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(54) Ceiling tile, suspended ceiling comprising such a ceiling tile and methods for manufacturing thereof

(57) A ceiling tile for a suspended ceiling comprising a grid of profiles arranged to support the ceiling tile, the ceiling tile comprising a first major surface (210) adapted to face a room and an opposing second major surface (220). The ceiling tile is provided with at least one groove (250), wherein the at least one groove (250) extends along a first side edge portion (240) of the ceiling tile and provides a void allowing the first side edge portion (240) to be inwardly, mainly laterally displaceable. The invention also relates to a suspended ceiling comprising such a ceiling tile (200) and a method for manufacturing of a ceiling tile (200).

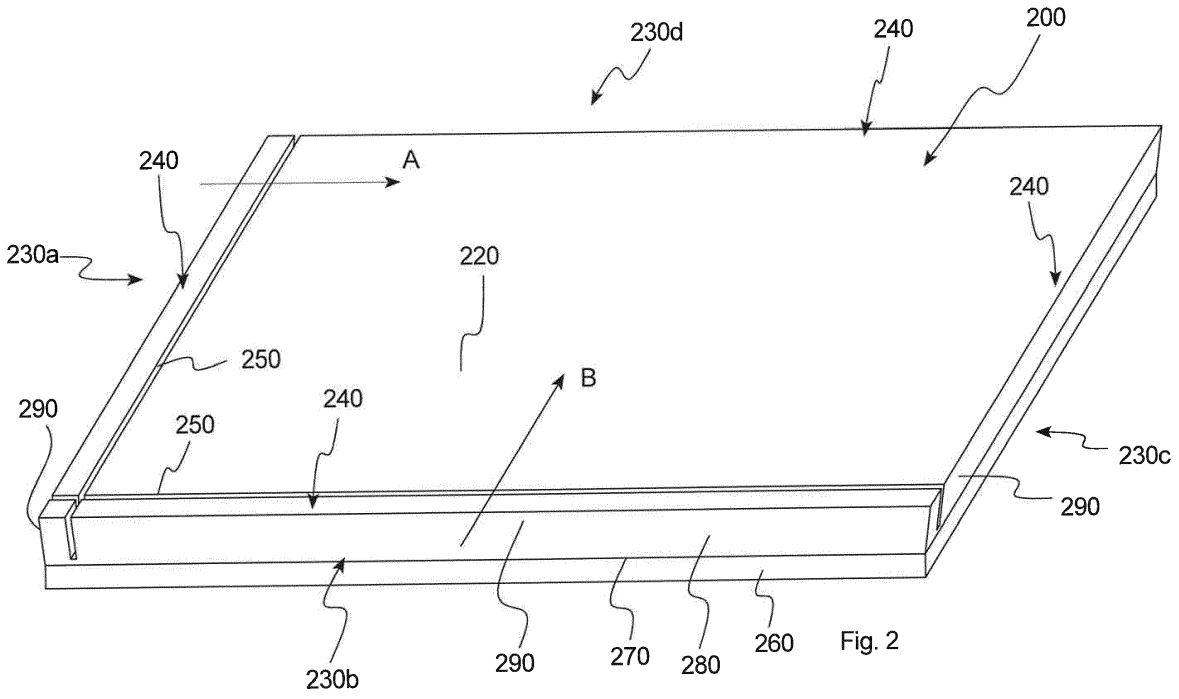

Fig. 2

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Description

Field of the invention

[0001] The present invention relates to a ceiling tile. More specifically, the invention relates to an improved ceiling tile for a suspended ceiling and a method for manufacturing such a ceiling tile.

Background art

[0002] Suspended ceilings are well known in the art and are normally arranged below the main ceiling structure in a room or in another accommodation and may serve a variety of purposes. One purpose may be to provide improved sound absorption and/or sound insulation in and outside of the room. The resulting plenum space located between the suspended ceiling and the main ceiling structure of the room may further be utilized to accommodate e.g. wiring, piping, as well as devices related to heating, ventilation and air condition. Typically, the suspended ceiling consists of a plurality of ceiling panels which are fitted into a supporting grid, comprising inverted T-profiles, which is mounted in the main ceiling.

[0003] Suspended ceilings may be used in large rooms divided into smaller rooms by means of partition walls. The suspended ceiling is normally first installed below the entire main ceiling structure. Subesquently, the partition walls are installed extending from the floor to the suspended ceiling.

[0004] Such an installation may suffer from poor sound insulation since sound generated in one of the smaller rooms may penetrate the suspended ceiling and in some extent propagate to a neighbouring smaller room.

[0005] In EP2116661 a suspended ceiling is disclosed comprising a grid of profiles supporting ceiling tiles. Each of the ceiling tiles comprises two layers comprising fibres and an intermediate air tight sheet layer. In one embodiment disclosed in EP2116661, the profiles of the grid are provided with flexible flaps arranged to engage the side edges of the ceiling tiles in order to obtain a sealed connection with restricted air flow between the grid of profiles and the ceiling tiles. Hereby the amount of sound penetrating the suspended ceiling may be reduced.

[0006] In US4428454, a laminated ceiling tile provided with a coating of a sealer on its side edges is disclosed.

[0007] The known solutions described above may exhibit good properties regarding sound insulation. However, the provision of the flexible flaps on the one hand and the coating of a sealer on the other hand results in increased costs.

Summary of the invention

[0008] In view of that stated above, the object of the present invention is to provide a ceiling tile having improved sound insulation properties and a method for the manufacturing thereof.

[0009] It is also an object to provide such a ceiling tile and manufacturing method at a comparable low cost.

[0010] It is further an object to provide a suspended ceiling comprising such a ceiling tile.

[0011] To achieve at least one of the above objects and also other objects that will be evident from the following description, a ceiling tile having the features defined in claim 1, a suspended ceiling having the features defined in claim 14 and a method having the features defined in claim 15 are provided according to the present invention. Preferred embodiments will be evident from the dependent claims.

[0012] More specifically, there is provided according a first aspect of to the present invention a ceiling tile for a suspended ceiling comprising a grid of profiles arranged to support the ceiling tile, the ceiling tile comprising a first major surface adapted to face a room and an opposing second major surface. The ceiling tile is provided with at least one groove, wherein the at least one groove extends along a first side edge portion of the ceiling tile and provides a void allowing the first side edge portion to be inwardly, mainly laterally displaceable.

[0013] Hereby a ceiling tile having improved sound insulation properties is achieved. The provision of a groove providing a void makes it possible to ensure an engagement or connection between the grid of profiles and the perimeter of the ceiling tile, which engagement or connection result in an increased air flow resistance reducing the possibility for sound to exit for a room below the ceiling tile to the plenum defined above the ceiling tile, or vice versa. The engagement or connection between the ceiling tile and the grid of profiles thus makes it possible to eliminate or at least significantly reduce the formation of clearances or gaps which otherwise may be formed due to a number of reasons such as misalignment between adjacent profiles, length and/or width deviations of individual ceiling tiles, non-straightness of individual profiles etc. The groove may be achieved in a simple cutting or milling process, and thus the ceiling tile may be achieved at a comparable lower cost

[0014] According to an embodiment, the ceiling tile may comprise at least one laterally protruding protrusion, where the at least one laterally protruding protrusion extends along the first side edge portion or a second side edge portion opposing the first side edge portion and being arranged for engagement with the grid of profiles such that the first side edge portion is inwardly, mainly laterally displaced. The laterally protruding protrusion may thus be arranged along the same side edge portion, along which the groove is provided, or along the opposing side edge portion or along both side edge portions. By the provision of at least on laterally protruding protrusion, an engagement between the ceiling tile and the grid of profiles displacing the side edge portion in an inward lateral direction is easily obtained.

