thermal insulation properties for car park ceilings. Such panels are generally secured directly to the car park ceiling structure by screws; the screws pass through the insulating panels into the ceiling structure, generally into a concrete slab which forms the ceiling structure, so that the thermal insulating material is held against the ceiling structure with the wood wool layer providing the visible major surface of the panel. Once the insulating panel system has been completed, lights are often installed at spaced positions in the car park ceiling, for example by attaching lights to the insulating panels at desired positions and running electrical wires to power the lights over the visible surface of the wood wool layer. Alternatively, lighting tracks may be secured to the insulating panels with the lights arranged at desired positions along the tracks; in this case, electrical wires to power the lights may be arranged within the tracks.

[0003] One aim of the invention is to provide an improved insulating panel system for applications where an electrical component requiring connecting wires is installed at at least one of the panels, for example for car park ceilings.

[0004] According to one aspect, the present invention provides an insulating panel system as defined in claim 1; preferably, the first and second insulating panels have different configurations, notably with the first insulating panel comprising a component cavity adapted to house an electrical component, for example a light, and the second insulating panel not comprising such a component cavity. The system is thus particularly suitable for providing an arrangement in which electrical components are provided at some but not all of the insulating panels in an insulating panel system. Other aspects are defined in other dependent claims. The dependent claims define preferred and/or alternative embodiments.

[0005] According to another aspect, the present invention provides an insulating panel attached to a building structure, in which the insulating panel comprises:

- a facing layer; and
- a thermal insulating layer,

wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being positioned between the facing layer and the building structure;

characterised in that the insulating panel further comprises:

- a component cavity configured to house an electrical component, the component cavity comprising i) a cavity portion within the thermal insulating layer and ii) an opening which passes through the facing layer from a first major surface of the insulating panel to the cavity portion within the thermal insulating layer;
- an electrical component housed at least partially within the component cavity, the electrical component comprising a portion projecting through the facing;
- a wire channel provided in and running along the entire length of a side surface of the insulating panel; and
- a wire passage connecting the component cavity and the wire channel;

and in which an electrical wire connected to the electrical component runs through the wire passage and along the wire channel.

[0006] According to a second aspect, the present invention provides an insulating panel for attachment to a building structure, in which the insulating panel comprises:

- i) a facing layer; and
- ii) a thermal insulating layer;

wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure;

characterised in that the insulating panel further comprises:

- a component cavity configured to house an electrical component, the component cavity comprising i) a cavity portion within the thermal insulating layer and ii) an opening which passes through the facing layer from the first major surface of the insulating panel to the cavity portion within the thermal insulating layer;
- a wire channel adapted to house an electrical wire, the wire channel being provided in and running along a side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel; and
- a wire passage adapted to house an electrical wire, the wire passage connecting the component cavity and the wire channel.

[0007] According to a third aspect, the present invention provides an insulating panel for attachment to a building structure, in which the insulating panel comprises:

- i) a facing layer; and
- ii) a thermal insulating layer;

wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure;

characterised in that the insulating panel further comprises:

- a wire channel adapted to house an electrical wire, the wire channel being provided in and running along a side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel; and
- a wire passage adapted to house an electrical wire, the wire passage providing at least part of a connection between the wire channel and an opening in the major surface of the insulating panel.

[0008] According to a fourth aspect, the present invention provides an insulating panel for attachment to a building structure, notably for assembly adjacent to an insulating panel in accordance with the second or third aspect to form a building system, in which the insulating panel comprises:

- i) a facing layer; and
- ii) a thermal insulating layer;

wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure;

characterised in that the insulating panel further comprises:

- a wire channel provided in and running along a side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel, and being adapted to house an electrical wire, the wire channel being configured to connect with the wire channel of an adjacent insulating panel.

[0009] The electrical component is preferably a light fixture or a light; it may be an emergency sign; it may be an emergency sign and/or emergency light, notably provided with power from a secure power supply and/or a battery; it may be a loudspeaker; it may be a sensor, for example a motion sensor or proximity sensor. The electrical component may be a sensor which detects the presence of a vehicle in a parking bay. The wire is preferably

an electrical power wire which provides electrical power to the electrical component; it is preferably configured to provide electrical energy at a voltage which is between 90 V and 130 V and/or which is between 210 V and 250 V, notably an AC voltage. The electrical component may comprise an electrical connector to which the wire is intended to be connected; such an electrical connector is preferably positioned within the component cavity. The electrical component may comprise a bus system wiring or a twisted pair.

[0010] The component cavity in the insulating panel is configured to house the electrical component, for example a light fixture, so that at least part of the electrical component is arranged within the insulating panel; this allows, for example, the installation of a light fixture having a light emitting portion which is flush with, or which projects slightly from the insulating panel, with a portion of the light fixture being housed within the insulating panel. The electrical component may be an interference fit in the component cavity. The component cavity may comprise one or more recesses and/or projections adapted to retain the electrical component.

[0011] The provision of a wire channel running along a side surface of the insulating panel together with a wire passage connecting the component cavity and/or an opening in the major surface with the wire channel facilitates electrical connection(s) to the electrical component, notably in a way which avoids the need to run electrical wires over the facing layer and in a way in which the electrical wires can be conveniently concealed from view and/or external exposure. The component cavity may provide an optional intermediate portion between the wire passage and an opening in the major surface of the insulating panel.

[0012] The invention is particularly suitable for use in arrangements where, once installed, a rear surface of the insulating panel is not accessible. This is the case where, for example, the insulating panels are secured against a surface, for example against a wall or against a ceiling, without an intervening space.

[0013] The invention is particularly advantageous for providing an insulating panel system over large surfaces, for example providing an insulating panel system covering an area which is $\geq 100 \text{ m}^2$, $\geq 500 \text{ m}^2$ or preferably $\geq 1000 \text{ m}^2$. In this or other configurations, insulating panels housing electrical components may be arranged at selected, spaced positions within the insulating panel systems. Particularly in such arrangements, the insulating panels housing electrical components may be arranged as part of a row of insulating panels with the electrical wire connected to the electrical component running along interconnecting wire channels provided in each of the insulating panels of a row.

[0014] The building structure is preferably a structure of a car park; it may be a structure of a storage area; it may be the structure of a cellar. The building structure may be substantially vertical; it may be a wall; it may be a pillar. The building structure may be substantially hor-

horizontal; it is preferably a ceiling. In one preferred embodiment, the building structure is a ceiling of a car park, particularly where the insulating panel system covers an area which is $\geq 1000 \text{ m}^2$. The insulating panels are preferably secured directly against the building structure, notably against a substantially planar surface of a building structure, so that the thermal insulating layer contacts the building structure.

[0015] The facing layer may comprise a wood wool board, that is to say a board comprising wood wool fibres arranged in an irregular geometry to form an open-pore, three-dimensional structure in which the wood wool fibres are held together by a binder. The wood wool fibres may comprise wood wool fibres having:

- a length which is $\geq 2.5 \text{ cm}$, $\geq 7 \text{ cm}$ or $\geq 10 \text{ cm}$, and/or $\leq 50 \text{ cm}$, $\leq 30 \text{ cm}$ or $\leq 20 \text{ cm}$; and/or
- a width which is $\geq 0.8 \text{ mm}$ or $\geq 1.8 \text{ mm}$ and/or $\leq 5.2 \text{ mm}$ or $\leq 4.2 \text{ mm}$; and/or
- a thickness of $\geq 0.1 \text{ mm}$ or $\geq 0.5 \text{ mm}$ and/or $\leq 3.2 \text{ mm}$ or $\leq 1.2 \text{ mm}$.

