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(71) Applicant: **Forestia AS**
2435 Braskereidfoss (NO)

(72) Inventors:
• **Sørli, Christian**
2270 FLISA (NO)
• **Sandermoen, Stein**
2280 GJESÅSEN (NO)

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(74) Representative: **Håmsø Patentbyrå AS**
P.O. Box 9
4068 Stavanger (NO)

(54) **A CEILING BOARD, A METHOD FOR MOUNTING A PLURALITY OF SAME, AND A KIT OF TOOLS FOR USE IN THE METHOD**

(57) A ceiling board (1) for use in a ceiling and a method for mounting a plurality of ceiling boards wherein, in a position of use, transitions (14) between adjoined boards of the same kind appear inconspicuous, the ceiling board (1) comprises: a force fit in the form of a tongue

(70) and groove (50) arrangement for allowing a plurality of boards (1, 1') to be lockingly interconnected. A kit of tools 100, 150 for use when aligning the ceiling boards is also disclosed.

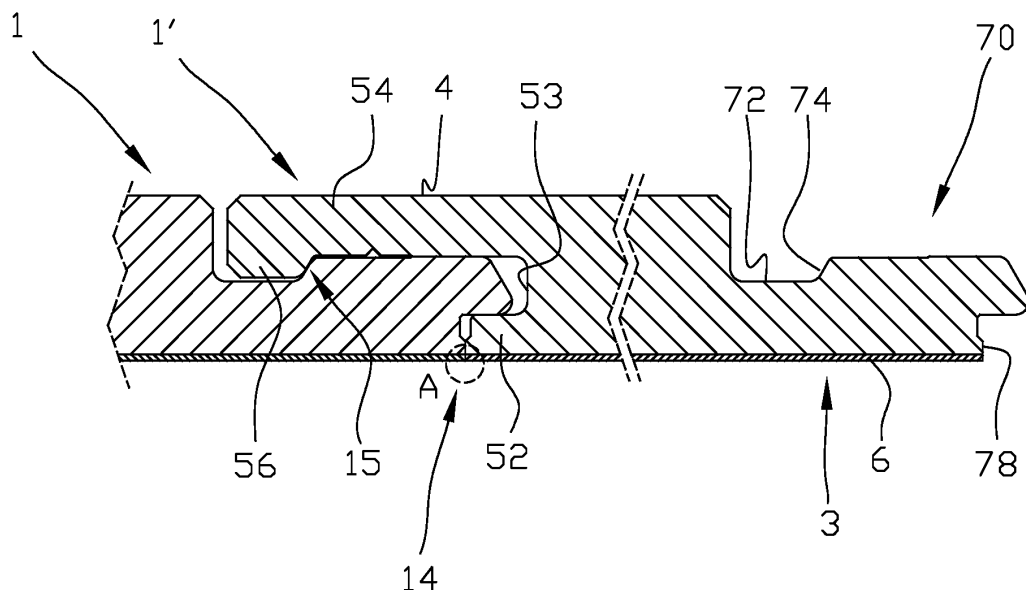


Fig. 1b

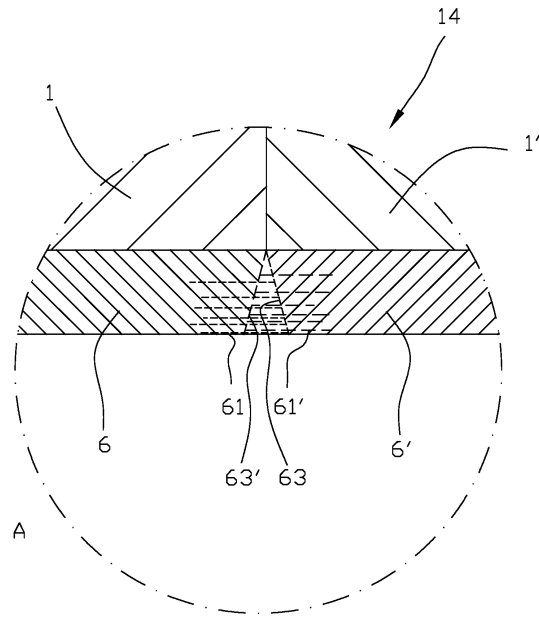


Fig. 2c

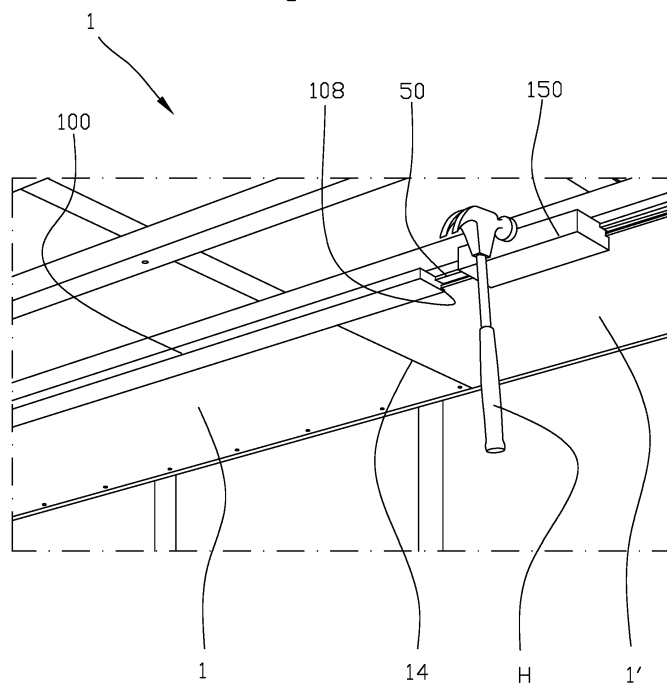


Fig. 3c

Description

[0001] The invention relates to a ceiling board for use in panelling a ceiling, a method for mounting a plurality of same to a supporting structure, and a kit of tools for use in the method. More particularly, the invention is related to a ceiling board and a method for providing transitions between adjoined boards of the same kind appearing substantially inconspicuous. By the term inconspicuous is meant invisible to the human eye when a human contemplates the ceiling from a normal position in a room.