[0015] According to a further embodiment of the present invention, the ceiling tile may provided with a groove extending along a third side edge portion of the

ceiling tile adjoining the first side edge portion and providing a void allowing the third side edge portion to be inwardly, mainly laterally displaceable. In this way, it is made possible to achieve a connection between the grid of profiles and the ceiling tile along its entire perimeter. The ceiling tile may further comprise a laterally protruding protrusion extending along the third side edge portion or a fourth side edge portion opposing the third side edge portion and being arranged for engagement with the grid of profiles such that the third side edge portion is inwardly, mainly laterally displaced.

[0016] The at least one laterally protruding protrusion may be formed by an obliquely extending side edge surface associated with a first, a second, a third or a fourth side edge portion of the ceiling tile .

[0017] According to yet another embodiment, the at least one grove may be provided in the first or second major surface of the ceiling tile.

[0018] According to yet another embodiment, the ceiling tile may comprises a first layer comprising mineral fibres, a second air flow restricting layer and a third layer comprising mineral fibres. By choosing suitable materials and dimension of the different layers in a ceiling having such a three-layered structure, the sound absorbing and sound insulation properties of the ceiling tile may be optimized.

[0019] The second air flow restricting layer maybe an intermediate layer arranged between and attached by means of an adhesive to the first and third layers.

[0020] The third layer may be associated with the second major surface of the ceiling tile and may comprise mineral fibres in the form of stone wool.

[0021] The first layer may be associated with the first major surface of the ceiling tile and may comprise mineral fibres in the form of glass wool.

[0022] According to yet another embodiment of the present invention, the at least one groove may be recessed in the third layer.

[0023] According to yet another embodiment of the present invention, the ceiling tile may be rectangular or triangular.

[0024] According to yet another embodiment of the present invention, the at least one groove may be V-shaped. Hereby it may be ensured that the void provided by the groove is filled when the associated side edge portion is laterally displaced, thereby improving the acoustical performance of the ceiling tile when it is mounted in a grid of profiles of a suspended ceiling.

[0025] According to a second aspect of the present invention, a suspended ceiling is provided comprising a ceiling tile as described above.

[0026] According to a third aspect of the present invention, a method for manufacturing of a ceiling tile is provided. The method comprises providing a ceiling tile having a first major surface adapted to face a room, an opposing second major surface and at least a first, a second and a third side edge extending along the perimeter of the ceiling tile and connecting the first and second major surfaces, and providing at least one groove in the ceiling tile. The at least one groove is provided such it extends along a first side edge portion associated with said first side edge of the ceiling tile and provides a void allowing first side edge portion to be inwardly, mainly laterally displaceable.

[0027] The details and advantages of the second and third aspects of the invention are largely analogous to those of the first aspect of the invention, wherein reference is made to the above. In addition, it is noted that the order of acts of the inventive method may be varied.

[0028] According to one embodiment, the method may further comprise providing the ceiling tile with at least one laterally protruding protrusion extending along the first side edge portion or a side edge portion opposing said first side edge portion.

[0029] According to another embodiment, the step of providing a ceiling tile comprises combining a first layer comprising mineral fibres, a third layer comprising mineral fibres and an intermediate, third air flow restricting layer.

[0030] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the [element, device, component, means, step, etc]" are to be interpreted openly as referring to at least one instance of said element, device, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless explicitly stated.

Brief Description of the Drawings

[0031] The above, as well as additional objects, features and advantages of the present invention, will be better understood through the following illustrative and non-limiting detailed description of preferred embodiments of the present invention, with reference to the appended drawings, where the same reference numerals will be used for similar elements, wherein:

Fig. 1 is a perspective view of a suspended ceiling in accordance with the present invention.

Fig. 2 is a perspective view of a ceiling tile in accordance with the present invention.

Fig. 3 is a cross sectional view of the ceiling tile shown in Fig. 2.

Figs. 4a-d are cross sectional views illustrating steps of mounting a ceiling tile in accordance with the present invention in a grid of profiles of a suspended ceiling.

Fig. 5 is a cross sectional view of a suspended ceiling in accordance with the present invention installed in a larger room divided into smaller rooms by means of a partition wall.

Figs. 6a, b are cross sectional views illustrating an alternative embodiment of the present invention.

Figs. 7a, b are cross sectional views illustrating yet another alternative embodiment of the present invention.

Description of Embodiments

[0032] Fig. 1 is a schematic perspective view illustrating an embodiment of an inventive suspended ceiling 100 comprising a plurality of inventive ceiling tiles 200 and a grid of profiles 110, 112, as seen obliquely from above. The suspended ceiling 100 is adapted to be mounted underneath a main ceiling structure of a room or another accommodation, thereby forming a two-dimensional visible ceiling surface as seen from below.

[0033] The grid of profiles 110, 112 is a supporting structure for the ceiling tiles 200 and comprises profiles 110, 112 in the form of main runners 110 as well as cross runners 112. A first set of main runners 110 may be suspended in the main ceiling structure, thereby supporting the grid of profiles 110, 112, while a second set of main runners 110 may be nonsupported in the same. Moreover, the first set may extend across several ceiling tiles 200 while the second set may comprise several segments, whereby each segment extends along the adjacent side edges of one pair of neighbouring ceiling tiles 200. The cross runners 112 are provided at right angles to the main runners 110 and are connected to the same at a discrete set of locations. Thereby, the main runners 110 and the cross runners 112 form a grid-like structure defining frames which are adapted to support ceiling tiles 200 of a rectangular shape. Optionally, the grid of profiles 110, 112 may also comprise wall runners as is well-known to a person skilled in the art. It is also understood that the overall geometry of the profiles may vary. For instance, the profiles may be curved, horizontally and/or vertically, and may consequently be adapted to support ceiling tiles of other shapes. For example, a ceiling tile may be in the shape of a polygon, such as a triangle, a quadrilateral or a pentagon, etc.

[0034] According to the present embodiment, the grid of profiles forms frames in the shape of rectangular frames into which the ceiling tiles 200 are to be inserted. Thus, each ceiling tile 200 is enclosed by profiles.

[0035] The rectangular frames may be adapted to support quadratic ceiling tiles with lateral dimensions 600 mm x 600 mm. Naturally also other lateral dimensions are conceivable. For example, a ceiling tile may have the dimensions 600 mm x 1200 mm.

[0036] The grid of profiles 110, 112 is suspended by hangers 130 such as hanger wires, rods, etc. An end portion of each hanger 130 may be provided with a hook and is inserted into a corresponding hole in a hanger clip which is provided in a main runner 110. Moreover, the length of each hanger 130 may be adjustable. The hangers 130 are fastened to a permanent structure of the room, such as the main ceiling structure of the room (not shown), thereby upholding the suspended ceiling.

