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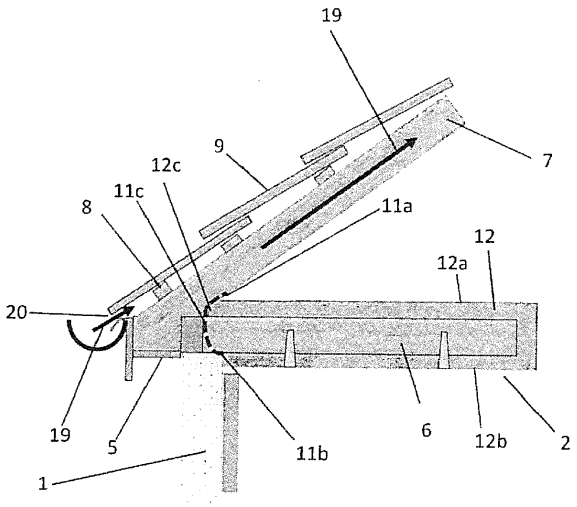
(54) ROOF SPACE INSULATION INSTALLATION, KIT AND METHOD FOR ROOF SPACE INSULATION

(57) Sloping roof space insulation installation with a main portion comprising an upper face (12a), a lower face (12b) which is supported on a roof space floor, and a tapered portion (12c) which is arranged at an end of the main portion, and is in contact with the said floor and with a lower roof surface in the vicinity of a lower edge of the roof, comprising a mat (12) of loose insulation selected from amongst: stone wool, glass wool and cellulose, and a unit permeable to air, provided with regularly distributed openings (11d), arranged on the surface of the tapered portion (12c) and retaining the loose insulation which forms part of the said tapered portion (12c).

Figure 1



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Description

[0001] The invention relates to the insulation of ventilated roof spaces, in particular unused roof spaces, respectively in lofts or, as they are sometimes called, attics. A heated building is insulated in order to reduce the heat losses. A significant part of the heat losses can take place through the ceiling and the roof.

[0002] In order to reduce the losses, different types of insulation are provided:

- insulation on the ceiling, with the roof space above then not being insulated;
- insulation on the underside of the roof, with the roof space then being insulated; and
- unused roof space insulation, which is often provided in new buildings and/or for low roof spaces which are inconvenient to use, in particular under roofs with a low slope.

[0003] Insulation of the unused roof space can be carried out by means of panels or rolls of insulation. However, these are sometimes difficult to handle in the access areas available, and they are problematic to lay in areas with low height. A loose insulation product in the form of flock is often preferred to them. The insulation product can be blown from underneath in the building, in a pulsed air duct towards the loft.

[0004] However, it is recommended to avoid contact between the roof covering (tiles, slates, or the like) and the insulation product. In fact, circulation of air under the covering prevents condensation, which is a cause of rapid deterioration of the battens and the roof timbers. This is difficult to obtain in low areas of the roof close to the outer walls. However, low areas of this type must have insulation which joins and covers the insulation of the outer walls in order to provide a complete insulated building envelope, respectively in order to prevent a thermal bridge occurring, as this is a preferential area for heat losses.

[0005] For the same reason, it is desirable to keep any vents operative, i.e. air inlets (vents) are left free of insulation.

[0006] This is difficult to obtain with a loose insulation product.

[0007] The objective of the invention is to improve the situation.

[0008] The invention proposes a sloping roof space insulation installation with a main portion comprising an upper face, a lower face which is supported on a roof space floor, and a tapered portion which is arranged at an end of the main portion, and is in contact with the said floor and with a lower roof surface in the vicinity of a lower edge of the roof. The installation comprises a mat of loose insulation selected from amongst: stone wool, glass wool and cellulose, and a unit permeable to air, provided with regularly distributed openings, arranged on the surface of the tapered portion and retaining the loose insulation which forms part of the said tapered portion. The unit permeable to air ensures that the loose insulation is retained, thus preventing vents from being blocked, and contact with the roof, and reducing greatly the risk of displacement of the loose insulation.

[0009] The invention proposes a sloping roof space insulation installation with a main portion comprising an upper face, a lower face which is supported on a roof space floor, and a lateral face connecting the upper face and the lower face, comprising a mat of loose insulation selected from amongst: stone wool, glass wool and cellulose, and a unit permeable to air, provided with regularly distributed openings, arranged on the surface of the lateral face, retaining the loose insulation and pressed onto struts of the roof, the mat covering an underlying wall insulation.

[0010] According to one embodiment, the said unit which is permeable to air is a grid. The level of opening is high. Preferably, the grid is made of metal, and more preferably of galvanised steel.