Preferably such fibres make up at least 80% by weight of the wood wool fibres. The structure of the wood wool layer may have a porosity which is $\geq 30\%$ by volume, $\geq 40\%$ by volume, $\geq 50\%$ by volume or $\geq 60\%$ by volume. The wood wool binder is preferably an inorganic binder; it may comprise cement, magnesia, caustic magnesia, silicates, gypsum or mixtures thereof. The amount of binder in the wood wool layer, based on the total weight of the wood wool layer, may be $\geq 10 \text{ %wt}$, $\geq 20 \text{ %wt}$, $\geq 30 \text{ %wt}$, $\geq 40 \text{ %wt}$ and/or $\leq 70\text{wt}$ or $\leq 60\text{wt}$.

The facing layer, particularly where this is a wood wool layer, may be in the form of a panel, notably a panel having a substantially rectangular shape. The facing layer, particularly when this is a wood wool layer, may have a thickness which is $\geq 3 \text{ mm}$, $\geq 5 \text{ mm}$, $\geq 8 \text{ mm}$ or $\geq 10 \text{ mm}$ and/or $\leq 35 \text{ mm}$, $\leq 30 \text{ mm}$, $\leq 25 \text{ mm}$ or $\leq 20 \text{ mm}$.

The wood wool is preferably wood wool in accordance with European standard EN 13168, the contents of which is hereby incorporated by reference.

It is preferred that the facing layer is a wood wool board; this provides an advantageous combination of acoustic and fire-resistant properties.

[0016] The facing layer may comprise: a gypsum board, a fibre-reinforced gypsum board, a fibre-cement board; a polymer board such as a poly(methyl methacrylate) board. In one embodiment, the facing comprises two boards secured together, for example by an adhesive, particularly a wood wool board and a board selected from a gypsum board, a fibre-reinforced gypsum board, a fibre-cement board and a polymer board such as a poly(methyl methacrylate) board.

[0017] In a preferred embodiment, the thermal insulating layer is a mineral wool layer, notably a layer of stone wool. Notably when it is stone wool, the mineral wool layer may have a density which is $\geq 60 \text{ kg/m}^3$ or $\geq 70 \text{ kg/m}^3$ and/or $\leq 140 \text{ kg/m}^3$ or $\leq 120 \text{ kg/m}^3$. Such densities

may be used to provide a suitable combination of weight, compression strength, thermal performance and fire resistance. In an alternative embodiment, the thermal insulating layer is a layer of glass wool, preferably a layer of glass wool having a density which is $\geq 60 \text{ kg/m}^3$ or $\geq 70 \text{ kg/m}^3$ and/or $\leq 140 \text{ kg/m}^3$ or $\leq 120 \text{ kg/m}^3$. The mineral wool binder may comprise an organic binder, notably with a binder content which is $\geq 1 \text{ wt\%}$ or $\geq 2 \text{ wt\%}$ and/or $\leq 7 \text{ wt\%}$ or $\leq 6 \text{ wt\%}$. The binder content may be measured by loss on ignition. The thermal insulating layer preferably comprises $\geq 90 \text{ wt\%}$ or $\geq 94 \text{ wt\%}$ mineral fibres and/or $\leq 99 \text{ wt\%}$ mineral fibres.

[0018] It is particularly preferred for the thermal insulating layer to be a mineral wool board and for the facing layer to be a wood wool board. An insulating panel comprising a wood wool facing layer and a mineral wool thermal insulating layer provides a particularly advantageous combination of weight, compression strength, thermal performance, fire resistance and acoustic performance.

[0019] The thermal insulating layer may comprise a foam layer, for example of polystyrene, extruded polystyrene (XPS), expanded polystyrene (EPS), polyurethane, or polyisocyanurate. Preferred foam materials are EPS, white EPS (i.e. EPS free of heat absorbing additives) or grey EPS (i.e. EPS comprising heat absorbing additives, notably graphite particles or aluminium particles). Where the thermal insulating layer comprises a foam layer, the foam preferably makes up at least 90 wt% of the thermal insulating layer.

[0020] The thermal insulating material, particularly where this comprises a mineral wool layer, may have a thickness which is $\geq 20 \text{ mm}$, $\geq 50 \text{ mm}$ or $\geq 70 \text{ mm}$, and/or $\leq 300 \text{ mm}$, $\leq 220 \text{ mm}$ or $\leq 200 \text{ mm}$. Preferably, the thermal insulating material, and indeed the insulating panel, has a compression strength which is $\geq 20 \text{ kPa}$ or $\geq 30 \text{ kPa}$ measured in accordance with EN826; this provides stability when secured to the building structure.

[0021] In a preferred embodiment, the insulating panel has a single facing layer and a single thermal insulating layer. Alternatively, the insulating panel may have a thermal insulating layer, notably a single thermal insulating layer, sandwiched between two facing layers, notably between two facing layers each made of wood wool. The insulating panel is preferably a unitary insulating panel, that is to say a panel in which the facing layer and the thermal insulating layer are permanently attached together, for example by one or more adhesive layers. This facilitates handling and installation of the insulating panels. The insulating panels may have:

- a width which is $\geq 45 \text{ cm}$ or ≥ 55 and/or $\leq 125 \text{ cm}$ or $\leq 105 \text{ cm}$; and/or
- a length which is $\geq 90 \text{ cm}$ or $\geq 100 \text{ cm}$ and/or $\leq 200 \text{ cm}$ or $\leq 180 \text{ cm}$ or $\leq 150 \text{ cm}$; and/or
- a thickness which is $\geq 50 \text{ mm}$ or $\geq 70 \text{ mm}$ and/or $\leq 300 \text{ mm}$ or $\leq 220 \text{ mm}$ or $\leq 200 \text{ mm}$; and/or
- a lambda value which is $\leq 0.1 \text{ W/m.K}$, preferably $\leq 0.05 \text{ W/m.K}$, more preferably $\leq 0.04 \text{ W/m.K}$ when

measures at 10°C, notably in accordance with EN 12677.

[0022] The component cavity may be spaced from the second major surface of the insulating panel by a cavity closure, notably by a cavity closure formed by a continuous portion of the thermal insulating layer. This allows the electrical component to be housed within the insulating panel without being exposed to the support structure to which the insulating panel is attached. It also allows for a continuous surface of the insulating layer which will be secured to the building structure.