[0037] According to the present embodiment, each of the profiles 110, 112 is an inverted T-profile, or a tee, thereby having a cross-section in the form of an inverted T. Thus, each of the profiles has a central web and two flanges 115 which protrude to an equal extent from a lower part of the web in two opposite horizontal directions. The flanges 115 are adapted to support the ceiling tiles 200. In the shown embodiment, the central web comprises an upper bulb 120, e.g. for reinforcing the T-profile. The profiles are comprised of a light-weight material. For example, the material may be a metal such as steel or a sheet metal. Alternatively, the material may be a rigid plastic, a light metal, such as aluminium, or similarly. The profiles 110, 112 according to the present embodiment are rigid. However, it is equally conceivable to utilize resilient profiles 110, 112 which may simplify the installation of the ceiling tiles 200.

[0038] According to an alternative embodiment, the profiles 110, 112 may comprise at least one of an L-profile, an H-profile, an I-profile and a Z-profile.

[0039] The lateral dimensions of each ceiling tile 200 substantially correspond to the lateral dimensions of frame into which it is to be inserted. Furthermore, the thickness of each ceiling tile 200 may be smaller, bigger or equivalent to a height of the upwardly directed web portions of the surrounding T-profiles.

[0040] The ceiling tiles 200 comprise in accordance with the present invention a first major surface (not shown in Fig. 1) adapted face a room and an opposing second surface 220 adapted to face a main ceiling structure. The inventive ceiling tiles are further provided with grooves 250 which in the shown embodiment are provided in the second surface 220 of the ceiling tiles 200.

[0041] An embodiment of the inventive ceiling tile will now be discussed in more detail with reference to Figs. 2 and 3.

[0042] The ceiling tile 220 comprises a first major surface 210 adapted to face a room, an opposing second major surface 220 adapted to face a main ceiling structure of a room and side edges 230 extending along the perimeter of the ceiling tile 200 and connecting the first and second major surfaces 210, 220. In the shown embodiment, the ceiling tile 200 is rectangular and consequently has four side edges: a first, a second, a third and a fourth side edge; 230a-d. It is to be understood that the ceiling tile may have other shapes, such as triangular.

[0043] The ceiling tile 200 may comprise a material which is sufficiently acoustically absorbing and/or acoustically insulating for the room under consideration. In addition, the materials are preferably chosen to be relatively lightweight, thereby giving rise to a lightweight suspended ceiling. For example, the ceiling tiles may be made of a compressed fibre material comprising mineral wool such as rock wool, or especially glass wool.

[0044] The ceiling tile 200 according to the embodiment has a three-layered structure.

[0045] A first layer 260 of said three-layered structure comprises mineral fibres and has a density in the range of 20-300 kg/m^3. The thickness of the first layer 260 may

be in the range 10-30 mm. In the shown embodiment, the density is 60 kg/m^3 and the thickness is 15 mm.

[0046] The first layer is associated with the first major surface 210 adapted to face the room and may be provided with an air permeable outer coating such a paint and/or a woven or non-woven fibre covering such as a glass fibre cloth.

[0047] The purpose of the first layer 260 is primarily to absorb sound generated in the room below the ceiling tile in its installed state, and it is thus necessary for the sound waves to be able to penetrate into the first layer.

[0048] A second layer 270 of said three-layered structure is an air flow restricting layer such as a plastic foil or a metal foil. The purpose of the second air flow restricting layer 270 is primarily to reduce the transmission of sound through the ceiling tile 200.

[0049] A third layer 280 of said three-layered structure comprises mineral fibres and has a density in the range of 60-300 kg/m^3. The thickness of the third layer 280 may be in the range 10-50 mm. In the shown embodiment, the density is 200 kg/m^3 and the thickness is 25 mm. The third layer 280 is associated with the second major surface 220 of the ceiling tile 200.

[0050] The purpose of the third layer 280 is primarily to absorb sound approaching the ceiling tile 200 in its installed state in the space or plenum formed between the suspended ceiling and the main ceiling structure, and it is thus necessary for the sound waves to be able to penetrate into the third layer 280.

[0051] The mineral fibres in the first or third layers 260, 280 may be in the form of glass wool or stone wool. More specifically, the mineral fibres in the first layer may be in the form of glass wool, and the third layer may be made from a crimped stone wool fibre mat.

[0052] The second layer 270 is as shown arranged intermediate the first and third layer. The second layer 270 may be attached to each of the first and third layer by means of an adhesive made of polymers or similar.

[0053] The ceiling tile 200 is provided with at least one groove 250 extending a long a side edge portion 240 associated with one of the side edges 230a-d. In the shown first embodiment of the inventive ceiling tile 200, the at least one groove comprises a groove 250 extending along a first side edge portion 240 associated with the first side edge 230a and a groove 250 extending along a second side edge portion 240 associated with the second side edge 230b. More specifically, the grooves 250 are provided in the second major surface 220 and extending in parallel with the associated side edge 230a, b.

[0054] Each groove 250 provides a void in the ceiling tile 200 allowing the associated side edge portion 240 to be inwardly, mainly laterally displaceable.

[0055] Consequently, the groove 250 provided along the first side edge portion 20 provides a void allowing the first side edge portion 240 to be inwardly, mainly laterally displaceable in the direction indicated by arrow A, and the groove 250 provided along the second side edge portion 240 provides a void allowing the second side edge portion 240 to be inwardly, mainly laterally displaceable in the direction indicated by arrow B.

[0056] As discussed above, the third layer may comprise a mineral fibre material in the form of stone wool having a density in the range of 60-300 kg/m^3. Such a material is quite rigid, but the first and second side edge portions 240 are laterally displaceable due to the formation of a pivot at the bottom of the respective groove 250, about which pivots the side edge portion may rotate resulting in an inward, mainly lateral displacement.

[0057] The at least one groove 250 may be arranged at 8-25 mm from the associated side edge, have a width in the rage of 1-5 mm and have a depth of 10-45 mm.

[0058] The inventive ceiling 200 tile further comprises at least one laterally protruding protrusion 290 extending along a side edge portion 240 provided with a groove 250 or a side edge portion opposing a side edge portion provided with a groove 250. When the ceiling tile 250 is included in a suspended ceiling and mounted in a grid of profiles, the at least one laterally protruding protrusion 290 is arranged to engage the grid of profiles such that the side edge portion provided with a groove 250 is inwardly, mainly laterally displaced.

[0059] In the shown embodiment, the at least one laterally protruding protrusion includes a protrusion 290 extending along each side edge portion 240 of the ceiling tile 200.

[0060] In Fig. 3, the detached, enlarged view illustrates the first side edge 230a of the inventive ceiling tile according to the first embodiment. As evident from this enlarged view, the first side edge 230a comprises a first side edge surface 231 associated with the first 260 and second 270 layer which extends perpendicular to the first and second major surfaces 210 ,220. The first side edge 230a further comprises an obliquely extending or cut second side edge surface 232 associated to the third layer 280. The second side edge surface may be arranged at an angle α in the range of 70-87° in relation to a plane parallel to the first and second major surfaces 210, 220. According to the shown embodiment, the angle a is 83°.

[0061] The obliquely cut second side edge surface 232 thus forms the laterally protruding protrusion 290 extending along the first side edge portion 240. In the shown embodiment, the remaining side edges 230 b-d each has a corresponding obliquely cut second side edge surface 232 forming a laterally protruding protrusion 290.