[0011] According to one embodiment, the said unit permeable to air is non-combustible. In another embodiment, the said unit permeable to air is flame retardant.

[0012] According to one embodiment, the grid has a square, hexagonal or octagonal mesh with dimensions of 16 mm or less, preferably of 14 mm or less in terms of their largest dimension. The said dimensions may be 2 mm or more, preferably 5 mm or more. These dimensions are particularly suitable for stone wool and cellulose. Small dimensions are preferred for stone wool, such that the grid makes a significant contribution to reducing the speed of the wind. The retention of the loose insulation is satisfactory. However, stone wool and cellulose are preferred in windy areas, for example coastal areas.

[0013] According to one embodiment, the insulation has a density of between 10 and 40 kg m^{-3}, preferably stone wool between 19 and 25 kg m^{-3}.

[0014] According to one embodiment, the insulation is in the form of flock with a diameter greater than 20 mm.

[0015] According to one embodiment, the unit permeable to air comprises a part in contact with the floor, a part in contact with the lower surface of the roof, and a part projecting towards the lower edge of the roof. The unit permeable to air is adapted to the form of the roof timbers and the floor. The unit permeable to air can pass below rafters, thus ensuring circulation of air between two adjacent rafters and between the roof covering and the loose insulation. In this case, the roof covering means the part of the roof which forms the seal against water, in practice the tiles, slates or other covering elements, whereas the roof comprises the roof timbers and roof covering.

[0016] According to one embodiment, the unit permeable to air is secured on the floor and/or on the roof by means of nailing, stapling or by collars which can be clamped. The nailing can be carried out with stapling nails. Nailing and stapling are well-suited to floors and/or roof timbers which are made of wood. Collars which can

be clamped are well-suited to metal (mesh) or concrete roof timbers.

[0017] According to one embodiment, the unit permeable to air is in contact with a pantile, and is preferably secured to the pantile.

[0018] According to another embodiment, the unit permeable to air is secured to at least one strut of the roof timbers of the roof.

[0019] Loose insulation products are specified and described in European standard EN 14064-1:2010 'Thermal insulation products for buildings. In-situ formed loose-fill mineral wool (MW) products' or EN15101-1:2013 'Thermal insulation products for buildings. In-situ formed loose fill cellulose (LFCI) products'.

[0020] Amongst these products, stone wool is preferred because of its cohesion and its mechanical resistance in the case of strong wind. Stone wool is well-suited to windy conditions found on coasts, at altitude and in exposed situations.

[0021] According to one embodiment, a kit comprises at least one bag of loose insulation selected from amongst: stone wool, glass wool and cellulose, and a unit permeable to air, which is provided with regularly distributed openings, and can retain the loose insulation. This therefore provides a ready-to-use assembly.

[0022] According to one embodiment, a kit additionally comprises elements for securing the unit permeable to air to a floor and/or to a roof.

[0023] The invention proposes a method for insulation of a sloping roof space, the roof space being provided with a floor, wherein a unit permeable to air provided with regularly distributed openings is fitted in contact with the said floor and with a lower roof surface in the vicinity of a lower edge of the roof, and loose insulation selected from amongst: stone wool, glass wool and cellulose is introduced, thus forming a mat, the assembly having a main portion comprising an upper face, a lower face supported on the floor, and a tapered portion or a lateral face arranged at an end of the main portion, the unit permeable to air forming together with the insulation the surface of the tapered portion, and retaining the insulation.

[0024] The invention proposes a method for insulation of a sloping roof space, the roof space being provided with a floor, wherein a unit permeable to air provided with regularly distributed openings is fitted in contact with the said floor and pressed onto struts of the roof, and loose insulation selected from amongst: stone wool, glass wool and cellulose is introduced, thus forming a mat, the mat covering an underlying wall insulation, the assembly having a main portion comprising an upper face, a lower face supported on the floor, and a lateral face connecting the upper face and the lower face, the unit permeable to air forming together with the insulation the lateral face, and retaining the insulation.

[0025] The work can be carried out rapidly, without laboriousness, and with a low risk of damage caused in the access areas.

[0026] In this case, floor means the lower surface of the roof space including the upper surface of the wall. The floor is in general flat or slightly inclined. However there may be sloping portions. The floor can be on one or a plurality of planes.

[0027] According to one embodiment, the unit permeable to air is fitted between two adjacent main beams and in contact with the said two main beams, and/or between two adjacent rafters and in contact with the said two rafters. The retention is ensured at the bottom, the front or edge of the roof, and at the top.