[0023] The wire channel preferably extends along the entire length of the side surface of the insulating panel. This allows for continuity of the wire channel with wire channels of adjacent insulating panels to provide inter-connecting wire channels along the side edges or each insulating panel assembled as a row of insulating panels. The wire channel is preferably provided in the thermal insulating layer, particularly where the facing layer is a wood wool layer and the thermal insulating layer is mineral wool or foam; this facilitates provision of the wire channel in the insulating panel, for example by machining. It also facilitates hiding of a wire in the wire channel from view. Furthermore, it may be used to avoid fragilizing the facing layer. Preferably, the wire channel is provided in the form of a recess in the said side surface of the insulating panel, the recess being open at the said side surface of the insulating panel. This facilitate placing of a wire within the wire channel, notably once the insulating panel has already been attached to the building structure. It also facilitates providing of the wire channel, for example by machining of the insulating panel and/or of the thermal insulating layer, for example using a router, mill or circular saw.

[0024] The cross section of the wire channel may be constant. The cross section of the wire channel or at least a portion of the cross section of the wire channel may be adapted to provide an interference fit with the wire; this facilitate a press-fit retention of the wire within the wire channel. The cross section of the wire channel may be ≥ 2 mm or ≥ 3 mm and/or ≤ 20 mm, ≤ 15 mm, ≤ 12 mm or ≤ 10 mm.

[0025] The wire channel may be provided along a single side surface of the insulating panel. Alternatively, a wire channel may be provided along two side surfaces of the insulating panel, notably two opposite side surfaces; this allows an individual panel to be arranged in more than one configuration whilst still providing connection between at least one of its wire channels and the wire channel of an adjacent insulating panel.

[0026] The wire passage connects the component cavity and/or an opening in the major surface of the insulating panel with the wire channel thus allowing the wire to pass from the electrical component, for example within the component cavity, via the wire passage to the wire channel and via the wire channel for connection to, for example, a power supply. The wire passage is preferably pro-

vided through the thermal insulating layer, preferably entirely within the thermal insulating layer. It may be provided by drilling through the thermal insulating layer. Such configurations may be used to avoid fragilizing the facing layer. The minimum cross-section of the wire passage is preferably adapted to provide a clearance fit for the wire; this allows easy feeding of the wire through the wire passage. The wire passage may have a cross section which is ≥ 2 mm or ≥ 3 mm and/or ≤ 20 mm, ≤ 15 mm, ≤ 12 mm or ≤ 10 mm. Preferably, the minimum cross-section of the wire passage is greater than the minimum cross-section of the wire channel, notably so that the minimum cross-section of the wire passage is adapted to provide a clearance fit for the wire allowing easy feeding of the wire through the wire passage and the minimum cross section of the wire channel is adapted to provide an interference fit with the wire to facilitate a press-fit retention of the wire within the wire channel.

[0027] The wire passage is preferably arranged such that the angle of deflection of a wire from its orientation in the wire channel to its orientation in the wire passage is $\leq 80^\circ$; $\leq 70^\circ$ or preferably $\leq 60^\circ$ and/or $\geq 10^\circ$, $\geq 20^\circ$ or preferably $\geq 30^\circ$. The wire passage is thus preferably arranged such that the angle of deflection between the wire passage and the wire channel is $\leq 80^\circ$; $\leq 70^\circ$ or preferably $\leq 60^\circ$ and/or $\geq 10^\circ$, $\geq 20^\circ$ or preferably $\geq 30^\circ$. This facilitates passage of the wire by controlling both the angling and length of the wire passage and avoids difficulties associated with kinking the wire through too great a deflection.

[0028] The electrical wire(s) may be provided within a wire conduit, notably a flexible wire conduit, running within:

- a portion of or the entire wire channel and/or
- a portion of or the entire wire passage.

The wire conduit may be a tube, particularly a plastics tube. Preferably the wire conduit is arranged to be press-fitted into the wire channel and is retained in the wire channel by an interference fit, notably an interference fit between an outside periphery of the wire conduit and at least a portion of the wire channel.

In a preferred embodiment, the wire conduit is flexible enough to bend from the wire channel to the wire passage; this is facilitated by arranging an angle of deflection between the wire passage and the wire channel which is $\leq 80^\circ$; $\leq 70^\circ$ or preferably $\leq 60^\circ$ and/or $\geq 10^\circ$, $\geq 20^\circ$ or preferably $\geq 30^\circ$. Such an angle also facilitates feeding a wire through the conduit and through the deflection between the wire channel and the wire passage.

In embodiments where a wire conduit is provided, the conduit preferably runs continuously through the entire length of the wire passage and through the entire length of the portion of the wire passage which runs between i) the intersection of the wire passage with the wire channel and ii) an end of the wire passage at an end of the panel i.e. the position at which the wire channel of the panel

will cooperate with a wire channel of an adjacent panel when present. Preferably, a single piece wire conduit is provided notably at the intersection between the wire passage and wire channel and more preferably for the entire distance from the component cavity, through the wire passage and through the wire channel to an end of the panel; this facilitates passing a wire through the conduit and helps to avoid snagging of the wire.

[0029] Preferably, the insulating panel comprises:

- a first wire passage connecting the component cavity and/or an opening in the major surface of the insulating panel with a first position along the wire channel and being adapted to house a first electrical wire portion; and
- a second wire passage connecting the component cavity and/or an opening in the major surface of the insulating panel with a second position along the wire channel and being adapted to house a second electrical wire portion.

This allows, for example, for housing of i) a first wire providing a connection via the first wire passage to a first end of the insulating panel and ii) a second wire providing a connection via the second wire passage to a second, opposite end of the insulating panel. This facilitates provision of electrical wire(s) along the side edges of each of a row of adjacent insulating panels.

[0030] According to a fifth aspect, the present inventing provides a method of installing a plurality of insulating panel at a building structure, comprising:

- securing a first row of abutting insulating panels in accordance with the fourth aspect of the invention at a building structure, the first row of abutting insulating panels comprising at least one insulating panel in accordance with the second and/or third aspect of the invention and the wire channels of each abutting insulating panel forming a row of interconnecting wire channels along the first row of abutting insulating panels;
- subsequently positioning at least one electrical wire such that the electrical wire passes along the wire channels of the abutting insulating panels and through the wire passage, notably in to the component cavity of at least one insulating panel and/or towards an opening in the major surface of the insulating panel; and
- subsequently arranging a second row of abutting insulating panels at the building structure so as to abut the first row of abutting insulating panels and so as to cause the electrical wire in the wire channels to be hidden behind a surface formed by the abutting first and second rows of insulating panels.

This allows an insulating panel system to be installed including hidden wires which will be used to connect electrical components to be housed, for example, in the com-

ponent cavity of the insulating panel(s) and/or at an opening in the major surface of the insulating panel.

[0031] Subsequent to arranging the second row of abutting insulating panels at the building structure, an electrical component is preferably installed in the component cavity of the at least one insulating panel or at an opening in the major surface of the insulating panel and electrically connected to the portion of the wire positioned within the component cavity or at the opening in the major surface of the insulating panel. These steps may be carried out by a qualified electrician once all of the insulating panels of the panel system have been secured to the building structure.

[0032] In accordance with a sixth aspect, the present invention provides a method of manufacturing an insulating panel, notably for attachment to a building structure, notably an insulating panel in accordance with the second, third or fourth aspects, in which the method comprises:

- providing an insulating panel comprises: a facing layer and a thermal insulating layer, wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure; and
- subsequently machining a wire channel in and running along the length of a side surface of the insulating panel, notably a wire channel adapted to house an electrical wire along the said side surface of the insulating panel, notably a wire channel configured to connect with the wire channel of an adjacent insulating panel.