[0062] Due to the obliquely cut second side edge surfaces 232 , the ceiling tile exhibits a diverging shape having a base width and a maximum width as measured across the opposing side edges 230a, 230c as well as measured across the opposing side edges 230b, 230d. The base width and the maximum width are indicated by L1 and L2, respectively, in the enlarged view in Fig. 3.

[0063] The detached, enlarged view in Fig. 3 also shows the groove 250 extending along the first side edge portion 240 in more detail. As evident, the groove 250 provides a void allowing the first side edge portion 240 to be inwardly, mainly laterally displaceable, which now

will be explained more in detail with reference to Figs. 4a-d.

[0064] In Fig. 4a, the inventive ceiling tile 200 is shown in a position above a pair of profiles 110 included in a grid of profiles of a suspended ceiling.

[0065] The profiles 110 are arranged such that the mutual distance L between the bulbs 120 of the profiles is greater that the base width L1 of the ceiling tile 200, but smaller than the maximum width L2; that is L1 < L < L2.

[0066] In Fig. 4b, the ceiling tile 200 has been lowered a distance, down between the profiles 110. Since the mutual distance L between the bulbs 120 of the profiles 110 is greater than the base width L1 of the ceiling tile 200, a clearance is formed allowing the base portion of the ceiling tile 200 to pass between the bulbs 120.

[0067] By further lowering of the ceiling tile 200, as shown in Fig. 4c, the laterally protruding protrusions 290 will cause an engagement between the ceiling tile 200 and the bulbs 120 of the profiles 110.

[0068] The engagement along the third side edge 230c of the ceiling tile 200 will cause an inward lateral displacement of the ceiling tile 200 in the direction indicated by arrow A1.

[0069] Due to the provision of the groove 250, the engagement along the first side edge 230a will cause an inward, mainly lateral displacement of the first side edge portion 240. More specifically, the void provided by the groove 250 allows the first side edge portion 240 to be displaced in the direction indicated by arrow A2.

[0070] In Fig. 4d, the ceiling tile 200 has been lowered to such an extent that it has come to rest on the lateral flanges 115 of the profiles 110 while the engagement between the laterally protruding protrusions 290 of the ceiling tile 200 and the bulbs 120 of the profiles 110 is maintained.

[0071] Thus, the disclosed embodiment of the inventive ceiling tile 200 provides a connection between the grid of profiles 110 and the ceiling tile 200. This connection provides an airflow restriction reducing the amount of sound which may penetrate in or out of a room below the ceiling tile.

[0072] A suspended ceiling 100 having a ceiling tile 200 in accordance with the first embodiment of the invention is illustrated in Fig. 5. The inventive suspended ceiling 100 is arranged below a main ceiling structure 300 in a larger room divided into smaller rooms 400, 410 by means of a partition wall 500. The provision of a groove 250 in the ceiling tile provides, as discussed above, a void allowing the side edge portion 240 to be inwardly mainly laterally displaced in response to the engagement of the laterally protruding protrusions 290 of the ceiling tile 200 with the bulbs 120 of the profiles 110, and to maintain this engagement once the ceiling tile 200 is mounted in the grid of profiles.

[0073] Conventionally, the ceiling tile is made smaller than the frame defined by the grid of profiles in order to enable mounting of the ceiling tile. As a consequence, clearances or gaps are formed between the profiles and the ceiling tile. This means that even if the ceiling tile has a three-layered structure as described above, sound may penetrate through the side edges of the ceiling tile and exit or enter a room though these clearances or gaps.

[0074] In this context it should be mentioned that gaps or clearances may also be formed as a consequence of variations of the bulb width of profiles, the profiles being crooked, misalignment of adjacent profiles (with respect of parallelism or mutual spacing) or width and/or length deviations of the ceiling tiles.

[0075] In contrast, the inventive ceiling tile 200 having a groove 250 providing a void allowing the associated side edge portion 240 to be inwardly, mainly laterally displaceable ensures that a air flow restricting connection is formed between the grid of profiles and the perimeter of the ceiling tile, thereby reducing the possibility for sound to exit from the first room 300, through the ceiling tile 200, to propagate through the plenum defined between the suspended ceiling 100 and the main ceiling structure 300, and to further enter into to the second room 410 or vice versa.

[0076] It will be appreciated that the present invention is not limited to the embodiment described above.

[0077] For example, all side edges of the ceiling tile need not to be provided with a lateral protrusion. A rectangular ceiling tile may for instance be provided with a laterally protruding protrusion along two adjacent side edges only.

[0078] Further, the at least one groove providing a void allowing the associated side edge portion to be inwardly, mainly laterally displaced may include a groove provided along each side edge portion of the ceiling tile.

[0079] It is also possible to provide the at least one groove along one side edge portion and to provide the lateral protrusion along an opposing side edge portion.

[0080] The groove may be provided in a number of different ways. Figs. 6a, b discloses an embodiment according to which the groove 250 provided in the second major surface 220 of the ceiling tile 200 has a V-shape. As a result, the void provided by the groove 250 will be filled in response to the lateral displacement of the side edge portion 240 when engaging the grid of profiles 110, as shown in Fig. 6b. The elimination of any void in the ceiling tile 200 in its mounted state will enhance the overall acoustical performance of the suspended ceiling.

[0081] Further, the groove need not be provided in the second major surface of the ceiling tile. It may be provided in the side edge or, as shown in Fig.7, in the first major surface 210 of the ceiling tile 200. This embodiment may, for instance, be beneficial if the height of the ceiling tile is greater than the height of the profiles. As shown in the illustrated embodiment, the top portion of the side edges may be chamfered such that the ceiling tile may be positioned in the grid of profiles without interfering with adjacent ceiling tiles.

[0082] Several modifications and variations are thus conceivable within the scope of the invention which thus is exclusively defined by the appended claims.

Claims

1. A ceiling tile for a suspended ceiling comprising a grid of profiles (110) arranged to support the ceiling tile, the ceiling tile comprising a first major surface (210) adapted to face a room and an opposing second major surface (220), **characterized in that**
the ceiling tile is provided with at least one groove (250),
wherein the at least one groove (250) extends along a first side edge portion (240) of the ceiling tile and provides a void allowing the first side edge portion (240) to be inwardly, mainly laterally displaceable.

2. The ceiling tile according to claim 1, further comprising at least one laterally protruding protrusion (290), where the at least one laterally protruding protrusion (290) extends along the first side edge portion (240) or a second side edge portion (240) opposing the first side edge portion (240) and being arranged for engagement with the grid of profiles (110) such that the first side edge portion (240) is inwardly, mainly laterally displaced.

3. The ceiling tile according to claim 1 or 2, wherein the ceiling tile is provided with a groove (250) extending along a third side edge portion (240) of the ceiling tile adjoining the first side edge portion (240) and providing a void allowing the third side edge portion (240) to be inwardly, mainly laterally displaceable.

4. The ceiling tile according to claim 3, further comprising a laterally protruding protrusion (290) extending along the third side edge portion (240) or a fourth side edge portion (240) opposing the third side edge portion (240) and being arranged for engagement with the grid of profiles (110) such that the third side edge portion (240) is inwardly, mainly laterally displaced.

