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(71) Applicant: **Knauf Insulation SPRL**
4600 Visé (BE)

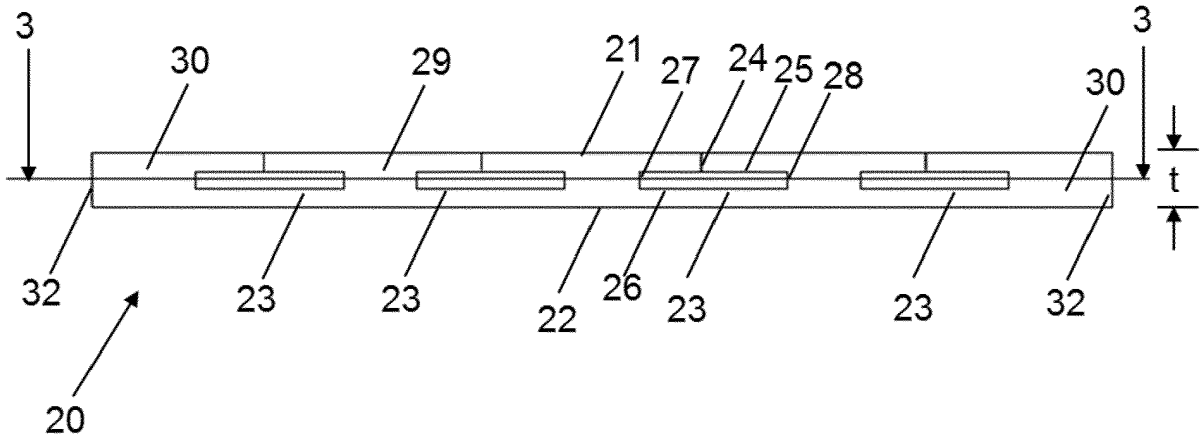
(72) Inventors:
- **SEBENIK, Gorazd**
  1435 Mont-Saint-Guibert (BE)
- **KESE, Miha**
  1435 Mont-Saint-Guibert (BE)
- **VEZOCNIK, Borut**
  1435 Mont-Saint-Guibert (BE)
- **SMOLEJ, Jurij**
  1435 Mont-Saint-Guibert (BE)
- **VRBINC, Anze**
  1435 Mont-Saint-Guibert (BE)

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

(54) MINERAL WOOL INSULATION PANEL AND METHOD OF MANUFACTURING THE SAME

(57) A single piece mineral wool insulation panel, notably for a fire rated door, is provided with a plurality of acoustic cavities positioned between its first and second major surfaces.

Fig 2



EP 3 412 858 A1

Description

[0001] This invention relates to a building structure, notably a fire rated door, and an insulation panel therefore.

[0002] Mineral wool insulation panels are commonly used within fire rated doors and can contribute significantly to the fire resistance of the door. The use of high density, high thicknesses mineral wool insulation panels enables desired levels of fire resistance to be achieved. Commercial panels generally have a homogenous mineral wool structure throughout their entire volume but the inclusion of additional elements has been proposed. For example, EP1347144 and EP1347145 discloses the inclusion of fire-protection rods, for example of aluminium hydroxide or magnesium hydroxide, in a middle layer of a mineral wool insulating plate of a fire-protection door.

[0003] It has now been realised that insulation panels, for example for fire rated doors, can be improved, notably to retain desired levels of fire resistance whilst improving one or more other properties.

[0004] In accordance with one of its aspects, the present invention provides a building structure as defined in claim 1. Additional aspects of the invention are defined in independent claims. The dependent claims define preferred and/or alternative embodiments.

[0005] In one of its aspects, the present invention provides an improved building structure, notably an improved door, which combines a desired combination of fire resistance and acoustic attenuation in a simple structure. Furthermore, such properties may be obtained using an insulation panel of lower mass; the lower mass facilitates handling and efficient use of materials. Thus, in accordance with one of its aspects, the present invention provides a building structure comprising a single piece mineral wool insulation panel arranged in a cavity between first and second structural plates, for example the cavity of a door. The single piece mineral wool insulation panel has a first, planar major surface and a second planar major surface, the first and second major surface of the mineral wool insulation panel preferably being parallel to each other. The first major surface of the mineral wool insulation panel is preferably arranged adjacent to a planar, cavity side major surface of the first structural plate; the second major surface of the mineral wool insulation panel is preferably arranged adjacent to a planar, cavity side major surface of the second structural plate. Furthermore, the mineral wool insulation panel comprises a plurality of acoustic cavities positioned between its first and second major surfaces.