[0033] When the sixth aspect is used to manufacture a panel in accordance with the second or third aspect, the method preferably comprises, subsequent to machining the wire channel, machining at least one wire passage, for example by drilling. Alternatively, the wire passage(s) may be machined in the insulating panel prior to machining the wire channel.

[0034] In accordance with a seventh aspect, the present invention provides a method of manufacturing an insulating panel, notably for attachment to a building structure, notably an insulating panel in accordance with the second aspect, in which the method comprises:

- providing an insulating panel comprises: a facing layer and a thermal insulating layer, wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the

- building structure; and
- subsequently machining the component cavity in the insulating panel.

According to this aspect, step of providing an insulating panel preferably comprises providing an insulating panel having a continuous facing layer and a continuous thermal insulating layer and the step of machining the component cavity preferably comprises machining the facing layer and machining the thermal insulating layer through the facing layer to provide the component cavity.

[0035] In accordance with an eighth aspect, the present invention provides for use in an insulating panel comprising a facing layer and a thermal insulating layer wherein the facing layer and the insulating layer are preferably secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure; of :

- a wire channel adapted to house an electrical wire, the wire channel being provided in and running along a side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel; and
- a wire passage adapted to house an electrical wire, the wire passage providing at least part of a connection between the wire channel and an opening in the major surface of the insulating panel;

to provide a pathway for an electrical wire.

[0036] In accordance with a ninth aspect, the present invention provides an insulating panel for attachment to a building structure, notably an insulating panel in accordance with any preceding aspect, in which the insulating panel comprises:

- i) a facing layer; and
- ii) a thermal insulating layer

wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure; characterised in that the insulating panel further comprises:

- a wire channel provided in and running along a portion of the side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel, the wire channel being configured to connect with the wire channel of an adjacent insulating panel; and

- at least one and preferably a single wire conduit provided in and running within the wire channel and being adapted to house an electrical wire, the wire conduit being configured to connect with a wire conduit provided in an running within a wire channel of an adjacent insulating panel.

[0037] In accordance with a tenth aspect, the present invention provides an insulating panel for attachment to a building structure, notably an insulating panel in accordance to the ninth aspect, in which the insulating panel comprises:

- i) a facing layer; and
- ii) a thermal insulating layer

wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure;

characterised in that the insulating panel further comprises:

- a component cavity configured to house an electrical component, the component cavity comprising i) a cavity portion within the insulating panel, notably within thermal insulating layer and ii) an opening which passes through the facing layer from the first major surface of the insulating panel to the cavity portion within the thermal insulating layer;
- a wire channel provided in and running along a portion of the side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel, the wire channel being configured to connect with the wire channel of an adjacent insulating panel;
- a wire passage connecting the component cavity and the wire channel,
- at least one and preferably a single wire conduit provided in and running within the wire channel and preferably within the wire passage, the wire conduit being adapted to house an electrical wire and being configured to connect with a wire conduit of an adjacent insulating panel.

[0038] As used herein, the term wire conduit means a pipe, channel, tubing or sleeve through which electrical wires may be passed. The wire conduit may be made of a plastics material, for example PVC; it may be metal, for example aluminium. Preferably, an inside surface of the wire conduit is smooth and/or substantially free of ridges and/or obstructions; this facilitates passing of the wire through the conduit. The wire conduit is preferably flexible; this facilitates passage of the conduit around an angle between the wire passage and the wire channel.

The conduit may have an outside diameter which is ≥ 10 mm or ≥ 15 mm and/or ≤ 40 mm, ≤ 30 mm or ≤ 25 mm. An outside diameter which is ≥ 18 mm and ≤ 22 mm is particularly suitable. Where the insulating panel(s) are configured for use with a wire conduit, the wire channel is preferably configured such that the depth of the wire channel (measured from the side surface of the insulating panel) entirely accommodates the dimension of the wire conduit and the height of the wire channel (measure perpendicular to the major surface of the insulating panel) is slightly smaller than the dimension of the wire conduit. The height of the wire channel may be between about 1mm and 5mm less than the dimension of the wire conduit; a wire channel height which is about 2mm less than the dimension of the wire conduit is particularly suitable, notably when the thermal insulating material is mineral wool. For example, when a cylindrical conduit having an outside diameter of 20 mm is used, the wire channel may have a depth of 20 mm and a height of 18mm. This facilitates arranging the wire conduit in the wire channel as a press-fit. Preferably, a single conduit extends along the length of the wire channels of a plurality of adjacent insulating panels; this facilitates passage of a wire through the wire channels of adjacent insulating panels.

[0039] According to an eleventh aspect, the present invention provides a method of installing a plurality of insulating panels at a building structure, notably i) an insulating panel system in accordance the first aspect or ii) adjacent insulating panels including at least one insulating panel in accordance with the ninth aspect and at least one insulating panel according to the tenth aspect, comprising:

- securing a first row of abutting insulating panels at a building structure, notably at a ceiling of a car park, the insulating panels comprising a facing layer and a thermal insulating layer, wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure, the insulating panels further comprising a wire channel provided in and running along the length of a side surface of each insulating panel and being adapted to house an electrical wire along the said side surface of the insulating panel, the wire channels of each insulating panel connecting with the wire channel of an adjacent insulating panel, and the first row of abutting insulating panels comprising at least one insulating panel comprising a wire passage adapted to house an electrical wire, the wire passage providing at least part of a connection between the wire channel and an opening in the major surface of the said insulating panel;
- subsequently positioning at least one wire conduit in the wire passage and wire channel of the first insu-

lating panel such that the at least one wire conduit passes along the wire channels of the abutting insulating panels and through the wire passage of at least one insulating panel; and

- 5 - subsequently arranging a second row of abutting insulating panels at the building structure so as to abut the first row of abutting insulating panels and so as to cause the wire conduit in the wire channels to be hidden behind a surface formed by the abutting first and second rows of insulating panels; and
- 10 - subsequently passing at least one electrical wire through the wire conduit such that the electrical wire passes along the wire channels of the abutting insulating panels and through the wire passage of at least one insulating panel.

Preferably, subsequent to arranging the second row of abutting insulating panels at the building structure, the method comprises installing an electrical component at at least one of the insulating panels and electrically connecting the electrical component to a portion of the electrical wire projecting from the wire passage.

Preferably, positioning the at least one wire conduit in the wire passage comprises positioning a single wire conduit such that the single wire conduit extends between at least two adjacent insulating panels.

The steps up to and including arranging the second row of abutting insulating panels at the building structure may be carried out by a person specialised in installing such panels and the steps of i) passing at least one electrical wire through the wire conduit and ii) installing an electrical component may be carried out by a qualified electrician. This allows a specialist installer to install the panels and the entire electrical installation to be installed and verified by a qualified electrician.