5. The ceiling tile according to any of the preceding claims, wherein at least one side edge (230a, 230b, 230c, 230d) associated with a first, a second, a third or a fourth side edge portion (240) of the ceiling tile comprises an obliquely extending side edge surface (232) forming the at least one laterally protruding protrusion (290).

6. The ceiling tile according to any of the preceding claims, wherein the at least one groove (250) is provided in the first or second major surface (210, 220) of the ceiling tile.

7. The ceiling tile according to any of the preceding claims, wherein the ceiling tile comprises a first layer (260) comprising mineral fibres, a second air flow restricting layer (270) and a third layer (280) comprising mineral fibres.

8. The ceiling tile according to claim 7, wherein the second air flow restricting layer (270) is an intermediate layer arranged between and attached by means of an adhesive to the first and third layers (260, 280).

9. The ceiling tile according to claim 7 or 8, wherein the third layer (280) is associated with the second major surface (220) of the ceiling tile and comprises mineral fibres in the form of stone wool.

10. The ceiling tile according to any of claims 7-9, wherein the first layer (260) is associated with the first major surface (210) of the ceiling tile and comprises mineral fibres in the form of glass wool.

11. The ceiling tile according to any of claims 7-10, wherein the at least one groove (250) is recessed in the third layer (280).

12. The ceiling tile according to any of the preceding claims, wherein the ceiling tile is rectangular or triangular.

13. The ceiling tile according any of the preceding claims, wherein the at least one groove (250) is V-shaped.

14. A suspended ceiling comprising at least one ceiling tile (200) according to any of the preceding claims and a grid of profiles (110, 112) supporting the at least one ceiling tile (200).

15. Method for manufacturing of a ceiling tile (200), comprising providing a ceiling tile (200) having a first major surface (210) adapted to face a room, an opposing second major surface (220) and at least a first, a second and a third side edge (230a, 230b, 230c) extending along the perimeter of the ceiling tile (200) and connecting the first and second major surfaces (210, 220),
providing at least one groove (250) in the ceiling tile (200),
the at least one groove (250) being provided such it extends along a first side edge portion (240) associated with said first side edge (230a) of the ceiling tile (200) and provides a void allowing the first side edge portion (240) to be inwardly, mainly laterally displaceable.

16. Method according to claim 15, further comprising providing the ceiling tile (200) with at least one laterally protruding protrusion (290) extending along the first side edge portion (240) or a side edge portion (240) opposing said first side edge portion (240).

17. Method according to claim 15 or 16, wherein the step of providing a ceiling tile (200) comprises combining a first layer (260) comprising mineral fibres, a third

layer (280) comprising mineral fibres and an intermediate, second air flow restricting layer (270).