[0006] One or each of the first and second structural plates may comprise a sheet metal plate, for example a steel plate or an aluminium plate, notably having a thickness which is $\geq$ 0.5 mm or $\geq$ 1 mm and/or $\leq$ 5 mm or $\leq$ 3 mm. The first and second structural plates may be structural plates of a fire door, for example sheet metal plates of a fire door. The cavity side major surfaces of the first and second structural plates are preferably parallel. The cavity side major surfaces of the first structural plate is preferably arranged in substantially continuous contact with a first major surface of the insulation panel; likewise, the cavity side major surfaces of the second structural plate is preferably arranged in substantially continuous contact with a second major surface of the insulation panel. Arranging for one or both planar surfaces of the mineral wool insulation panel to be in continuous contact with its associated cavity side major surface of the structural plate facilitates assembly, for example by facilitating gluing of the mineral wool insulation panel to one or both cavity side surfaces of the structural plates. The combination of a planar surface of the mineral wool insulation panel assembled against and/or in contact with a planar surface of the structural plate may also help to avoid the risk on a non-homogeneous visual appearance at the external side of, notably sheet metal, structural plates. In an alternative building structure, notably a door structure, the first and/or second structural plates may comprise or consist of wooden plates or panels or plastics plates or panels which define an internal door cavity in which the insulation panel is arranged. Each wooden or plastics panel or plate may have a thickness $\geq$ 2 mm, notably $\geq$ 2.5 mm or $\geq$ 3 mm and/or $\leq$ 8 mm notably $\leq$ 5 mm or $\leq$ 4.5 mm. The wooden panels or plates may be of chipboard or medium density fibre board (MDF) or high density fibre board (HDF) and may comprise a veneer.

[0007] The building structure may be a fire rated door, for example, a door meeting a Ei30, Ei60, Ei90 or Ei120 fire class. The door may have a door leaf thickness $\geq$ 30 mm, notably $\geq$ 35 mm or $\geq$ 40 mm and/or $\leq$ 100 mm notably $\leq$ 85 mm or $\leq$ 70 mm. The door leaf weight in kg/m^2 may be $\geq$ 10, notably $\geq$ 15 or $\geq$ 20 and/or $\leq$ 100 notably $\leq$ 70 or $\leq$ 40. Alternatively, the building structure may be a sandwich panel.

[0008] Preferably the insulation panel is a single piece insulation panel. As used herein, the term single piece insulation panel means that the mineral wool fibres of the insulation panel are all held together to form a mineral wool panel that may be handled as a single piece as opposed to a plurality of non-attached individual pieces. The provision of a single piece mineral wool insulation panel having a height of, for example at least 160 cm and a width of, for example at least 60cm allows the panel to be used without requiring additional panels to fill the cavity of, for example a fire rated door. Thus, the building structure, particularly in the case of a door or a sandwich panel, preferably comprises a single mineral wool insulation panel. Handling and assembling a single panel is easier and more efficient than dealing with multiple different panels. In addition, the provision of a single panel having dimensions that can fill the entire cavity of a door avoids the risk of a point of weakness or a thermal bridge in the insulation that would occur at the abutments of separate but adjoining panels. The panel may be substantially rectangular; it may be provided with preformed cuts and/or cut-outs to facilitate its assembly in a door cavity. The panel may be provided in the form of a panel in which the acoustic cavities have been cut out and removed from a single starting panel. Alternatively, the panel may be provided as a single

piece insulation panel formed from assembly of a plurality of individual pieces of mineral wool insulation.

[0009] . The insulation panel may have a reaction to fire of at least A2, preferably A1, according to the European Standard EN 13501-1. References herein to standards are to the versions in force at the priority date of the present application.

[0010] The mineral wool insulation panel has a height, a width and a thickness. As used herein the term thickness of the mineral wool insulation panel refers to the dimension, when sandwiched between the first and second structural plates, which corresponds to the space separating the first and second structural plates. The thickness of the mineral wool panel may be ≥ 1,5 cm, ≥ 2 cm ≥ 3 cm or ≥ 4 cm and/or ≤ 12 cm, ≤ 10 cm, ≤ 8 cm or ≤ 5cm. The mineral wool insulation panel may be rectangular, that is to say that its major surfaces which make up its height and width are rectangular. The height of the mineral wool insulation panel may be ≥ 160 cm, optionally ≥ 180 cm or ≥ 200 cm and/or ≤ 260 cm, optionally ≤ 240 cm or ≤ 230 cm. The width of the mineral wool insulation panel may be ≥ 60 cm, optionally ≥ 70 cm or ≥ 80 cm and/or ≤ 150 cm, optionally ≤ 120 cm or ≤ 100 cm.

[0011] Reference to the surfaces of the mineral wool insulation panel being planar as used herein means that the surface defined by the combination of all of the individual fibre at the surface of the mineral wool panel is planar, notwithstanding interstices between individual fibres as the surface.

[0012] The acoustic cavity may be an air cavity, that is to say a cavity that contains only air and any materials present in atmospheric air, for example water vapour. The term "acoustic cavity" as used herein means a cavity in the mineral wool insulation panel which provides a reduction in the sound that passes through the mineral wool insulation panel from its first to its second major surface structure, notably when the mineral wool insulation is sandwiched between the first and second structural plates in the building structure. The reduction in the sound that passes through the mineral wool insulation panel is considered in comparison to a mineral wool insulation panel having an equivalent configuration (for example thickness and density of mineral wool) but in which the mineral wool material is continuous thought the entire volume of the insulation panel. Preferably, the acoustic cavities provide a reduction in white noise at a frequency between 20 Hz and 20 kHz passing through the mineral wool insulation panel and/or through the building structure comprising the insulation panel. At least one and preferably each acoustic cavity may be an air cavity.