[0002] Ceiling boards have been on the market for decades for providing a covering of a substructure of a ceiling. The ceiling boards may typically be of a rectangular shape in an X- and Y-direction. Typical visual dimensions of such ceiling boards in a position of use may for example be 1.2 meters in an X-direction and 0.6 meters in a Y-direction. To inter alia facilitate mounting such ceiling boards, a periphery of the ceiling boards may be provided with mating coupling means, such as a tongue-and-groove arrangement allowing a plurality of ceiling boards to be interconnected.

[0003] A transition zone between abutting edges of the ceiling boards is typically bevelled and may be filled up with a filler. To prevent subsequent cracking of the filler, a textile strip may be applied to the transition zone. This is a cumbersome process to arrive at a visually attractive end-result. Alternatively, the ceiling boards may be manufactured with a coating or wallpaper wherein the bevelled transition zones provide a groove remaining visible in a position of use.

[0004] Publication US 2006/0010820 A1 discloses a board for use in interior construction, especially for producing new walls in a room or for panelling wall, ceiling or roof surfaces of a room. The board is provided on at least two opposite ends, a first and a second end, with connecting means, especially having a groove-and-tongue design, for linking the board with other boards of the same kind. The connecting means facilitate a catch, snap-in or click-in connection with an adjoining board of the same kind. Additional fastening means are provided on the board itself or on two boards linked with each other for fastening the board on a support construction. US 2006/0010820 A1 further discloses a method for producing new walls of a room or for panelling already existing wall, ceiling or roof surfaces of a room, wherein a first board is mounted, a second board is linked with the first board by establishing a catch, snap-in or click-in connection on the adjoining lateral edges of the two boards, and the second board is secured by additional fastening means.