[0028] According to one embodiment, the unit permeable to air is cut from a roll and formed by pressing it into the corner formed between the floor and the lower roof surface, in the direction of the said lower edge of the roof. The unit permeable to air can be cut to the distance between two adjacent main beams and/or rafters. The unit permeable to air can be cut by providing notches for the main beams and/or the rafters. The unit permeable to air can be secured below the rafters and pass between each pair of main beams, whilst coming into contact with the floor.

[0029] According to one embodiment, the unit permeable to air is pressed into the said corner, thus forming a rounded projection. The unit permeable to air can be pressed by means of a tool with a handle. The unit permeable to air makes it possible to retain the loose insulation in line with wall insulation.

[0030] According to one embodiment, the loose insulation is introduced by blowing. Preferably, the loose insulation is put into form definitively by blowing.

[0031] According to a preferred embodiment, the insulation is stone wool in accordance with European standard EN 14064-1:2010. The stone wool can have a density of between 10 and 40 kg m^{-3}, preferably between 19 and 25 kg m^{-3}. The stone wool can have an average flock size of between 20 and 30 mm.

[0032] Other characteristics and advantages of the invention will become apparent from examining the following detailed description and the appended drawings in which:

- figure 1 illustrates schematically, in a view in transverse cross-section, an example of installation according to an aspect of the invention;
- figure 2 illustrates schematically, in a view in perspective, the example of an installation in figure 1 before the insulating mat is laid; and
- figure 3 illustrates schematically, in a view in perspective, an example of installation according to another aspect of the invention.

[0033] The appended drawings can not only be used to complete the invention, but also to contribute towards its definition, if applicable.

[0034] The objective of the invention is to permit continuity of the insulation between a wall and a loft. In certain cases, the loose insulation is delimited by a wooden panel arranged spaced from the wall. There is then a disconti-

nuity between the wall, which is in general insulated, and the insulation of the roof space. This results in significant heat losses. On the other hand, if panels of this type are absent, then the loose insulation extends either until it falls onto the pantile, in the case of restoration of a house with conventional roof timbers, or until it comes well beyond the wall in the case of a modern house, thus blocking the vents which are generally arranged on the overhanging underside of the roof. The loose insulation also comes into contact with the roof itself, between the small girders, or between the rafters, therefore giving rise to a risk of condensation.

[0035] Conventional roof timbers generally comprise battens which support the roof, and are supported by rafters in the direction of the slope, the latter themselves being supported by horizontal purlins. The lower purlin is supported on the wall and is known as the pantile. The other purlins are supported on trusses which are spaced by several metres. The truss has a triangular base structure with or without struts and/or braces.

[0036] Modern or industrial roof timbers generally comprise battens which support the roof covering, and are supported by prefabricated wooden, concrete or steel small girders. The small girders are spaced by a few tens of centimetres, substantially by the distance between two aforementioned rafters. The small girder has a triangular base structure. Different types of bracing between the main parts which form the three sides of the small girder triangle exist in order to offset the load of the roof covering and limit the bearing distances, i.e. in the form of a stanchion, an "M", an "N", a "W", a fan, or a trimmed joist, etc.

[0037] The Applicant has realised that low areas, close to the edge of the roof, were often affected by a thermal bridge. It is desirable for such low zones to have insulation that substantially joins and covers the insulation of the walls in order to prevent a thermal bridge occurring, as this is a preferential area for heat losses. However, the roof also requires ventilation in order to prevent condensation. Vents and air passages are vital for the sustainability of the roof.

[0038] In the embodiment illustrated in figures 1 and 2, a building comprises a wall 1 with a visible upper surface 1a, a loft floor 2, and roof timbers 3. In this case, the upper surface 1a is horizontal. The upper surface may form part of the floor. The flooring 2 can comprise panels based on wood, for example of the OSB type, or on plaster. The roof timbers 3 have small girders 4. Beyond the wall 1, the roof is overhanging, and is provided with a roof underlay 5.

[0039] The small girder 4 of the roof timbers 3 comprises a main beam 6 and one principal rafter 7, the other principal rafter n not being visible in the figure. The main beam 6 is supported on the wall 1. The flooring 2 is in this case situated spaced below the main beam 6. The main beam 6 and the principal rafter 7 are secured together projecting beyond the wall 1. The roof timbers 3 comprise battens 8 which are secured on the principal rafter 7. The roof cover 9, in this case consisting of tiles, is supported on the battens 8 of the roof timbers 3. The roof underlay 5 is secured on the lower surface of the main beams 6.