[0013] The acoustic cavity may form a substantially rectangular polygon within the mineral wool structure. Peripheries of the acoustic cavity which extend in the same direction as the major surfaces of the insulation panel may extent substantially parallel to the major surfaces. The acoustic cavity may be surrounded or substantially surrounded by the mineral wool structure. The acoustic cavity may be a polygon which is surrounded by the mineral wool structure other that at one or each of its end faces; such end faces may correspond to an edge of the insulation panel. When it is surrounded by the mineral wool structure all surfaces of the acoustic cavity are bounded by the mineral wool structure.

[0014] The one or more acoustic cavities may be positioned equidistantly between the first and second major surfaces. They may form a discontinuous layer of cavities within the mineral wool structure. The one of more acoustic cavities may have a thickness which is ≥ 2mm, ≥ 5mm, ≥ 10 mm, ≥ 15 mm, or ≥ 20 mm, and/or ≤ 60 mm, ≤ 50 mm or ≤ 40 mm. The one or more acoustic cavities may have a total projected surface area which is ≥ 2%, ≥ 5%, ≥ 10%, ≥ 20%, ≥ 30% or ≥ 40% and/or ≤ 80%, ≤ 70 or ≤ 65% of the surface area of the first major surface of the mineral wool insulation panel. As used herein, the term projected surface area means the maximum surface area of the one or more acoustic cavities at a plane which is parallel to the plane of the first major surface of the mineral wool insulation panel.

[0015] The one or more acoustic cavities may provide the mineral wool insulation panel and/or the building structure with an improved level of sound reduction performance with respect to that obtained using a comparable mineral wool insulation panel without the one or more acoustic cavities, notably a level of sound reduction performance that is better by ≥ 2 dB, ≥ 3 dB, ≥ 4 dB or ≥ 5 dB. Any such comparison should be made with a mineral wool insulation panel having comparable, notably identical, structural features including, for example, dimensions and density, in a test simulating the intended use of the mineral wool insulation panel and/or the building structure.

[0016] The mineral wool structure comprises a three-dimensional network of mineral wool fibres having interstices between fibres. The mineral wool fibres may be man-made vitreous fibres (MMVFs) and preferably comprise rock wool fibres; other mineral wool fibres, for example glass wool fibres, may be used in combination or instead of rock wool fibres. The rock wool fibres may comprise: between 30 and 55 wt-% SiO_2 and/or between 8 and 30 wt-% Al_2O_3; and/or an alkali/alkaline-earth ratio of their composition which is < 1; and/or a combined quantity of CaO and MgO ranging from 20 to 40 wt-%; and/or a combined quantity of Na_2O and K_2O < 8 wt%; and/or a total iron content expresses as Fe_2O_3 of between 4 and 15 wt-%, notably between 4 and 10 wt-%. The rock wool fibres may have a softening point in the range 900-1200°C, notably in the range 1000-1100°C. The mineral wool fibres may have an average diameter of less than 10μm, preferably less than 8μm, more preferably less than 7 μm.

[0017] The insulation panel may comprise at least 50%, at least 55%, at least 60%, at least 65%, at least 70%, at least 75% , at least 80% or at least 85% and/or no more than 99%, no more than 98% or no more than 95% by weight of mineral wool fibres. This provides desirable thermal properties and/or a suitable structure.

[0018] The mineral wool structure may comprise a binder, notably an organic binder, which may make up at least 1% or at least 2% and/or no more than 8%, no more than 7% or no more than 6% by weight of the mineral wool structure.

The quantity of binder may be determined by loss on ignition by comparing the weight prior to and subsequent to thermal decomposition of the binder. Preferably, the mineral wool structure comprises between 1% and 6% by weight of binder; this provides a suitable cohesion without prejudicing fire performance and/or flame resistance. The binder is preferably a thermally cured organic binder, for example a phenol formaldehyde binder, a urea formaldehyde binder or a binder based on carbohydrates, applied to the mineral fibre between their formation and their collection together as a primary mat.

[0019] The density of the mineral wool structure may be: at least 60 kg/m^3; notably at least 80 kg/m^3 or at least 100 kg/m^3; and/or not more than 300 kg/m^3, notably not more than 250 kg/m^3 or 200 kg/m^3. Such densities may contribute to the compressive strength and/or fire performance and thus facilitate use in doors, floor applications and/or sandwich panels for structural applications.

[0020] The thermal conductivity of the mineral wool insulation fibre panels, notably measured according to EN 12667 at 20°C, may be ≤ 50 mW/m.K, ≤ 45 mW/m.K or ≤ 40 mW/m.K and/or ≥ 34 mW/m.K, ≥ 35 mW/m.K or ≥ 36 mW/m.K.

[0021] The building structure may have:

a sound insulation category of at least SSK3, preferably SSK2, more preferably SSK1; and/or
a sound isolation on the facility RW,R (DIN 4109) of at least 35-39 dB, preferably 30-34 dB, more preferably 25-29 dB; and/or
a laboratory sound isolation RW (EN ISO 140-3) of at least minimum 42 dB, preferably minimum 37 dB, more preferably minimum 32 dB;
particularly where the building structure is a door or sandwich panels comprising the construction:

[0022] An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawing of which:

Fig 1 is a perspective view of a fire rated door;
Fig 2 is a side view of a first embodiment of an insulation panel;
Fig 3 is a cross section along line 3-3 of Fig 2;
Fig 4 is a side view of a second embodiment of an insulation panel; and
Fig 5 is a cross section along line 5-5 of Fig 4.