[0005] Publication WO 2016/149466 A1 discloses a ceiling system in configured for concealing joints between adjoining ceiling panels to provide a monolithic ceiling appearance. The system includes the support structure and ceiling panels each having a top surface, bottom surface, and peripheral edges. The peripheral

edges of the panels have a hybrid edge detail including a first edge profile and a second edge profile different than the first. A facing material, bonded to the bottom surfaces of ceiling panels after securement to the support structure, has a continuous uninterrupted extent to cover and conceal multiple panels and joints. The facing may be adhesively bonded to the panels.

[0006] Publication WO 2013/044377 A1 discloses covering panel comprising a plurality of lips, wherein each lip projecting from a corresponding edge of the panel and extending along at least a portion of said edge, each lip comprising: at least one flange projecting from the lip; and at least one groove being configurable for receiving the at least one flange of a separate lip, the at least one groove being substantially contiguous with the flange of a same lip.

[0007] Publications EP0911464 A2 and DE19539388 A1 disclose tools for a seamless joining of profiled boards. The tool is provided with a profiled section which corresponds to tongue and groove connection of a profiled board.

[0008] Publications US2013/0269280 A1 and DE102005051564 A1 disclose elongate ceiling planks provided with engagement means such as a tongue-and-groove arrangement.

[0009] A ceiling board is typically made from a particle board, an MDF-board (medium density fiber board) or HDF-board (high density fiber board) provided with milled tongues and grooves in the side portion so that a plurality of ceiling boards can be interconnected in a two-dimensional plane, i.e. in an X- and Y-direction.

[0010] To provide an inconspicuous transition, it is imaginable that it would be sufficient to provide a lower part of the side portion facing an interior of the room with abutting faces being perpendicular with respect to a plane of the ceiling board. The inventor has found that it is not possible to provide an inconspicuous appearance of the transitions between adjacent boards by providing such perpendicularly abutting faces only.

[0011] The invention has for its object to remedy or to reduce at least one of the drawbacks of the prior art, or at least provide a useful alternative to prior art.

[0012] The object is achieved through features, which are specified in the description below and in the claims that follow.

[0013] The invention is defined by the independent patent claims. The dependent claims define advantageous embodiments of the invention.

[0014] In a first aspect of the invention there is provided a ceiling board for use in a ceiling wherein, in a position of use, transitions between adjoined boards of the same kind appear inconspicuous, the ceiling board comprises:

- a first surface for facing an interior of a room, and a second surface opposite the first surface for abutting against a supporting structure; and four side portions defining the first and second surfaces, wherein the side portions comprise a first side portion and a sec-

ond side portion complementary to and opposite the first side portion, and a third side portion and fourth side portion complementary to and opposite the third side portion, the side portions provided with a force fit coupling means in the form of a tongue-and-groove arrangement for allowing a plurality of boards to be interconnected. The first surface of the ceiling board is further provided with a wallpaper comprising non-woven fibers, the wallpaper adhered to said first surface, and at least some of the fibers at a periphery of the wallpaper protrude beyond the four side portions of the first surface of the ceiling board so that, in a position of use, fibers of two adjoining ceiling boards interdigitate and provide a substantially inconspicuous appearance of the transitions between adjacent ceiling boards. This has the effect that the interdigitating fibers provide a reinforcement or "bridge" for a paint that may be applied after the ceiling boards have been mounted. Such a paint can therefore be applied without any additional preparation immediately after the ceiling boards have been mounted.

[0015] The force fit is a so-called snap-in or click-connection.

[0016] Preferably, the wallpaper may be bevelled from a visual portion of the wallpaper towards the first surface of the ceiling boards, so that the protrusion of the fibers at the periphery decreases towards the ceiling board to which the wallpaper is attached. This has the effect that any fibers of the wallpaper is prevented from being trapped between the abutting faces of the plate material itself. Thereby, a tight fit of abutting faces may be achieved.