[0040] The insulation installation 10 comprises a unit permeable to air, provided with regularly distributed openings. The said unit permeable to air is in this case a grid 11. The grid 11 is in a single piece. The grid 11 is made of galvanised steel. The grid 11 has square mesh. The mesh forms regularly distributed openings 11d. Alternatively, the grid 11 has hexagonal or octagonal mesh. The grid 11 is made of welded wires. Alternatively, the grid 11 is made of twisted wires. The grid 11 has mesh with mesh dimensions of between 2 and 16 mm, preferably between 5 and 16 mm, and more preferably between 10 and 14 mm. The grid 11 comprises wires with a diameter of between 0.4 and 1.5 mm, and preferably between 0.6 and 1.2 mm.

[0041] The grid 11, which is packed in rolls, is unwound. The grid 11 is put into form under the principal rafters 7. The grid 11 passes between the main beams 6. The grid 11 is supported on an upper surface 1a of the wall 1. The grid 11 is secured on the roof timbers 3 by securing units 13.

[0042] More particularly, the grid 11 comprises an upper portion 11a, a lower portion 11b, and a central portion 11c. The upper portion 11a has a slope which is substantially equal to the slope of the roof covering. The upper portion 11a occupies more than half of the grid 11. The upper portion 11a is stapled or nailed on the principal rafters 7. The upper portion 11a has a free edge situated at a level higher than the main beams 6. The area with a rectangular cross-section formed between two adjacent principal rafters 7, in the horizontal direction, and between the underside of the roof covering 9 and the plane passing below the principal rafters 7, in the direction of the slope of the roof, is left free for circulation of air in the direction of the arrows 19 in figure 1.

[0043] The lower portion 11b is substantially horizontal. The lower portion 11b is formed on the upper surface 1a of the wall 1. The lower portion 11b is supported on the upper surface 1a of the wall 1. The lower portion 11b can be attached to the upper surface 1a of the wall 1. Preferably, the lower portion 11b is free relative to the upper surface 1a of the wall 1, the contact being ensured by the resilience of the grid 11 and the weight of the insulation. The lower portion 11b has a small size, for example approximately 4 to 10 cm. The lower portion 11b has a free edge which is trimmed towards the interior of the building.

[0044] The central portion 11c is arranged between the upper portion 11a and the lower portion 11b. The central portion 11c forms a rounded angle which is substantially equal to the slope of the roof. The central portion 11c has a rounded radius of approximately a few centimetres.

[0045] The grid 11 can be laid by cutting notches corresponding to the main beams 6. Thus, the central portion 11c and the lower portion 11b are cut out longitudinally in a plurality of sections, all attached to the upper portion

11a. Each section of central portion 11c and lower portion 11b is arranged between two adjacent main beams 6. Stapling or nailing onto a vertical main beam 6 face can be carried out.

[0046] The cut grid 11 is then put into place by pushing it manually or with a tool. It is possible firstly to put the notches on the main beams 6 then deform the grid 11 by pushing the central portion 11c towards the exterior of the building. The central portion 11c can be flush with the outer surface of the wall 1.

[0047] The insulation installation 10 comprises a mat 12 made of loose insulation. The insulation can be in the form of flock. The flock can have an average diameter of approximately 20 to 40 mm, depending on the insulation material selected. The insulation is selected from amongst: stone wool, glass wool and cellulose. Stone wool has good cohesion. The stone wool may be the product marketed by the Applicant under the reference Jetrock. The product, when laid in accordance with the provisions of the CSTB, i.e. 'Technical Specification Guidelines (CPT) 3693 (Thermal insulation of roof spaces: methods for insulation by blowing loose insulation forming the subject of a Technical Opinion or of a Technical Application Document)', may have a density of between 19 and 25 kg m^{-3} in the blown state.

[0048] Alternatively, a glass wool product may be of the type 'Comblissimo' from St Gobain Isover, with a density of between 11 kg m^{-3} and 15 kg m^{-3} in the blown state.

[0049] A loose cellulose product may be of the type 'Univercell' from Soprema, with a density of between 28 kg m^{-3} and 35 kg m^{-3} in the blown state.

[0050] The mat 12 is put into place after the grid 11 has been fitted. The mat 12 has in general a thickness of one to several tens of centimetres according to the local climate, the standards applicable and the thermal performance required.