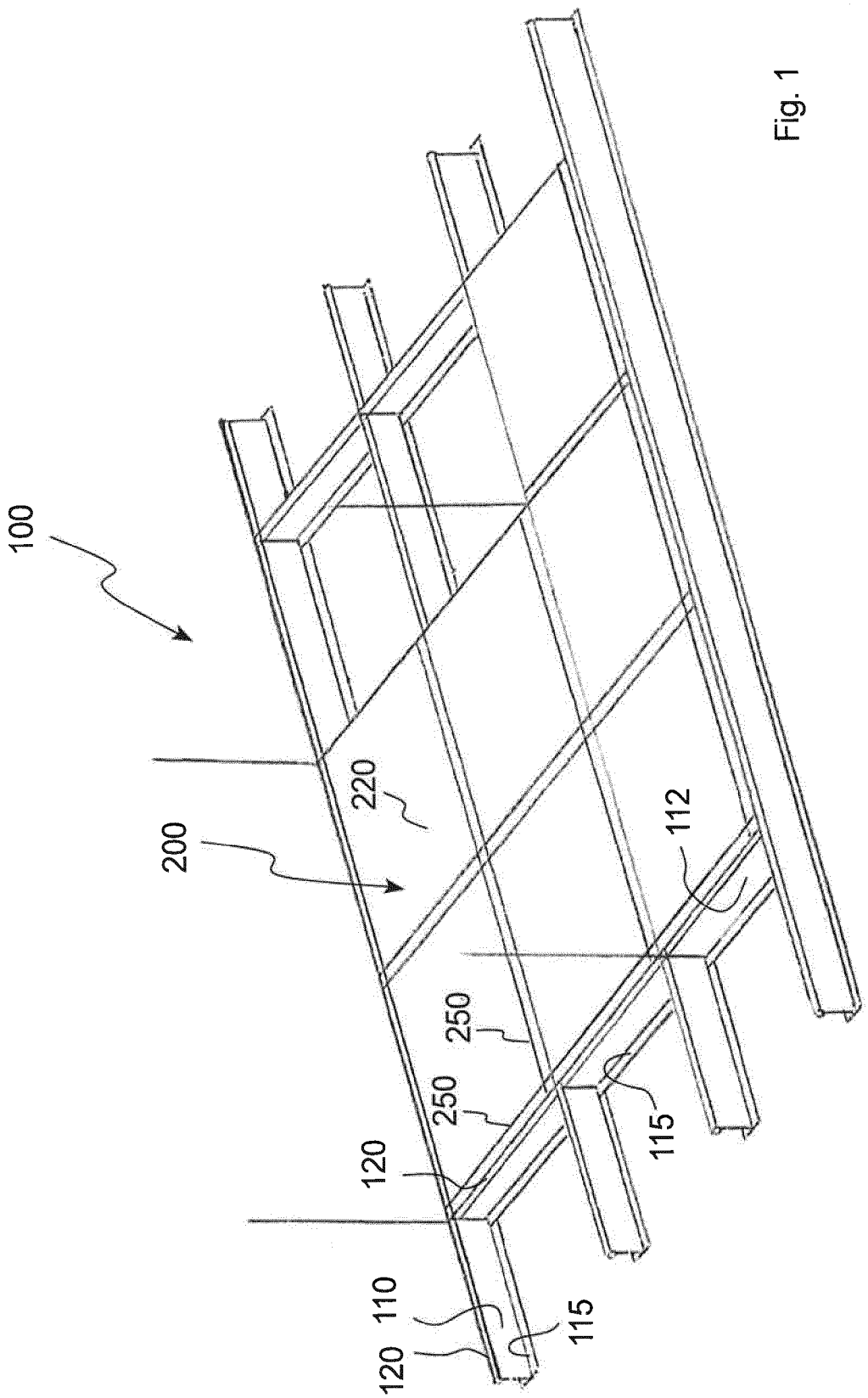


Fig. 1

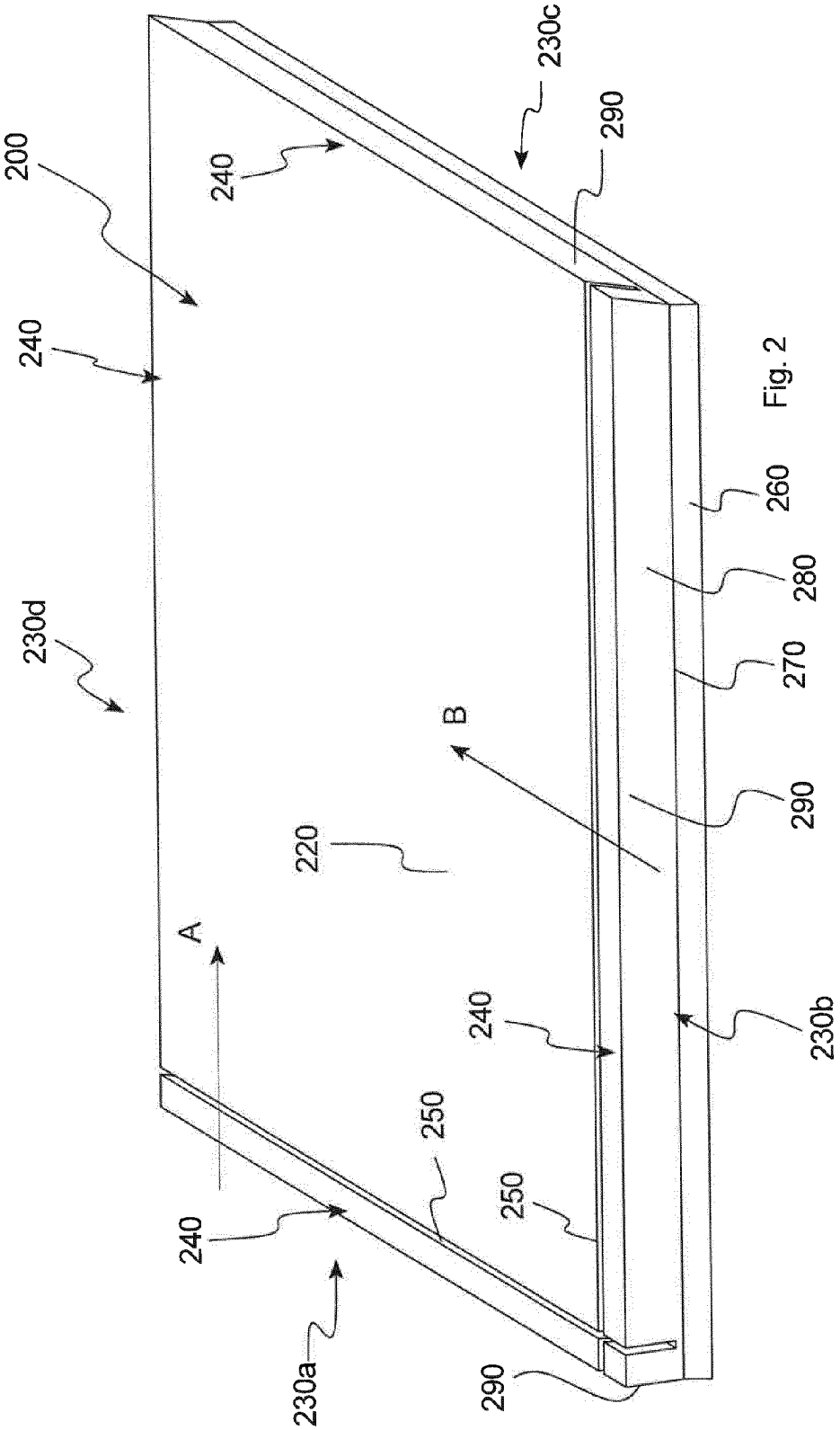
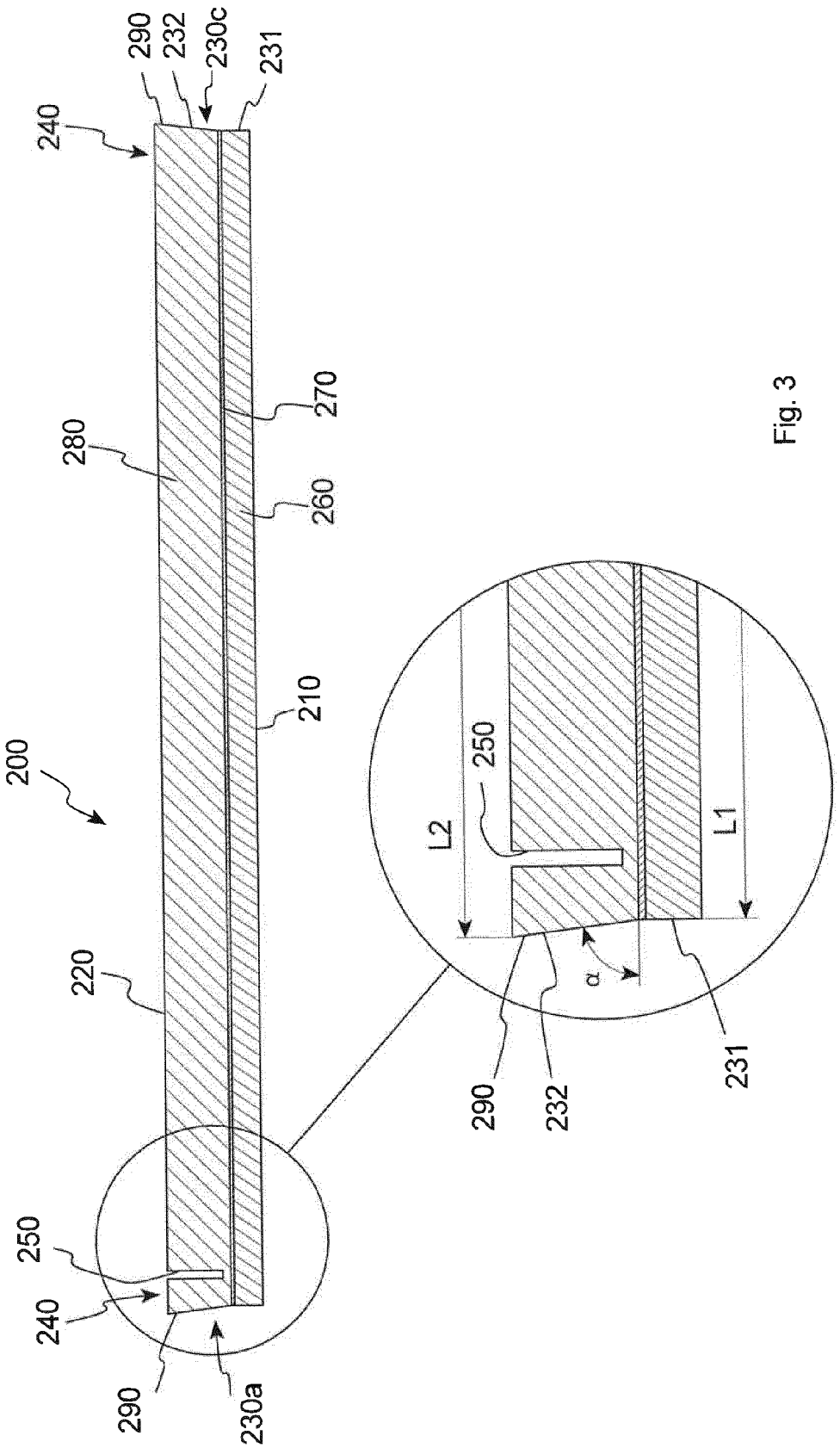