[0040] According to a twelfth aspect, the present invention provides a method of installing a plurality of insulating panel at a building structure, comprising:

- 40 - securing a first row of abutting insulating panels in accordance with the ninth aspect of the invention at a building structure, the first row of abutting insulating panels comprising at least one insulating panel in accordance with the tenth aspect of the invention and the wire conduits provided within the wire channels of each abutting insulating panel forming a row of interconnecting wire conduits along the first row of abutting insulating panels;
- 45 - subsequently arranging a second row of abutting insulating panels at the building structure so as to abut the first row of abutting insulating panels and so as to cause the interconnected wire conduits in the wire channels to be hidden behind a surface formed by the abutting first and second rows of insulating panels; and
- 50 - subsequently arranging at least one electrical wire such that the electrical wire passes within the interconnected wire conduits along the wire channels of

the abutting insulating panels and through the wire passage, notably into the component cavity of at least one insulating panel and/or towards an opening in the major surface of the insulating panel.

This allows an insulating panel system to be installed including hidden wires which will be used to connect electrical components to be housed, for example, in the component cavity of the insulating panel(s) and/or at an opening in the major surface of the insulating panel. Subsequent to arranging the second row of abutting insulating panels at the building structure, an electrical component is preferably installed in the component cavity of the at least one insulating panel or at an opening in the major surface of the insulating panel and electrically connected to the portion of the wire positioned within the component cavity or at the opening in the major surface of the insulating panel. These steps may be carried out by a qualified electrician once all of the insulating panels of the panel system have been secured to the building structure.

[0041] Preferably, when the electrical component has been connected to the electrical wire and has been installed at the insulating panel, the electrical wire is not exposed at any portion of the major surface of the insulating panel.

[0042] According to yet further aspects, the present invention provides a building provided with one or more insulating panels or building panel systems according to other aspects.

[0043] One or more individual features or aspects described herein may be freely combined, other than where such features or aspects are incompatible with each other.

[0044] Embodiments of the inventions will now be described, by way of example only, with reference to the accompanying drawings of which:

Fig. 1 is a schematic cross-sectional side view of a car park;

Fig 2 is a schematic plan view of a building panel system covering the ceiling of a car park;

Fig 3 and Fig 4 and perspective views of one of the insulating panels of the building panel system;

Fig 5 is a schematic cross-sectional side view of the insulating panel; and

Fig 6 is a schematic cross-sectional plan view of the insulating panel.

[0045] The building structure of the car park of Fig 1 comprises reinforced concrete slabs 1 which form the floors and ceilings of the car park and vertical reinforced concrete pillars 2. A building panel system 3 comprising a plurality of individual insulating panels 4,5,6 is arranged at the ceiling of the building structure, each individual panel being clamped directly against the concrete of the ceiling by screws (not shown) which pass through the panel and into the concrete of the ceiling.

[0046] As illustrated in Fig 2, the building panel system 3 comprises a number of insulating panels 4 each fitted with a light fitting 7 which are intended to illuminate the car park. These electrical component insulating panels 4 are illustrated in Figs 3-6 and are arranged at spaced positions within the building panel system 3. The insulating panels 4, 5, 6 are arranged in rows. An electrical component row 8 of insulating panels comprises a combination of one or more electrical component insulating panel 4 and one or more wired insulating panels 5 which include wire channels. Rows of insulating panels which do not comprise an electrical component insulating panel 4, for example an ordinary row 9 adjacent to an electrical component row 8 of insulating panels, may comprise ordinary insulating panels 6 which do not comprise a wire channel.

[0047] Each insulating panel 4,5,6, in the illustrated embodiment comprises a wood wool facing layer 10 and a mineral wool thermal insulating layer 11. The facing layer and the thermal insulating layer are adhered together to form a unitary panel, for example using binder of the wood wool layer during manufacture or using a separate adhesive. Preferably the panels have a length of 120 cm and a width of 60 cm; this facilitates handling and installation. The wood wool facing layer preferably has a thickness of about 10 mm; the mineral wool insulating layer may have a thickness between about 30mm and 250 depending upon the desired level of thermal insulation. In general, and not limited to the specific embodiment described: the cut-out for receiving an electrical component may have a length of between 20 mm and 900 mm and/or a width of between 20 and 500 mm and/or a depth of between 20 to 290 mm; the shape of the cut-out may be square, rectangle, round, oval, triangular, polygonal; the cut-out may be central or off-centre with respect to an insulating panel.

[0048] An electrical component, in this embodiment a light fitting 7, is housed in a component cavity 12 provided at a central position of an electrical component insulating panel 4 and spaced from each side edge of the insulating panel 4. The light fitting has a light diffuser 13 which is flush with the major surface 15 of the insulating panel and a light frame 14 which projects slightly from the major surface 15. The component cavity 12 comprises a cavity portion 16 within the thermal insulating layer 11, a cavity opening 17 which passes through the facing layer 10 layer from the first major surface 15 of the insulating panel 4 to the cavity portion 16 within the thermal insulating layer 11 and a cavity closure 18 formed by a portion of the thermal insulating panel which separates the cavity portion 16 from the rear major surface of the insulating panel 4.

[0049] Each of the electrical component insulating panels 4 and the wired insulating panels 5 are provided with a wire channel 19. The wire channel 19 is provided as an open sided recess in a side surface of the thermal insulation layer 11 of the insulating panel 4,5 and houses one or more electrical wires 20,21 for connection to the

electrical component 7. The wire channels of adjacent insulating panels 4,5 interconnect thus providing a pathway for running wires along a row 8 of insulating panels, for example to a power supply situated at the end of a row.

[0050] As best seen in Fig 6, each of the electrical component insulating panels 4 is provided with a first 22 and second 23 wire passage. Each wire passage 22,23 connects the cavity 12 and the opening 17 at the major surface 15 with the wire channel 19 so that a wire 22, 21 can be passed via the wire passage 22,23 for connection to the electrical component 7. The wire passages each provide part of a connection between the wire channel and an opening in the major surface of the insulating panel; in the illustrated embodiment, this connection passes from the wire passages to the opening 17 via the component cavity 12. Each wire passage 22,23 is angled such that the angle of deviation α between the wire channel 19 and the wire passage 22,23 for a wire passing from the wire channel 19 into the wire passage 22,23 is about 45°.

[0051] Installation of the building panel system of Fig 2 is preferably carried out in the followings sequential order:

- i) a row 8 of electrical component insulating panels 4 and wired insulating panels 5 is secured to the ceiling of the building structure;
- ii) a first electrical wire 20 is run along the wire channel of adjacent insulating panels and through the first wire passage 22 to provide an end portion of the wire 22 within the cavity 12 for subsequent connect to an electrical component 7;
- iii) a second electrical wire 21 is run along the wire channel of adjacent insulating panels and through the second wire passage 22 to provide an end portion of the wire 22 within the cavity 12 for subsequent connection to an electrical component 7. Provision of both the first and second electrical wires 20,21 is useful for connection of the electrical components in parallel or as an array. Sufficient length or slack is provided for the end portion of each wire to facilitate easy connection to electrical components, for example to allow the end portion of the wire to protrude through the cavity opening 17 for connection to the electrical component;
- iv) a subsequent row 9 of insulating panels 6 is then installed adjacent to the previous row 8. The side surfaces of the insulating panels 6 in the subsequent row 9 abut the side surfaces of the insulation panels in the previous row 8. This results in the wires 20,21 being retained within and hidden from view by the building panel system 3.
- v) once a number of rows of the building panel system 3 have been secured to the building structure such that wire end portions are accessible at the component cavities 12 of each of the electrical component insulating panels, the electrical components 7 are installed and connected to the wires 20,21, for

example by an electrician.