[0051] Preferably, the loose insulation is installed and spread by blowing. By way of example, an operator situated on the exterior aspirates the open loose insulation by means of the upstream part of a duct. The loose insulation comes from previously produced packaging. The aspiration is carried out by a blower which opens into the duct. An operator situated in the loft handles a blower nozzle which forms the downstream part of the duct. The loose insulation is spread on the flooring 2 to the required thickness. The loose insulation is spread until it comes into contact with the inner face of the grid 11, in particular the concave face of the central portion 11c. Continuity of insulation with the wall 1 which is insulated by other means is ensured.

[0052] In addition, since the extent of the mat 12 is limited towards the exterior by the grid 11, the unnecessary presence of insulation beyond the wall 1 is avoided. The circulation of air rising from the overhang of the roof is free. In the case of an overhang without a roof underlay, the insulation is prevented from falling by passing between the roof covering 9 and the wall 1. In the case of an overhang with a roof underlay 5, for example a lower fascia board, the aeration openings 20 provided in the roof underlay 5 are prevented from being blocked by insulation projecting from the wall 1. The aeration openings 20 are kept clear. The grid 11 prevents the insulation from coming between two adjacent principal rafters 7. The mat 12 is spaced from the roof covering 9 in order to keep a ventilation air passage. The condensation is reduced.

[0053] The mat 12 has a main portion comprising an upper face 12a, a lower face 12b which is supported on the flooring 2, and a tapered portion 12c which is arranged at an end of the main portion. The tapered portion 12c is in contact with the upper surface 1a of the wall 1. The tapered portion 12c is in contact with a lower surface of the roof, in this case the lower surface of the principal rafters 7 in the vicinity of the lower edge of the roof. The tapered portion 12c is maintained in place by the grid 11, which forms a unit permeable to air with regularly distributed openings. The tapered portion 12c is in continuity with the wall 1.

[0054] The upper face 12a is arranged at a height lower than or equal to the free edge of the upper portion 11a.

[0055] For roof timbers with metal or concrete trusses, the grid 11 can be secured by collars which can be clamped.

[0056] The grid can be packaged together with the insulation. For example, a bag of insulation can be surrounded by the grid, which itself is covered by packaging. Grid securing elements (staples, nails or a collar which can be clamped) can be packaged together with the grid and the insulation.

[0057] Stone wool is preferred because of its stability in relation to strong winds. Tests have been carried out with Jetrock loose stone wool, as specified above, in a wind tunnel. With a wind speed of 126 km/h outside the roof and at various angles of incidence, it was found that there was no displacement of the stone wool of the mat 12. For the tests, a grid with a mesh of 12 mm was used. A building of 3 m by 3.5 m was constructed using roof timbers with small girders. The roof slope is 45%. The thickness of the mat is 365 mm for the stone wool and 375 mm for the glass wool, giving the same coefficient R = 8 m^2K/W. The area of the ventilation air passages complies with the DTU (building code). Two types of air inlet are tested; one via curved tiles and the other via roof underlay aerators. The building is subjected to a wind at an angle of incidence of 0° and at an angle of incidence of 30° azimuth. The wind is adjusted from 5 to 35 m/s in steps of 5 m/s for a period of 5 minutes. Four configurations are tested:

1) angle of incidence 0°, air inlet via the tiles
2) angle of incidence 0°, air inlet via the aerators
3) angle of incidence 0°, air inlet via the tiles and the aerators
4) angle of incidence 30°, air inlet via the tiles up to 25 m/s.

[0058] The stone wool remains in place in the cases tested at the test speeds, including the highest test speeds.

[0059] In circumstances where the density of the loose insulation in the blown state is close to the lower limits indicated above, for example around 15 kg m^{-3} or less, and where the cohesion between the flock is low, it may be beneficial to provide a grid with a small mesh.

[0060] In one embodiment, the elements are similar to those described above, except that the roof timbers are made of metal. Each small girder comprises a main beam, a principal rafter and N-shaped spacers. There is a strut positioned within the N-shaped spacers. The strut is substantially vertical. The strut is positioned next to the edge of the roof. The strut is substantially level with the underlying wall. If there are several struts on a roof side, the strut is the smallest of the struts. The strut forms a subdivision of the triangle formed by the main beams and the principal rafter into a smaller and more mechanically resistant triangle. A spacer is inclined in a direction opposite to the principal rafter. The inclined spacer is secured to the junction between the strut and the principal rafter. The spacer is secured, at its opposite end, to the main beam and, if appropriate, to another strut.