200
240
230c
290
240
230d
260
280
270
B
290
220
A
240
230b
250
250
240
230a
290

Fig. 2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232
230c
231
240
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280
260
210
200
220
250
240
290
230a
L2
250
L1
α
290
232
231

Fig. 3

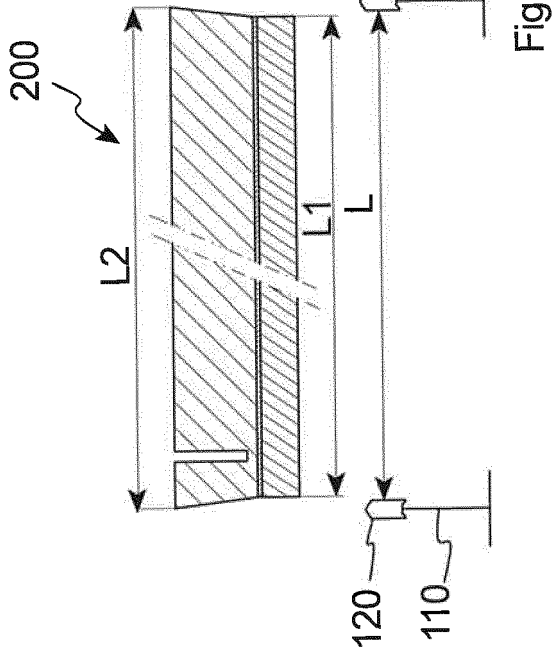

Fig. 4a

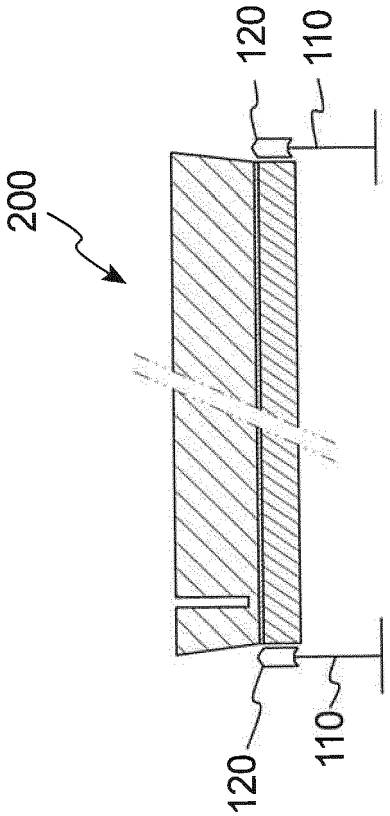

Fig. 4b

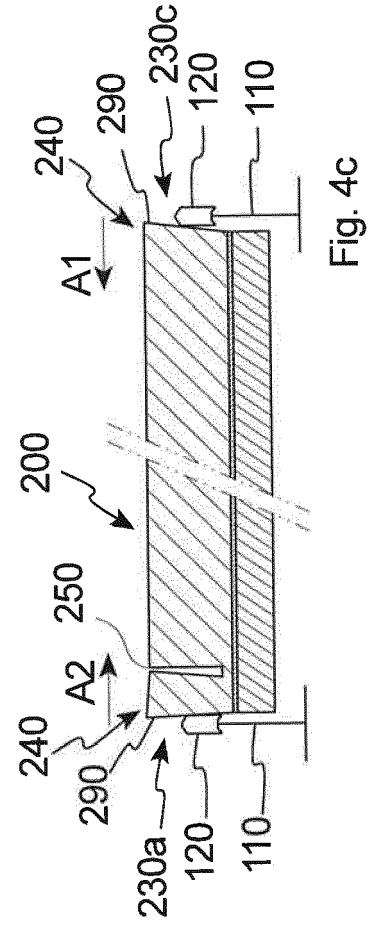

Fig. 4c

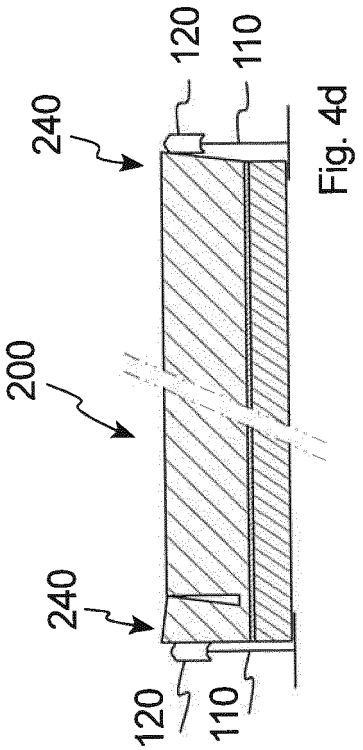

Fig. 4d

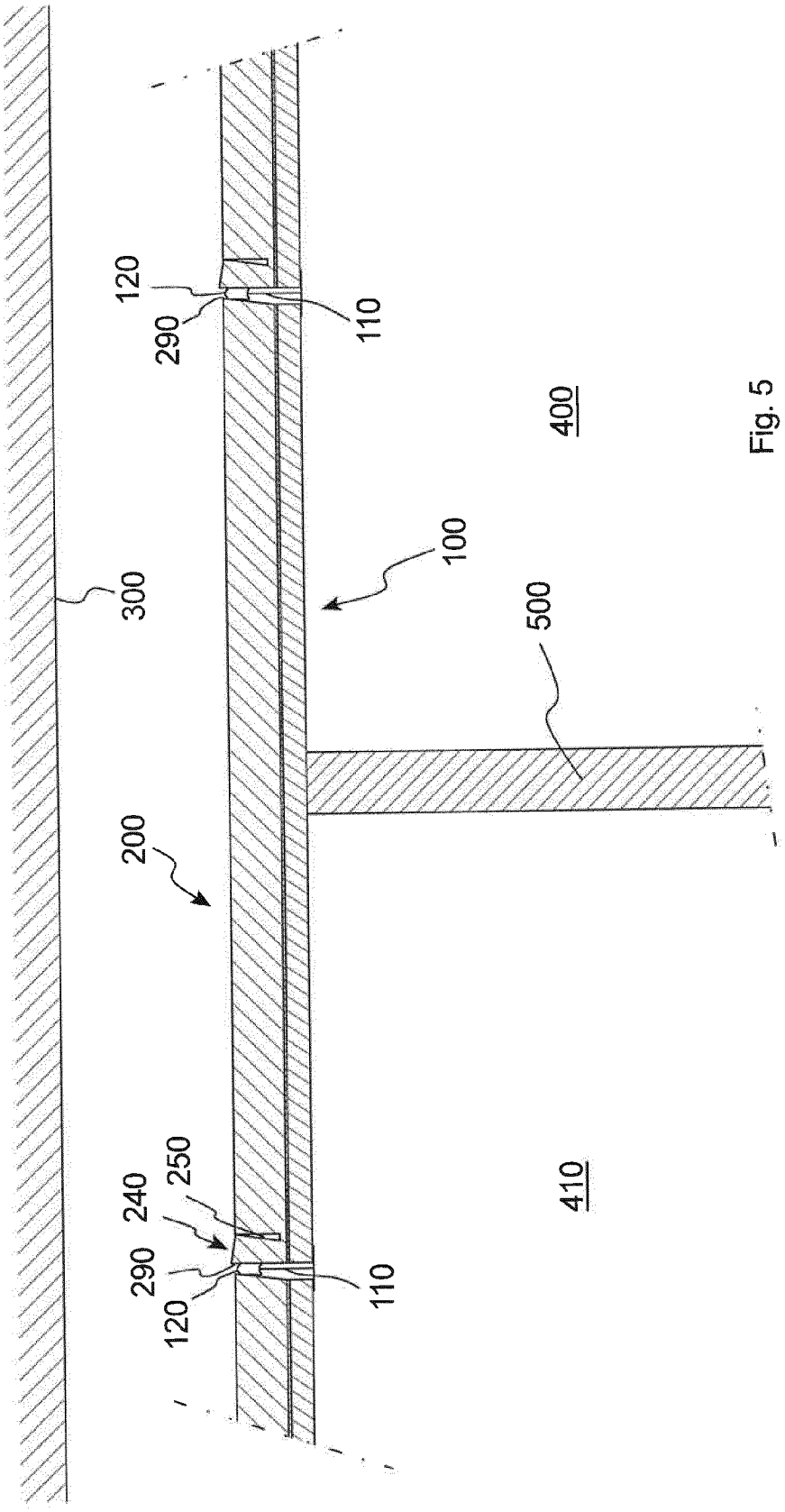

Fig. 5

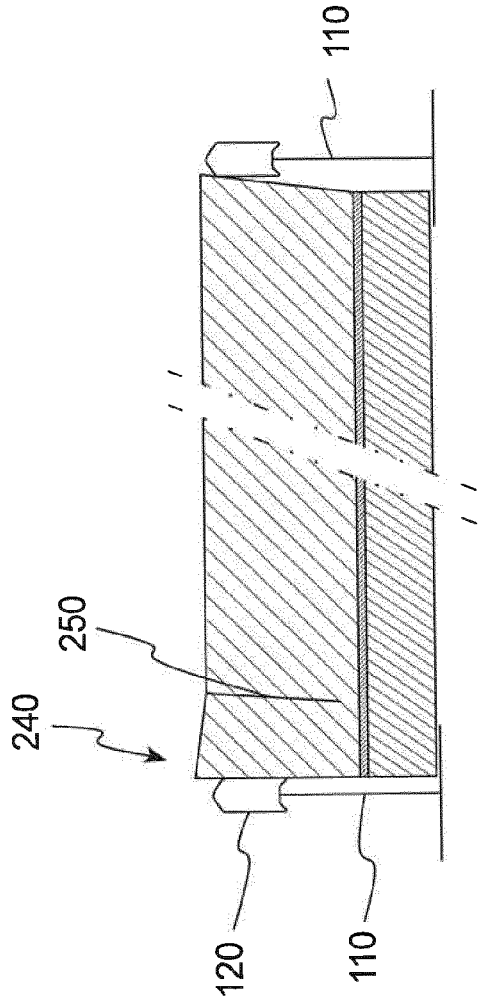

Fig. 6b

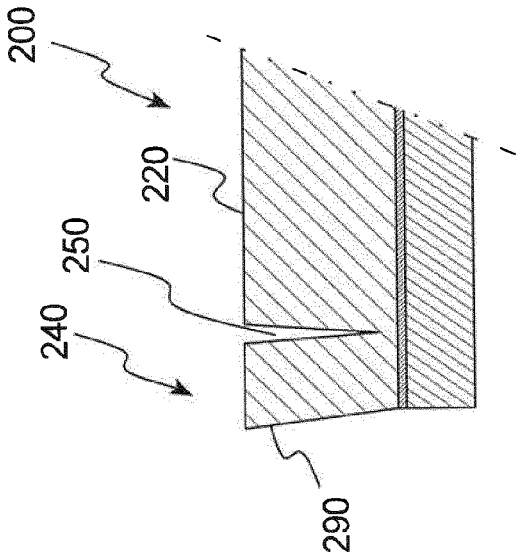