List of reference numbers:

5 **[0052]**

- | | |
|-------|---|
| 1 | concrete slabs |
| 2 | concrete pillars |
| 3 | building panel system |
| 10 4 | electrical component insulating panel |
| 5 | wired insulating panel |
| 6 | ordinary insulating panel |
| 7 | light fitting |
| 8 | electrical component row of insulating panels |
| 15 9 | ordinary row of insulating panels |
| 10 | wood wool facing layer |
| 11 | mineral wool thermal insulating layer |
| 12 | component cavity |
| 13 | light diffuser |
| 20 14 | light frame |
| 15 | major surface of the insulating panel |
| 16 | cavity portion |
| 17 | cavity opening |
| 18 | cavity closure |
| 25 19 | wire channel |
| 20 | first wire |
| 21 | second wire |
| 22 | first wire passage |
| 23 | second wire passage |

30 **Claims**

- 35 1. An insulating panel system for attachment to a building structure, in which the insulating panel system comprises:

a) a first insulating panel comprising:

- 40 i) a facing layer; and
- ii) a thermal insulating layer;

45 wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure;

the first insulating panel further comprising:

- 50
- a component cavity configured to house an electrical component, the component cavity comprising i) a cavity portion within the thermal insulating layer and ii) an opening which passes through the facing layer from the first major surface of the insulating

- panel to the cavity portion within the thermal insulating layer;
- a wire channel adapted to house an electrical wire, the wire channel being provided in and running along a side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel; and
 - a wire passage adapted to house an electrical wire, the wire passage connecting the component cavity and the wire channel; and
- b) a second insulating panel for assembly adjacent to the first insulating panel, the second insulating panel comprising:
- i) a facing layer; and
 - ii) a thermal insulating layer;
- wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure;
- the second insulating panel further comprising:
- a wire channel provided in and running along a side surface of the insulating panel, preferably along the entire length of the side surface of the insulating panel, and being adapted to house an electrical wire, the wire channel being configured to connect with the wire channel of an adjacent insulating panel.
2. An insulating panel system in accordance with any claim 1, in which, in the first insulating panel, the component cavity is spaced from the second major surface of the insulating panel by a cavity closure, notably by a cavity closure formed by a continuous portion of the thermal insulating layer.
 3. An insulating panel system in accordance with claim 1 or claim 2, in which, in the first insulating panel, the wire passage is provided through the thermal insulating layer, preferably entirely within the insulating panel.
 4. An insulating panel system in accordance with any preceding claim, in which the first insulating panel comprises:
 - a first wire passage connecting the component cavity and a first position along the wire channel and being adapted to route a first electrical wire
- portion between the component cavity and the wire channel; and
- a second wire passage connecting the component cavity and a second position along the wire channel and being adapted to route a second electrical wire portion between the component cavity and the wire channel.
5. An insulating panel system in accordance with any preceding claim, in which, in the first and second insulating panels, the wire channel is provided in the thermal insulating layer.
 6. An insulating panel system in accordance with any preceding claim, in which, in the first and second insulating panels, the wire channel is provided in the form of a recess in the said side surface of the insulating panel, the recess being open at the said side surface of the insulating panel.
 7. An insulating panel system in accordance with any preceding claim, in which, in the first and second insulating panels, the facing layer comprises a wood wool panel.
 8. An insulating panel system in accordance with any preceding claim, in which, in the first and second insulating panels, the thermal insulating layer comprises a mineral fibre panel, notably a mineral fibre panel selected from a stone wool panel and a glass wool panel.
 9. An insulating panel system in accordance with any of claims 1 to 7, in which, in the first and second insulating panels, the thermal insulating layer comprises a foam insulation panel, notably a foam insulation panel selected from a polystyrene panel, an expanded polystyrene panel, an extruded polystyrene panel, a polyurethane panel and a polyisocyanurate panel.
 10. An insulating panel system in accordance with any preceding claim, in which:
 - in the first insulating panel, a wire conduit is arranged in the wire passage and in the wire channel; and
 - in the second insulating panel, a wire conduit is arranged in the wire channel.
 11. An insulating panel system in accordance with any preceding claim in which the minimum cross-section of the wire passage is greater than the minimum cross-section of the wire channel, notably an insulating panel system selected from:
 - an insulating system in accordance with any of claims 1 to 9, in which the minimum cross-

section of the wire passage is adapted to provide a clearance fit for a wire intended to be used with the insulating panel system allowing easy feeding of the wire through the wire passage and the minimum cross section of the wire channel is adapted to provide an interference fit with the wire to facilitate a press-fit retention of the wire within the wire channel; and

- an insulating system in accordance with claim 10, in which the minimum cross-section of the wire passage is adapted to provide a clearance fit for a wire conduit intended to be used with the insulating panel system allowing easy feeding of the wire conduit through the wire passage and the minimum cross section of the wire channel is adapted to provide an interference fit with the wire conduit to facilitate a press-fit retention of the wire conduit within the wire channel.

12. An insulating panel system in accordance with any preceding claim, in which the insulating panel system is attached to a building structure, notably attached to the ceiling of a car park, in which,

- for the first and second insulating panels, the thermal insulating layer is positioned between the facing layer and the building structure; and
- the wire channel of the first panel and the wire channel of the second panel connect with each other.

13. An insulating panel configured to provide an insulating panel of an insulating panel system in accordance with any preceding claim.

14. A method of installing a plurality of insulating panels at a building structure, notably an insulating panel system in accordance with any of claims 1 to 12, comprising:

- securing a first row of abutting insulating panels at a building structure, the insulating panels comprising a facing layer and a thermal insulating layer, wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure, the insulating panels further comprising a wire channel provided in and running along the length of a side surface of each insulating panel and being adapted to house an electrical wire along the said side surface of the insulating panel, the wire channels of each insulating panel connecting with the wire channel of an adjacent insulating panel, and the

first row of abutting insulating panels comprising at least one insulating panel comprising a wire passage adapted to house an electrical wire, the wire passage providing at least part of a connection between the wire channel and an opening in the major surface of the said insulating panel;

- subsequently positioning at least one electrical wire such that the electrical wire passes along the wire channels of the abutting insulating panels and through the wire passage of at least one insulating panel; and

- subsequently arranging a second row of abutting insulating panels at the building structure so as to abut the first row of abutting insulating panels and so as to cause the electrical wire in the wire channels to be hidden behind a surface formed by the abutting first and second rows of insulating panels;

- and preferably, subsequent to arranging the second row of abutting insulating panels at the building structure, installing an electrical component at at least one of the insulating panels and electrically connecting the electrical component to a portion of the electrical wire projecting from the wire passage.