The grid is unwound and cut to length. The grid is positioned with a lower edge supported on the floor or on a beam of the floor and a free upper edge. The upper edge is remote from the roof covering and from the battens. The grid is affixed to the strut on the side opposite the roof edge. The securing units in this case comprise clamping collars passing around the strut and/or the principal rafter. The securing units may comprise nails for securing to the floor. The grid may be laid without notched cutouts when the surface of the floor is flat. The grid is rectangular in shape. The grid is situated in a substantially vertical plane. The grid is situated beyond the insulated part of the wall, towards the overhang of the roof. In this case, the insulation of the wall is interior or in the mass. For a wall with exterior insulation, it is advantageous for the strut to be positioned as close as possible to the overhang, for example flush with the outer surface of the wall.

[0061] Next, the mat is introduced to a height a few centimetres lower than the height of the grid. The mat is supported on the ground by its lower face. The upper face of the mat is free. The grid defines a lateral face of the mat. Due to the porosity of the grid, the mat and the grid form the lateral face of the insulation installation as a whole.

[0062] In the embodiment of figure 3, the elements are similar to those described above, except that the roof timbers 3 are traditionally made of wood. The roof timbers 3 comprise rafters 7 which are supported on purlins 21 and a pantile 22 which is supported on the height of the wall 1. The grid 11 is flat. The grid 11 is secured on the underside of the rafters 7. There is a free air passage between the rafters 7. The grid 11 is secured by nailing on the lower face of the rafters 7. The grid 11 is in contact, via its lower edge, with a surface, for example upper surface, of the pantile 22. The mat 12 is in contact with the grid 11 and the pantile 22, possibly with an upper edge of the wall 1. The tapered portion 12c is formed in this case between the grid 11 and the pantile 22.

[0063] The invention is not limited to the examples of the method and device previously described purely by way of example, but it incorporates all the variants which persons skilled in the art could envisage within the context of the following claims.

Claims

1. Sloping roof space insulation installation with a main portion comprising an upper face (12a), a lower face (12b) which is supported on a roof space floor, and a tapered portion (12c) which is arranged at an end of the main portion, and is in contact with the said floor and with a lower roof surface in the vicinity of a lower edge of the roof, comprising a mat (12) of loose insulation selected from amongst: stone wool, glass wool and cellulose, and a unit permeable to air, provided with regularly distributed openings (11d), arranged on the surface of the tapered portion (12c) and retaining the loose insulation which forms part of the said tapered portion (12c).

2. Sloping roof space insulation installation with a main portion comprising an upper face (12a), a lower face (12b) which is supported on a roof space floor, and a lateral face connecting the upper face (12a) and the lower face (12b), comprising a mat (12) of loose insulation selected from amongst: stone wool, glass wool and cellulose, and a unit permeable to air, provided with regularly distributed openings (11d), arranged on the surface of the lateral face, retaining the loose insulation and pressed onto struts of the roof, the mat covering an underlying wall insulation.

3. Installation according to Claim 1 or 2, wherein the said unit which is permeable to air is a grid (11) preferably made of metal, and more preferably of galvanised steel, the grid (11) having a square, hexagonal or octagonal mesh with dimensions between 2 and 16 mm, preferably between 5 and 14 mm.

4. Installation according to one of the preceding claims, wherein the unit permeable to air comprises a part (11a) in contact with the floor, a part (11b) in contact with the lower surface of the roof, and a part (11c) projecting towards the lower edge of the roof.

5. Installation according to any one of the preceding claims, wherein the unit permeable to air is secured on the floor and/or on the roof by means of nailing, stapling or by collars which can be clamped.

6. Installation according to any one of the preceding claims, wherein the insulation has a density of between 10 and 40 kg m^{-3}, preferably stone wool between 19 and 25 kg m^{-3}, the insulation preferably being in the form of flock with a diameter greater than 20 mm.

7. Kit comprising at least one bag of loose insulation selected from amongst: stone wool, glass wool and cellulose, and a unit permeable to air, which is provided with regularly distributed openings, and can retain the loose insulation.

8. Kit according to Claim 7, additionally comprising elements (13) for securing the unit permeable to air to a floor and/or to a roof.

9. Method for insulation of a sloping roof space, the roof space being provided with a floor, wherein a unit permeable to air provided with regularly distributed openings (11d) is fitted in contact with the said floor and with a lower roof surface in the vicinity of a lower edge of the roof, and loose insulation selected from amongst: stone wool, glass wool and cellulose is introduced, thus forming a mat (12), the assembly having a main portion comprising an upper face, a lower face supported on the floor, and a tapered portion or a lateral face arranged at an end of the main portion, the unit permeable to air forming together with the insulation the surface of the tapered portion, and retaining the insulation.

10. Method according to Claim 9, wherein the unit permeable to air is fitted between two adjacent main beams (6) and in contact with the said two main beams (6) and in contact with rafters or principal rafters (7).