[0023] Fig 1 shows a schematically cut away perspective view of a fire rated door 10 comprising parallel first 11 and second 12 planar structural plates which form respectively the front and rear major surface of the door 10. The structural plates may be metal sheets, for example sheet steels. A conventional mineral wool insulation panel 13 is arranged in a door cavity 14 between the two structural plates.

[0024] Fig 2 and Fig 3 illustrate a first embodiment of a mineral wool insulation panel 20 which may be used in accordance with the invention and which comprises a single piece mineral wool insulation panel having a length l_p of about 205 cm, a width w or about 95 cm and a thickness t of about 4 cm. The panel 20 has first 21 and second 22 planar surfaces which are parallel to each other. When assembled in the cavity of a building structure, for example a fire rated door, the first planar surface 21 is intended to be adhered to a cavity facing planar surface of a structural plate of the building structure, for example to the cavity facing planar surface of a metal sheet forming the front surface 11 of a door. Similarly, the second planar surface 22 is intended to be adhered to a cavity facing planar surface of a second structural plate of the building structure, for example to the cavity facing planar surface of a metal sheet forming the rear surface 12 of a door. The adhesive is preferably a fire-resistant adhesive, for example a water glass or non-flammable adhesive.

[0025] The mineral wool insulation panel is provided with a series of acoustic cavities 23 in the form of air filled spaces between the major surfaces 21, 22 of the panel. In this embodiment, four acoustic cavities 23 are provided, each in the form of a slot which extend across the entire width of the panel 20 through a central portion of the thickness of the panel; the acoustic cavities have a thickness of about 12mm in the direction of the thickness of the panel t. In this embodiment, each slot is formed by wire cutting, the wire being forced into the first surface 21 of the mineral wool panel 20 surface to form an entry cut 24 substantially perpendicular to the first major surface 21 before cutting the desired periphery of the acoustic cavity 23 and exiting from the panel through the entry cut 24. The portion of the mineral wool panel that has been cut from the central portion is then removed, for example by being slide widthways out of the panel. The acoustic cavity thus formed has open side surfaces corresponding to the side surfaces of the mineral panel but its remaining surfaces are entirely surrounded by mineral wool of the panel 20. In the Fig 1 example these surfaces are its first surface 25 which is spaced from and parallel with the first major surface 21 of the panel, its second surface 26 which is spaced from and parallel with the second major surface 22 of the panel, and its connecting surface 27, 28 which connect its first 25 and second 26 surfaces. In the Fig 1 embodiment, the projected surface area of the acoustic cavities represents about 55% of the surface area of the first major surface 21 of the panel, that is to say the total area defined by the sum of the areas of each acoustic cavity ((l_1 x w) + (l_2 x w) + (l_3 x w) + (l_4 x w)) represents about 55% of the total area of the first major surface (l_p x w). Each acoustic cavity 24 is separated from its adjacent acoustic cavity by a portion

29 of the mineral wool panel which is continuous between the first 21 and second 22 major surfaces. Similarly, a continuous portion 30 of mineral wool between the first 21 and second 22 major surfaces of the panel is provided between each of the end cavities and its respective end 32 of the insulation panel. The continuous portions of mineral wool insulation contribute to the mechanical performance of the panel, notably resistance in compression.

[0026] In the embodiment illustrated in Fig 4 and Fig 5, six acoustic cavities 43a, 43b, 43c, 43d, 43e, 43f are provided at a central portion of the insulation panel. The total projected area of the acoustic cavities $((l_1 \times w) + (l_2 \times w) + (l_3 \times w) + (l_4 \times w) + (l_5 \times w) + (l_6 \times w))$ represents about 35% of the total area of the first major surface $(l_p \times w)$. In this embodiment, each acoustic cavity is again formed by cutting from a central portion of the mineral wool panel. However, in this arrangement, the entry cut 24 from the first major surface 21 is arranged to open on to a portion 44 of the mineral wool panel which remains in place when the cavities are created. Any passage of thermal energy from the first major surface 21 along the entry cut 24 is thus interrupted by this remaining portion 44 of mineral wool before reaching the second major surface 22. Alternatively, the cavities may be formed by drilling, by use of a cutter, for example a rotating cutter, or by removal of material from a starting insulation panel.

Reference numbers:

10	Fire rated door
11	First structural plate
12	Second structural plate
13	Conventional mineral wool insulation plate
14	Cavity
20	Mineral wool insulation panel
21	First planar surface of mineral wool insulation panel
22	Second planar surface of mineral wool insulation panel
23	Acoustic cavities
24	Entry cut
25	First surface of acoustic cavity
26	Second surface of acoustic cavity
27	Connecting surface of acoustic cavity
28	Connecting surface of acoustic cavity
29	Continuous portion of panel
30	Continuous portion of panel
32	End of insulation panel
40	Insulation panel
43a, 43b, 43c, 43d, 43e, 43f	Acoustic cavities
44	Portion of the mineral wool panel

Claims

1. A building structure comprising a single piece mineral wool insulation panel arranged in a cavity between first and second structural plates,
in which the single piece mineral wool insulation panel has a first, planar major surface and a second planar major surface, the first and second major surfaces of the mineral wool insulation panel being parallel to each other;
in which the first major surface of the mineral wool insulation panel is arranged adjacent to a planar, cavity side major surface of the first structural plate, and
in which the second major surface of the mineral wool insulation panel is arranged adjacent to a planar, cavity side major surface of the second structural plate,
and in which the mineral wool insulation panel comprises a plurality of acoustic cavities positioned between its first and second major surfaces.