[0017] In one embodiment, the groove of the tongue-and-groove arrangement arranged at the first side portion and the third side portion of the ceiling board, is defined by a lip forming part of the first surface of the board, and a cheek forming part of the second surface of the board, wherein an end portion of the cheek is provided with a cheek protrusion extending towards the first surface of the ceiling board, wherein the cheek protrusion of the third side portion is smaller than the cheek protrusion of the first side portion.

[0018] Measured from a bottom of a cavity of the groove, a length of the cheek forming part of the first side portion may be the same as a length of the cheek forming part of the third side portion. This has the effect that a common tool may be used for applying a force towards the grooves, as will be discussed below.

[0019] In a second aspect there is provided a method for mounting a plurality of ceiling boards according to any one of the previous claims, to a supporting structure of a ceiling extending in an X- and Y-direction to provide a ceiling substantially with inconspicuous transitions between the ceiling boards, the method comprising:

- a) bringing a first ceiling board adjacent to a corner

of the ceiling, the ceiling board arranged with the groove portions of the tongue-and-groove arrangement facing away from a corner of a ceiling;

- b) aligning the first board with respect to a predetermined guide line; and then securing the ceiling board to a ceiling supporting structure by mechanical fastening means at least some of which penetrating the cheek of the grooves;
- c) in the X-direction of the ceiling, inserting a tongue of a subsequent ceiling board fully into the groove of the secured board. The method further comprises:
- d) providing a mounting rail having at least a tongue profile mating with the groove of the ceiling board, the tongue profile of the mounting rail being tailored to abut against a bottom portion of a cavity of the groove of the ceiling board, and engaging the mounting rail to overlap the transition of the ceiling boards and adjusting the subsequent ceiling board with respect to the secured ceiling board so that the tongue profile of the mounting rail fully abuts against the bottom portion of the cavity of the connected ceiling boards throughout its length to align the ceiling boards in the X-direction; and
- e) securing the subsequent board to the supporting structure by mechanical fastening means at least some of which protruding the cheek of the grooves; and
- f) repeating steps c) to e) until a first row of ceiling boards is installed throughout the length of the ceiling in the X-direction.

[0020] After step f), the method may further comprise the steps of:

- g) installing a second row of ceiling boards in parallel with the first row by interlocking a tongue of the first ceiling board in the second row with a portion of a continuous groove provided by the aligned plurality of ceiling boards of the first row;
- h) securing the first ceiling board in the second row to the ceiling supporting structure by mechanical fastening means at least some of which penetrating the cheek of the grooves;
- i) interlocking a tongue of a subsequent ceiling board with a portion of the continuous groove of the previous row of ceiling boards, said interlocking taking place adjacent to a groove of the previous ceiling board in the same row, and then
- j) applying a force in an X-direction of said subsequent ceiling board to engage a tongue of the subsequent ceiling board with a groove of the previous ceiling board in the same row to provide a force fit and securing the ceiling board in the row to the ceiling supporting structure by mechanical fastening means that penetrates the cheek of the grooves;
- k) repeating steps i) and j) until the row of ceiling boards is installed throughout the length of the ceiling in the X-direction; and

- l) repeating steps i) to k) until the ceiling boards cover the ceiling in the X- and Y-direction.

[0021] Preferably, the force in step j) is applied by means of an impact block provided with a tongue profile complementary fitting with the grooves of the ceiling board so that the impact block interlocks with said grooves by means of a force fit, thereby being self-supported in a position of use. This has the effect that the impact block after being connected with the groove is in exact position while at the same time an operator mounting the ceiling boards does not have to hold the impact block in place. An impact block being in exact position eliminates a possibility of damaging the transition zone between abutting ceiling boards when a force is applied to the impact block for example by means of a hammer.