11. Method according to Claim 9 or 10, wherein the unit permeable to air is cut from a roll and put into form by pressing it into the corner formed between the floor and the lower roof surface, in the direction of the said lower edge of the roof, with the unit permeable to air forming a rounded projection.

Figure 1

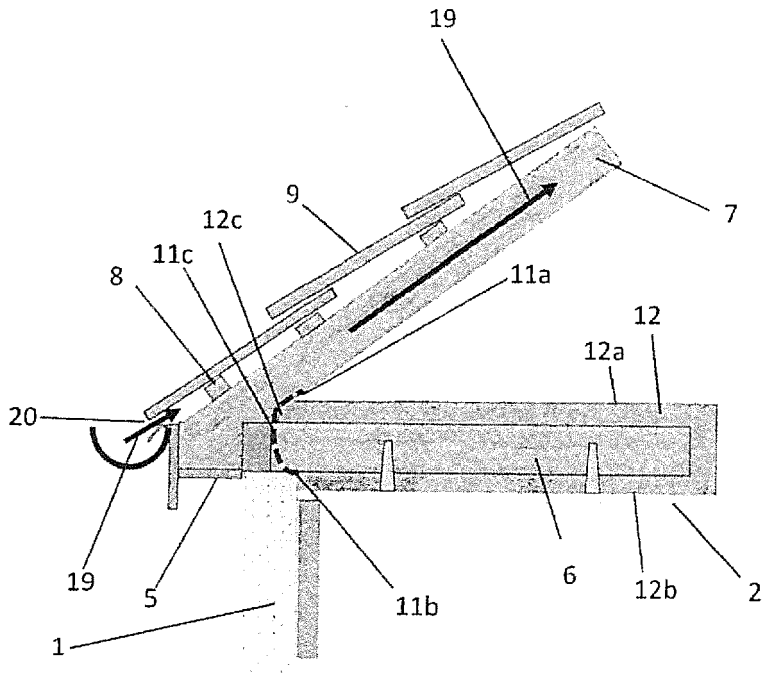


Figure 2

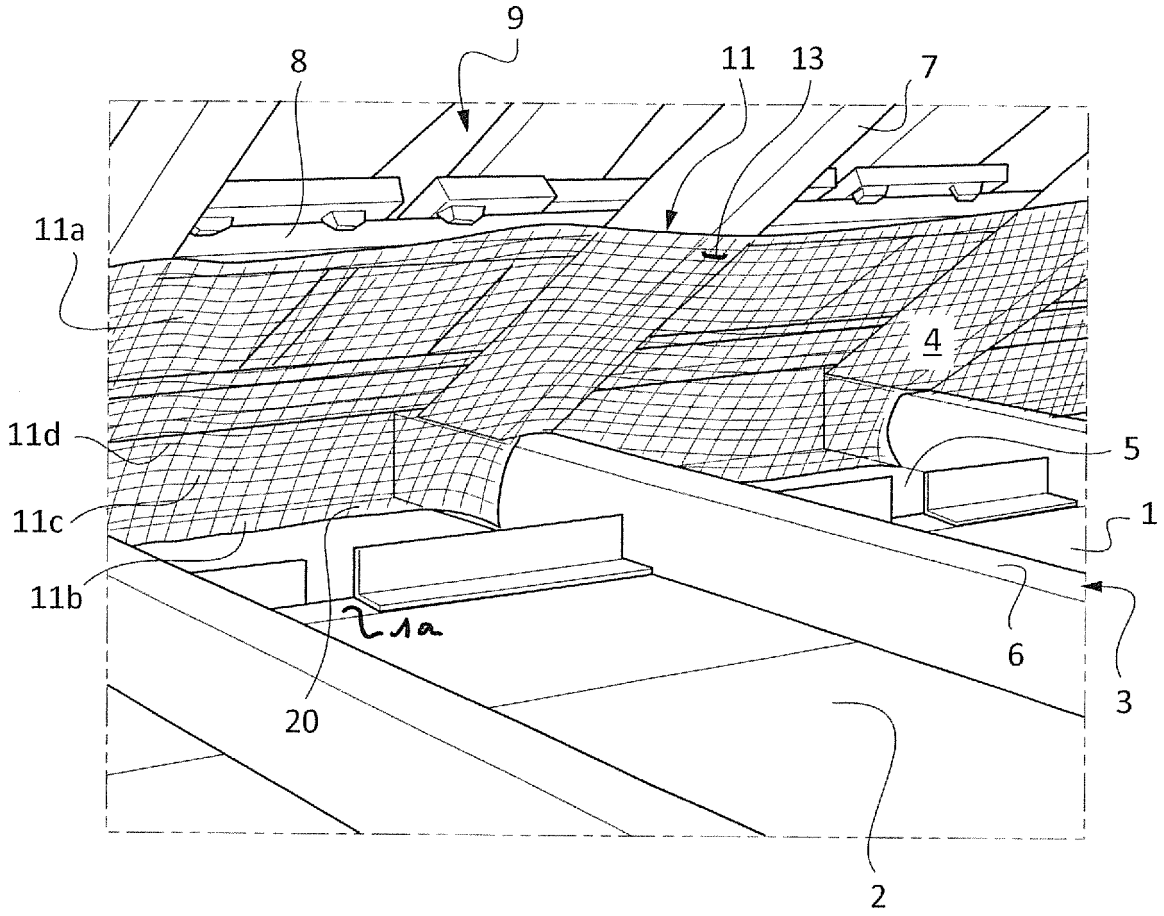
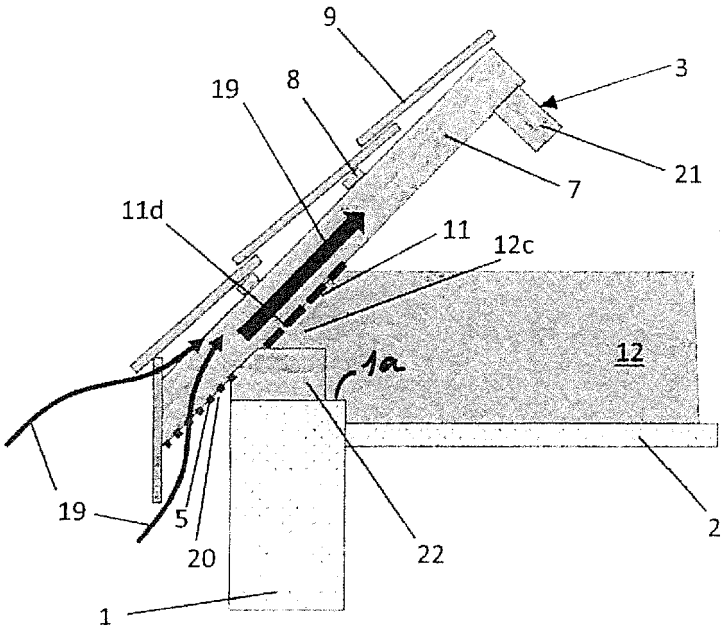


Figure 3



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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 1577

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 Y	CA 2 717 405 A1 (MOORE KIRK THOMAS [US]) 14 April 2012 (2012-04-14) * paragraphs [0059], [0066], [0067]; figures 1a,1b,8 *	1,2,4,5, 7-10 6	INV. E04D13/16 E04D13/17
X	US 2010/229498 A1 (POLLACK ROBERT W [US]) 16 September 2010 (2010-09-16) * paragraphs [0073] - [0077]; figures 36-39 *	2-5,7-11	
X Y	US 6 349 518 B1 (CHACKO JACOB T [US]) 26 February 2002 (2002-02-26) * figures 3,4 *	2-5,7-10 6	