Fig. 6a

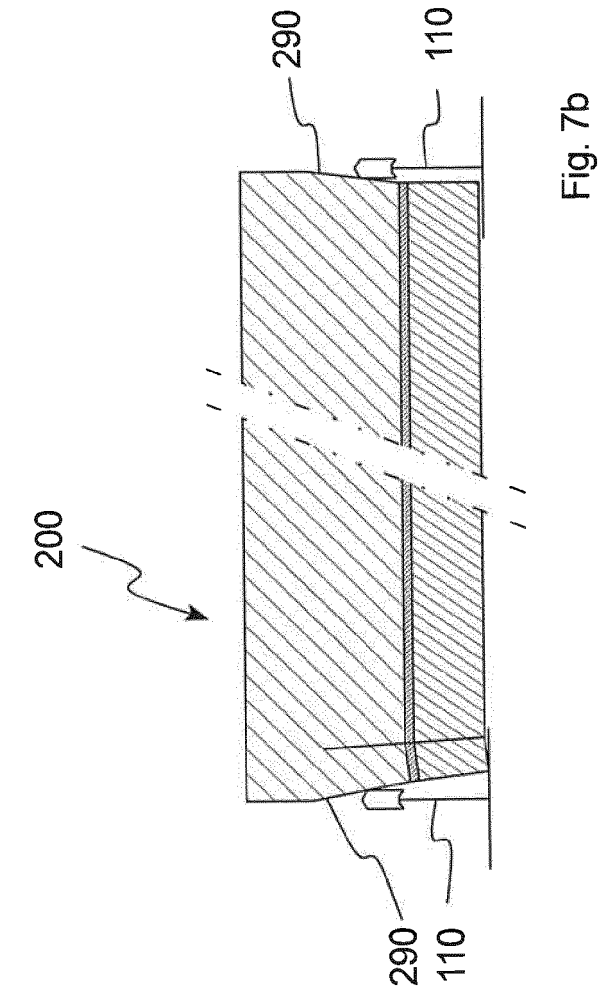

Fig. 7b

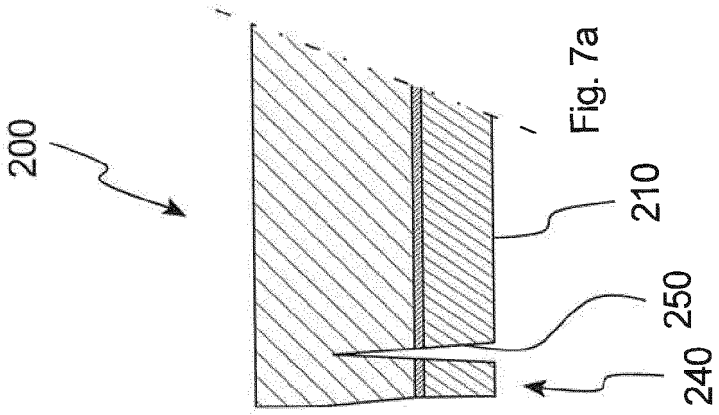

Fig. 7a

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EUROPEAN SEARCH REPORT

Application Number
EP 14 17 6869

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 998 014 A (BARTELS HAROLD ET AL) 21 December 1976 (1976-12-21) * column 2, line 40 - column 4, line 36; figures 1,2,4 *	1,3,4,6, 12,13, 15,16	INV. E04B9/00 E04B9/04
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E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 January 2015	Lopes, Claudia

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