2. A building structure in accordance with claim 1, in which each of the first and second structural plates comprise plate selected from: a metal plate, notably a steel plate; a wooden plate; and a plastics plate.

3. A building structure in accordance with claim 1 or claim 2, in which the building structure is a door.

4. A building structure in accordance with any preceding claim, in which the first major surface of the mineral wool insulation panel is secured to the planar, cavity side major surface of the first structural plate, and
in which the second major surface of the mineral wool insulation panel is secured to the planar, cavity side major surface of the second structural plate,

6. A building structure in accordance with any preceding claim, in which the plurality of acoustic cavities form a series of offset, individual cavities which extends along the width and the length of the major surfaces of the mineral wool insulation panel.

7. A building structure in accordance with any preceding claim, in which the one or more acoustic cavities have an elongated cross section having a major axis which extends parallel to the major surfaces of the mineral wool insulation panel.

8. A building structure in accordance with any preceding claim, in which the one or more acoustic cavities have an elongated cross section which extends across the height or across the width of the mineral wool insulation panel.

9. A building structure in accordance with any preceding claim, in which the one of more acoustic cavities have a thickness in the thickness direction of the mineral wool insulation panel of at least 2mm, notably at least 5mm, more notably at least 10 mm.

10. A building structure in accordance with any preceding claim, in which the one of more acoustic cavities have a total projected surface area of between 2% and 80%, notably between 10% and 80%, of the surface area of the first major surface of the mineral wool insulation panel.

11. A building structure in accordance with any preceding claim, in which adjacent acoustic cavities are separated from each other by a portion of the mineral wool structure, the said portion of the mineral wool structure providing a continuous thickness of mineral wool between the first and the second structural plates.

12. A building structure in accordance with any preceding claim, in which the insulation panel comprises one of more cuts passing through the mineral wool structure in a direction from one major surface of the panel towards the other major surface of the panel, the cut being separated from the other major surface of the panel by an uninterrupted portion of the mineral wool structure.

13. A mineral wool insulation panel configured for assembly between first and second structural plates to form a building structure in accordance with any preceding claim.

14. A method of manufacturing a mineral wool insulation panel, notably for a building structure in accordance with any of claims 1 to 12, comprising :

providing a mineral wool panel having first and second mineral wool major surfaces and a substantially homogeneous mineral wool structure throughout its volume; and
removing portions of the mineral wool structure from the mineral wool panel so as to form one or more cavities between the first and second mineral wool major surfaces, the cavities being substantially surrounded by the remaining mineral wool structure.

15. A method in accordance with claim 14, in which removing portions of the mineral wool structure from the mineral wool panel so as to form a one or more cavities comprises wire cutting of the mineral wool panel, passing a cutter, particularly a rotating cutter, thought the mineral wool panel or drilling of the mineral wool panel.

Amended claims in accordance with Rule 137(2) EPC.

1. A building structure comprising a single piece mineral wool insulation panel arranged in a cavity between first and

second structural plates,
in which the single piece mineral wool insulation panel has a first, planar major surface and a second planar major surface, the first and second major surfaces of the mineral wool insulation panel being parallel to each other;
in which the first major surface of the mineral wool insulation panel is arranged adjacent to a planar, cavity side major surface of the first structural plate, and
in which the second major surface of the mineral wool insulation panel is arranged adjacent to a planar, cavity side major surface of the second structural plate,
and in which the mineral wool insulation panel comprises a plurality of acoustic air cavities positioned between its first and second major surfaces.

2. A building structure in accordance with claim 1, in which each of the first and second structural plates comprise plate selected from: a metal plate, notably a steel plate; a wooden plate; and a plastics plate.

3. A building structure in accordance with claim 1 or claim 2, in which the building structure is a door.

4. A building structure in accordance with any preceding claim, in which the first major surface of the mineral wool insulation panel is secured to the planar, cavity side major surface of the first structural plate, and
in which the second major surface of the mineral wool insulation panel is secured to the planar, cavity side major surface of the second structural plate.

5. A building structure in accordance with any preceding claim, in which the single piece mineral wool insulation panel has one or more of the following features:

i) a thickness of $\geq$ 1,5cm and/or $\leq$ 12cm;
ii) a height of $\geq$ 160cm and/or $\leq$ 260cm;
iii) a width of $\geq$ 60cm and/or $\leq$ 150cm.

6. A building structure in accordance with any preceding claim, in which the plurality of acoustic air cavities form a series of offset, individual air cavities which extends along the width and the length of the major surfaces of the mineral wool insulation panel.

7. A building structure in accordance with any preceding claim, in which the one or more acoustic air cavities have an elongated cross section having a major axis which extends parallel to the major surfaces of the mineral wool insulation panel.

8. A building structure in accordance with any preceding claim, in which the one or more acoustic air cavities have an elongated cross section which extends across the height or across the width of the mineral wool insulation panel.