Y	WO 2013/093057 A1 (ROCKWOOL INT [DK]) 27 June 2013 (2013-06-27) * page 19, lines 19-21 *	6	
X	NL 9 201 835 A (VERCA B V) 16 May 1994 (1994-05-16) * figures 2,3 *	7,8	
X	DE 35 08 852 A1 (RATZKY REINER) 25 September 1986 (1986-09-25) * pages 5-6; figure 1 *	7,8	TECHNICAL FIELDS SEARCHED (IPC) E04D
A	US 2008/280554 A1 (KORTUEM MATT [US] ET AL) 13 November 2008 (2008-11-13) * figure 1 *	11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 July 2018	Leroux, Corentine

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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13-07-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 2717405 A1	14-04-2012	NONE	
US 2010229498 A1	16-09-2010	NONE	
US 6349518 B1	26-02-2002	NONE	
WO 2013093057 A1	27-06-2013	CA 2856356 A1	27-06-2013
		CN 104185711 A	03-12-2014
		EA 201491243 A1	30-09-2014
		EP 2795015 A1	29-10-2014
		US 2015330080 A1	19-11-2015
		WO 2013093057 A1	27-06-2013
NL 9201835 A	16-05-1994	NONE	
DE 3508852 A1	25-09-1986	NONE	
US 2008280554 A1	13-11-2008	NONE	

EPO FORM P0459

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