15. A method of installing a plurality of insulating panels at a building structure, notably an insulating panel system in accordance with claim 10, comprising:

- securing a first row of abutting insulating panels at a building structure, the insulating panels comprising a facing layer and a thermal insulating layer, wherein the facing layer and the insulating layer are secured together to form the insulating panel with the facing layer forming one of the major surfaces of the insulating panel and the thermal insulating layer being intended to be positioned between the facing layer and the building structure when the insulating panel is attached to the building structure, the insulating panels further comprising a wire channel provided in and running along the length of a side surface of each insulating panel and being adapted to house an electrical wire along the said side surface of the insulating panel, the wire channels of each insulating panel connecting with the wire channel of an adjacent insulating panel, and the first row of abutting insulating panels comprising at least one insulating panel comprising a wire passage adapted to house an electrical wire, the wire passage providing at least part of a connection between the wire channel and an opening in the major surface of the said insulating panel;

- subsequently positioning at least one wire conduit in the wire passage and wire channel of the

first insulating panel such that the at least one wire conduit passes along the wire channels of the abutting insulating panels and through the wire passage of at least one insulating panel; and

- subsequently arranging a second row of abutting insulating panels at the building structure so as to abut the first row of abutting insulating panels and so as to cause the wire conduit in the wire channels to be hidden behind a surface formed by the abutting first and second rows of insulating panels;
- subsequently passing at least one electrical wire through the wire conduit such that the electrical wire passes along the wire channels of the abutting insulating panels and through the wire passage of at least one insulating panel;
- and preferably, subsequent to arranging the second row of abutting insulating panels at the building structure, installing an electrical component at at least one of the insulating panels and electrically connecting the electrical component to a portion of the electrical wire projecting from the wire passage.

5

10

15

20

25

30

35

40

45

50

55

Fig 1

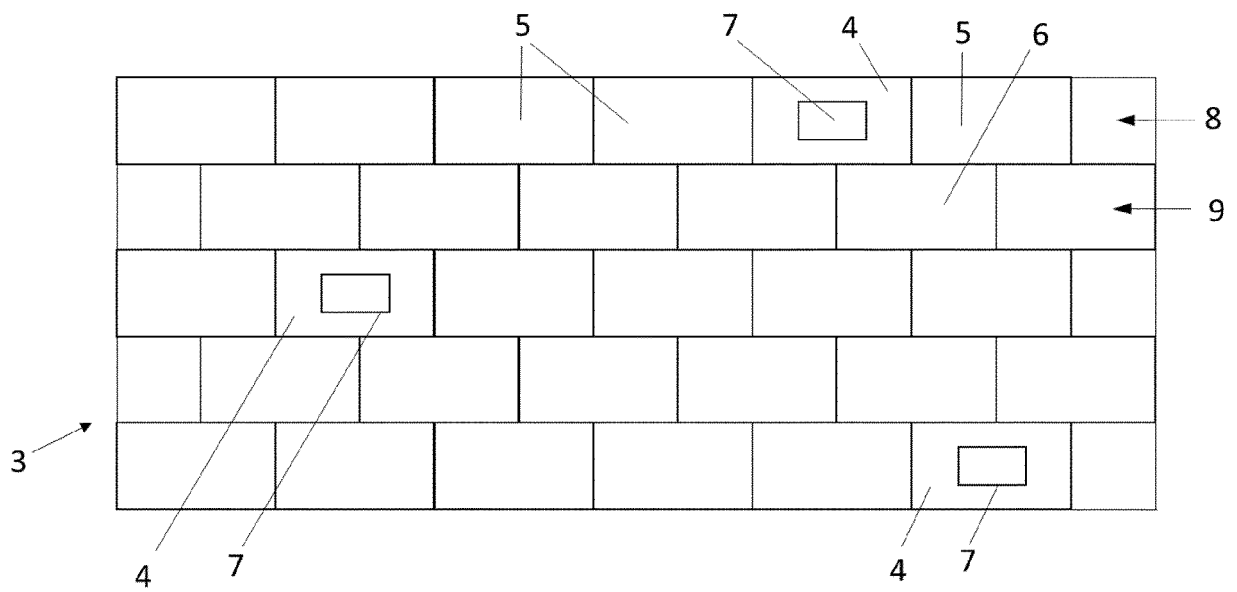
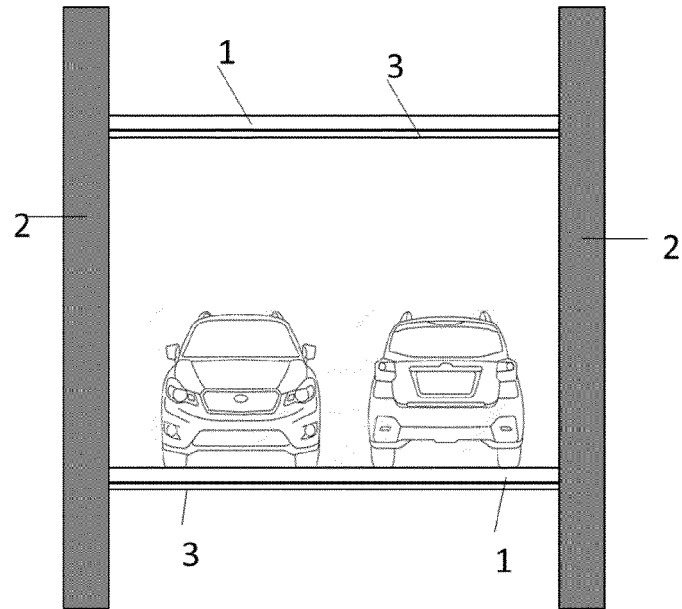