9. A building structure in accordance with any preceding claim, in which the one of more acoustic air cavities have a thickness in the thickness direction of the mineral wool insulation panel of at least 2mm, notably at least 5mm, more notably at least 10 mm.

10. A building structure in accordance with any preceding claim, in which the one of more acoustic air cavities have a total projected surface area of between 2% and 80%, notably between 10% and 80%, of the surface area of the first major surface of the mineral wool insulation panel.

11. A building structure in accordance with any preceding claim, in which adjacent acoustic air cavities are separated from each other by a portion of the mineral wool structure, the said portion of the mineral wool structure providing a continuous thickness of mineral wool between the first and the second structural plates.

12. A building structure in accordance with any preceding claim, in which the insulation panel comprises one of more cuts passing through the mineral wool structure in a direction from one major surface of the panel towards the other major surface of the panel, the cut being separated from the other major surface of the panel by an uninterrupted portion of the mineral wool structure.

13. A mineral wool insulation panel configured for assembly between first and second structural plates to form a building structure in accordance with any preceding claim.

14. A method of manufacturing a mineral wool insulation panel, notably for a building structure in accordance with any of claims 1 to 12, comprising :

providing a mineral wool panel having first and second mineral wool major surfaces and a substantially homogeneous mineral wool structure throughout its volume; and
removing portions of the mineral wool structure from the mineral wool panel so as to form one or more air cavities between the first and second mineral wool major surfaces, the one or more air cavities being substantially surrounded by the remaining mineral wool structure.

15. A method in accordance with claim 14, in which removing portions of the mineral wool structure from the mineral wool panel so as to form a one or more air cavities comprises wire cutting of the mineral wool panel, passing a cutter, particularly a rotating cutter, thought the mineral wool panel or drilling of the mineral wool panel.