Fig 2

Fig 3

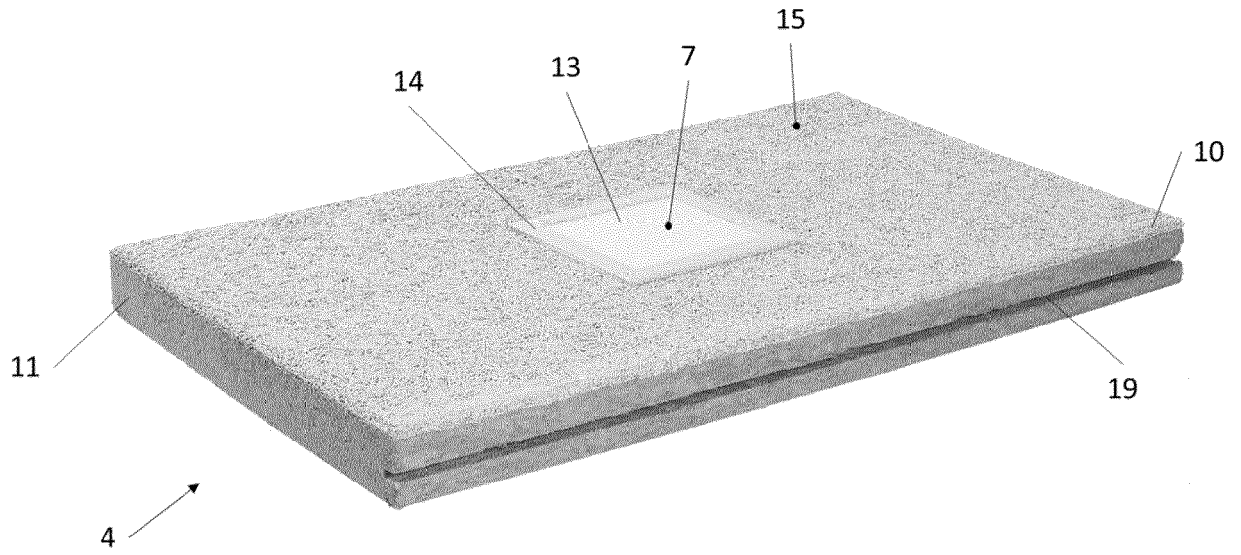


Fig 4

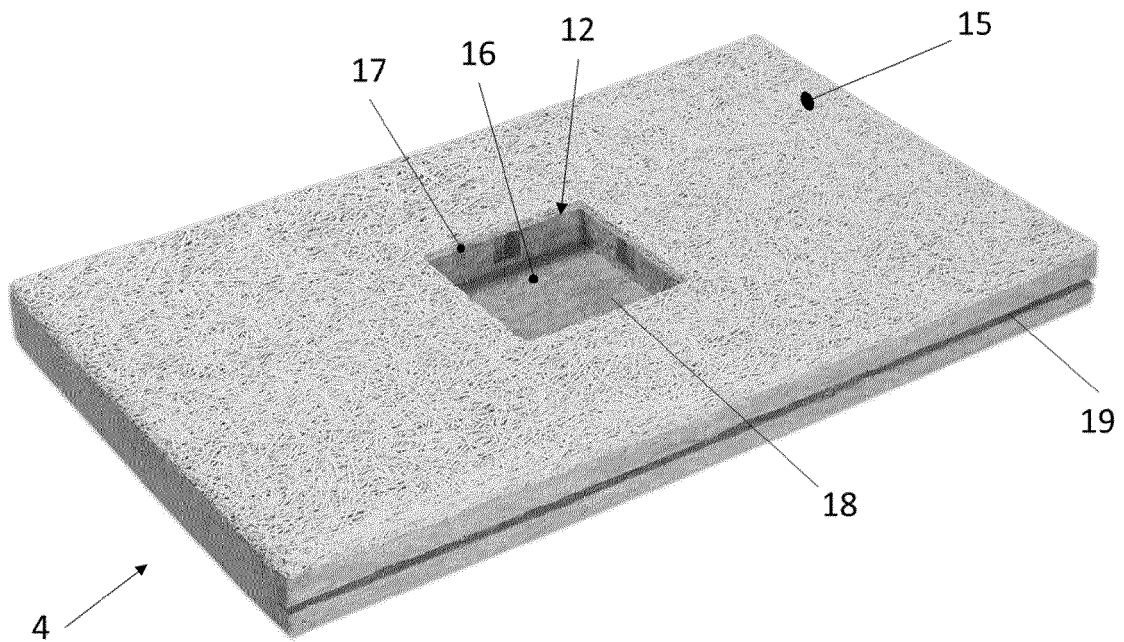


Fig 5

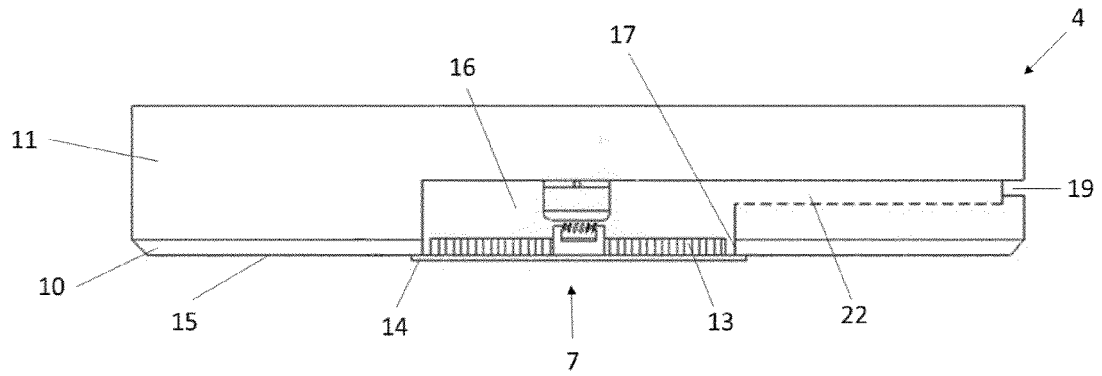
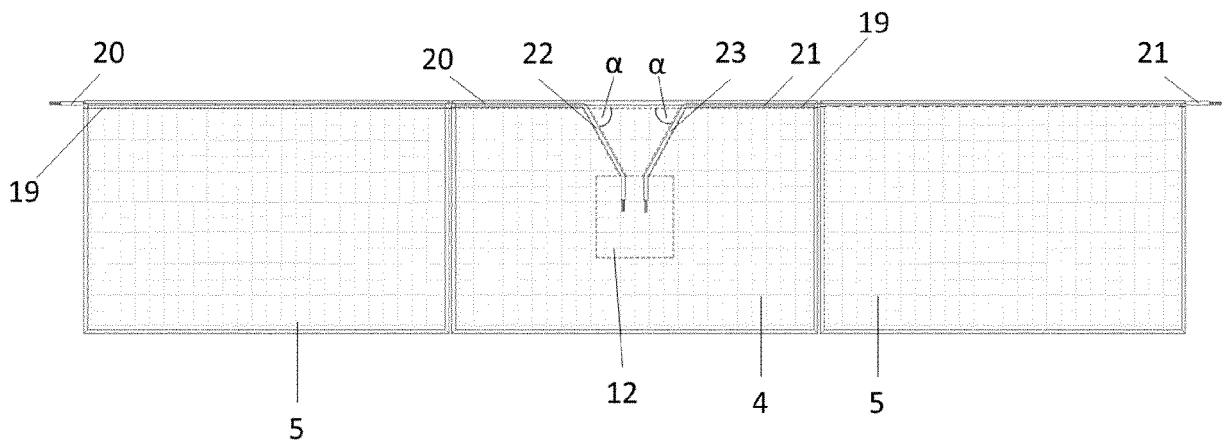


Fig 6





EUROPEAN SEARCH REPORT

Application Number
EP 19 20 3119

5

10

15

20

25

30

35

40

45

50

55

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	JP H09 13577 A (KANAME KK) 14 January 1997 (1997-01-14)	1-6,8-15	INV. E04B1/94 E04B1/80 E04B1/86
Y	* paragraph [0002] - paragraph [0012]; figures 4,10 *	7	
X	US 5 771 645 A (PORTER WILLIAM H [US]) 30 June 1998 (1998-06-30) * column 2, line 66 - column 6, line 44; figures 1,3,5 *	1-6,8-15	
Y	EP 2 281 962 A2 (KNAUF INSULATION TECHNOLOGY GMBH [AT]) 9 February 2011 (2011-02-09) * paragraph [0058]; figure 4 *	7	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 March 2020	Examiner Melhem, Charbel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 20 3119

5 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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-03-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP H0913577 A	14-01-1997	NONE	

US 5771645 A	30-06-1998	NONE	

EP 2281962 A2	09-02-2011	EP 2281961 A1	09-02-2011
		EP 2281962 A2	09-02-2011

EPO FORM P0459

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