Fig 1

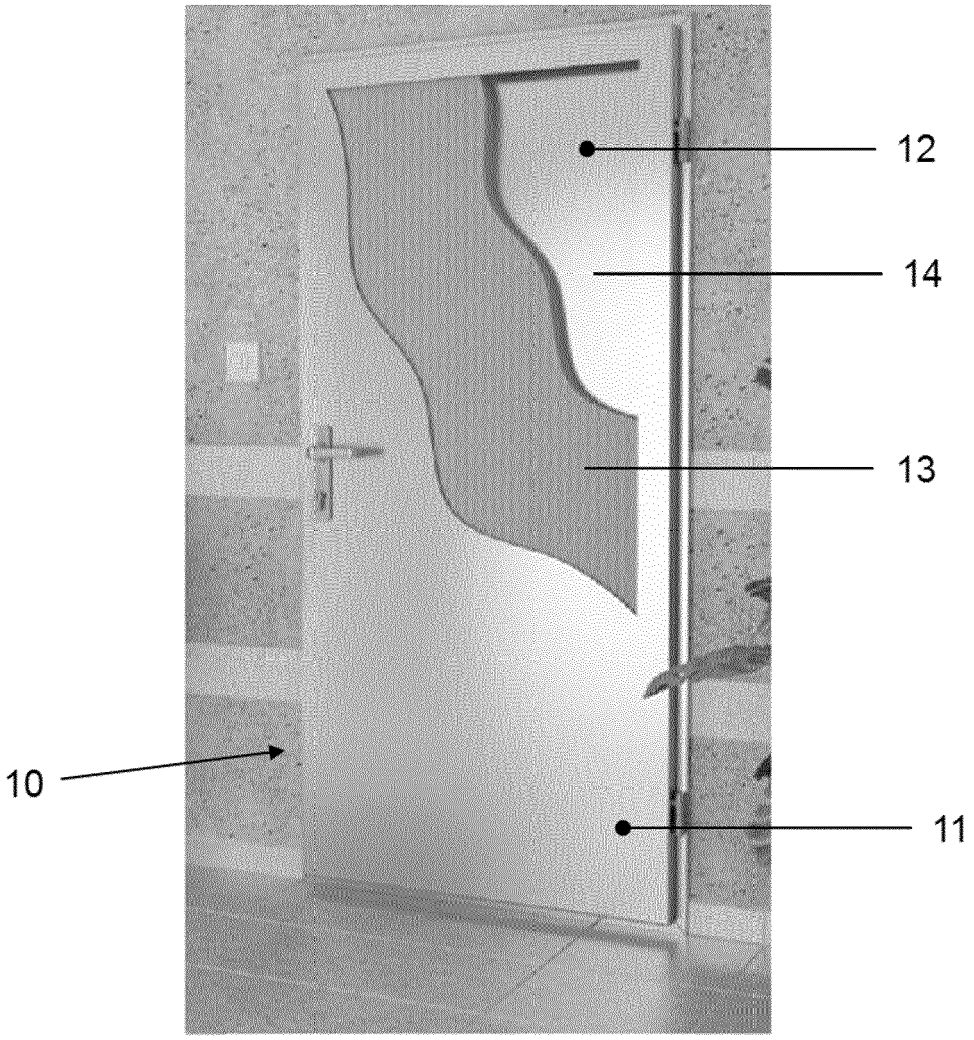


Fig 2

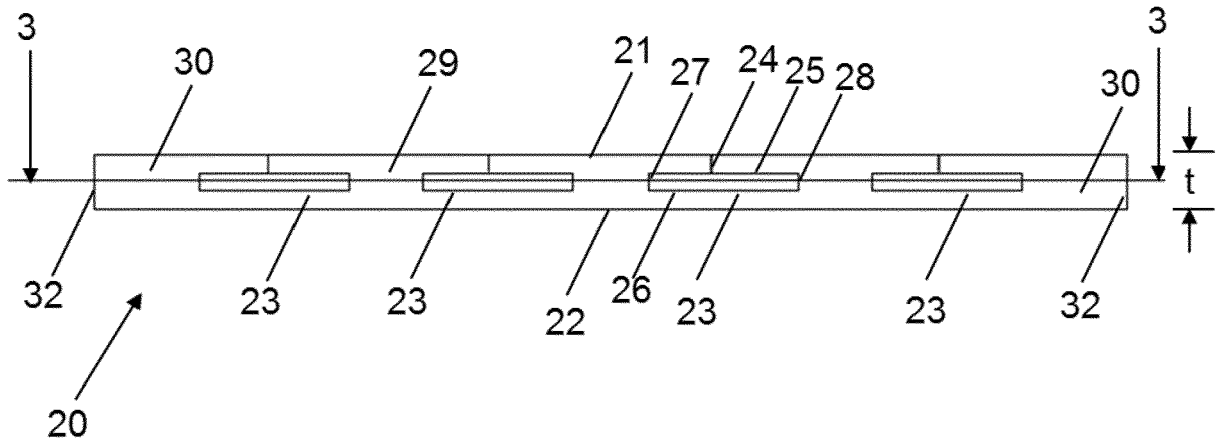

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Fig 3

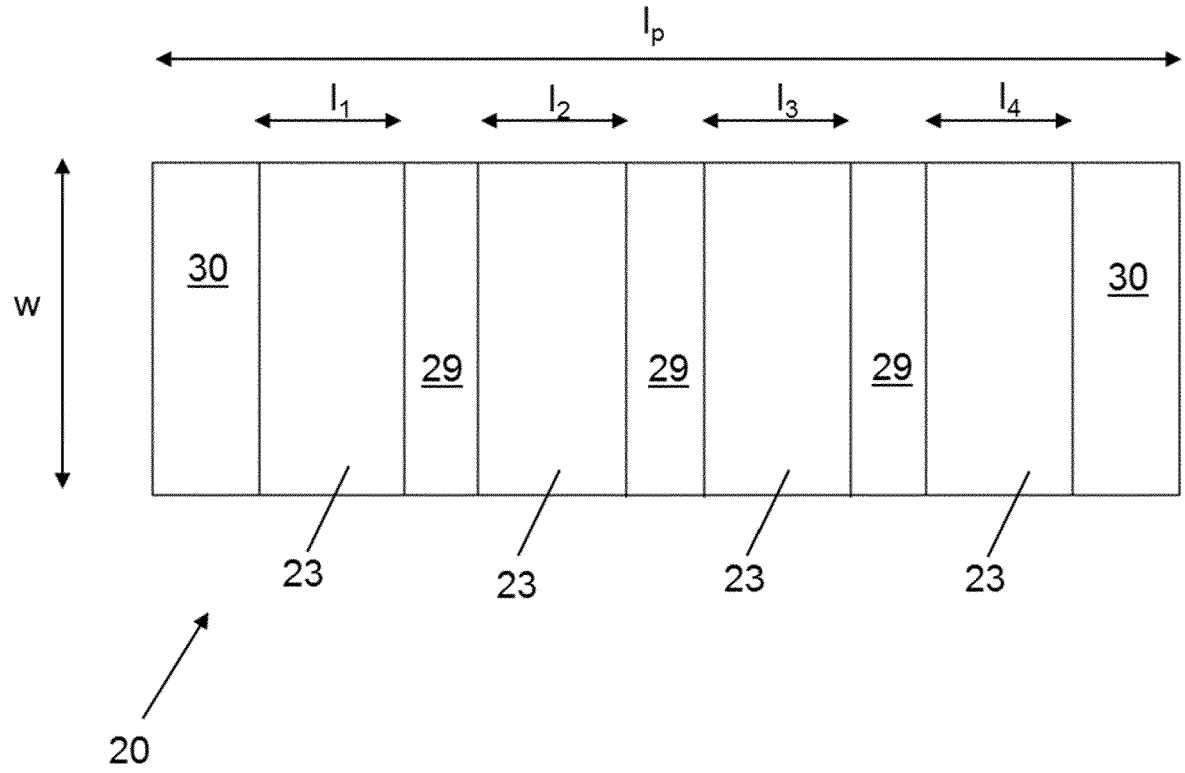
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Fig 4

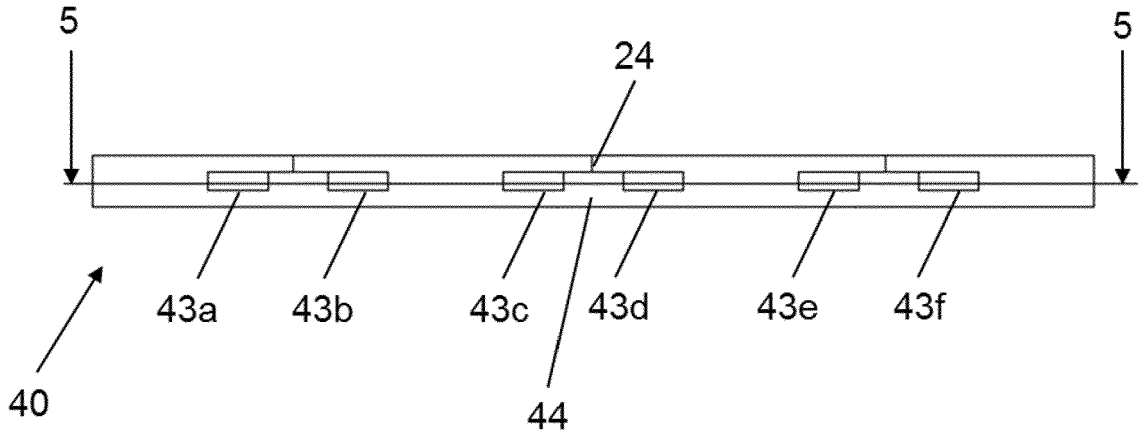
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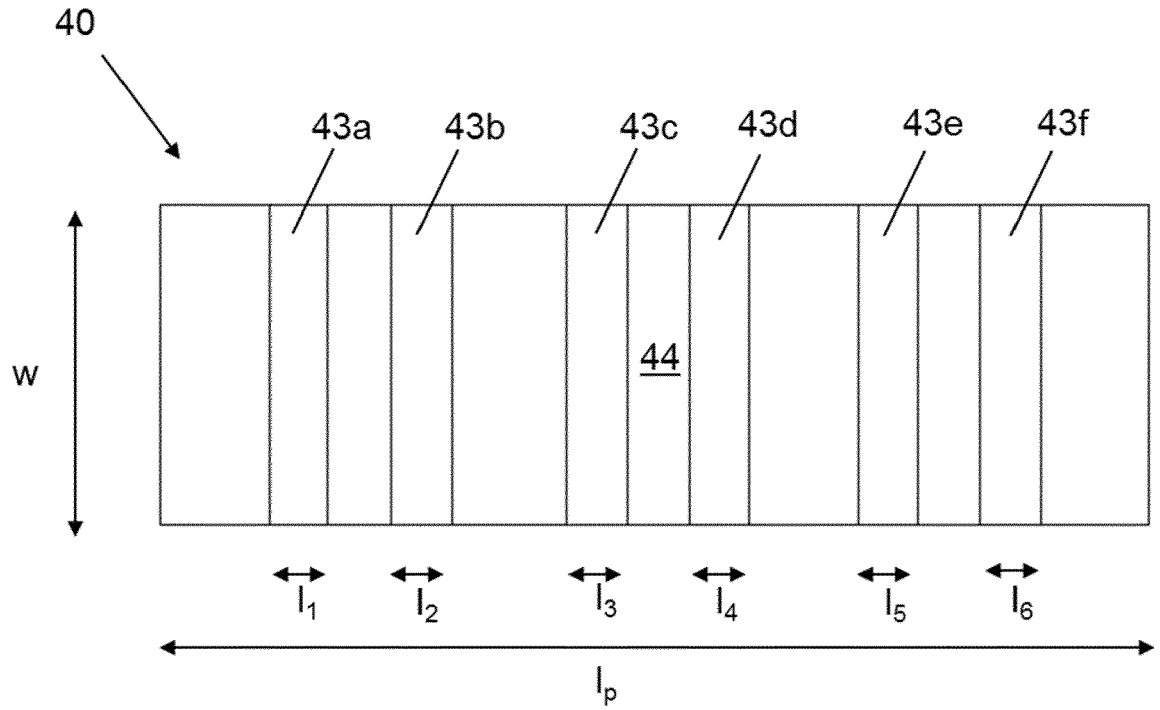
Fig 5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Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 18 17 2569

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,D	EP 1 347 145 A2 (ROCKWOOL MINERALWOLLE [DE]) 24 September 2003 (2003-09-24) * claims 1-8; figures 1, 2 *	1-4,6-15	INV. E06B5/16 E06B5/20 E04B1/94
A	JP H05 51979 A (KANEGAFUCHI CHEMICAL IND) 2 March 1993 (1993-03-02) * paragraph [0018] - paragraph [0019] *	15	E06B3/70
A	US 2011/296785 A1 (HOLT JOHN TIMOTHY [US]) 8 December 2011 (2011-12-08) * paragraph [0049] - paragraph [0050] *	15	

TECHNICAL FIELDS SEARCHED (IPC)

E06B
E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 September 2018	Crespo Vallejo, D

CATEGORY OF CITED DOCUMENTS

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21-09-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1347145 A2	24-09-2003	DE 10212331 A1	16-10-2003
		EP 1347145 A2	24-09-2003
JP H0551979 A	02-03-1993	NONE	
US 2011296785 A1	08-12-2011	CA 2742046 A1	04-12-2011
		US 2011296785 A1	08-12-2011

EPO FORM P0459

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

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Patent documents cited in the description

- EP 1347144 A **[0002]**
- EP 1347145 A **[0002]**