[0022] The method may further comprise the additional step of applying in at least some of the steps c), g) and i) an adhesive to a portion of the tongue of groove abutting in a position of use against the cheek of the secured ceiling board.

[0023] In a third aspect of the invention there is provided a kit of tools for use in the method according to the second aspect of the invention, the kit of tools comprising:

- a mounting rail for aligning two ceiling boards having side portions provided with a force fit in the form of tongue-and-groove arrangement for allowing a plurality of ceiling boards to be interconnected in an X- and Y-direction against a supporting structure, the mounting rail having a tongue profile tailored for abutting against at least a bottom portion of a cavity of the groove of the ceiling board, the mounting rail having a length being at least 50% of the length of the groove in an X-direction of the ceiling board so that the mounting rail can align a second board with respect to a first board secured to a supporting structure; and

an impact block having a tongue profile fitting with the grooves of the ceiling board.

[0024] The tongue profile of the impact block may be complementary fitting with the grooves of the ceiling board so that the impact block is configured for interlocking with said grooves by means of a force fit, thereby being self-supported in a position of use.

[0025] Preferably, the mounting rail has a tongue profile complementary fitting with the groove of the ceiling board so that the mounting rail is configured for interlocking with said grooves by means of a force fit, thereby being self-supported in a position of use.

[0026] In the following is described an example of a preferred embodiment illustrated in the accompanying drawings, wherein:

Fig. 1a shows a cross-sectional view of a groove and tongue arrangement of the first side portion and the second side portion, re-

spectively, of the ceiling board according to the invention, wherein the second side portion is complementary to and opposite the first side portion;

5 Fig. 1b shows a cross-sectional view of a tongue-and-groove arrangement of two ceiling boards wherein the second side portion of a second ceiling board is in engagement with a first side portion of a first ceiling board;

10 Fig. 2a shows in a smaller scale a cross-sectional view of a tongue-and-groove arrangement of the third side portion formed as a groove, and the fourth side portion, formed as a tongue, of the ceiling board according to the invention, wherein the fourth side portion is complementary to and opposite the third side portion;

15 Fig. 2b shows in a smaller scale cross-sectional view of a tongue-and-groove arrangement of two ceiling boards wherein the fourth side portion of a second ceiling board is in engagement with a third side portion of a first ceiling board;

20 Figs. 3a-3d show steps in mounting a plurality of ceiling boards in a first row;

25 Fig. 3e shows a step of connecting a first ceiling board in a second row;

30 Fig. 4 shows a perspective view of a mounting rail forming part of a kit of tools according to the invention; and

35 Fig. 5 shows a perspective view of an impact block forming part of the kit of tools according to the invention.

[0027] Positional specification, such as upper, lower, right, left, refer to positions shown in the figures.

40 **[0028]** In the figures, same or corresponding elements are indicated by same reference numerals. For clarity, some elements may in some of the figures be without reference numerals.

[0029] For illustrative reasons, the relative proportions of some of the elements may be somewhat distorted.

45 **[0030]** In the figures, reference numeral 1 denotes a ceiling board according to the invention. The ceiling board 1 comprises a first surface 3 which in a position of use faces an interior of a room. The first surface 3 of the ceiling board 1 comprises, in the embodiment shown, a facing in the form of a fiber fabric or "wallpaper" 6 that are adhered to the first surface 3 in a thermo combining and laminating process. Thus, the wallpaper 6 adhered

to the first surface 3 is the only surface being visible when a plurality of ceiling boards have been interconnected, i.e. in a position of use. A paint (not shown) may be applied on the wallpaper 6.

[0031] Opposite the first surface 3 is a second surface 4 for abutting against a supporting structure as indicated in figures 3a - 3e wherein the supporting structure comprises a plurality of furring strips FS.

[0032] The first and second surfaces 3, 4 are defined by four side portions 5, 7, 9, 11 wherein a first side portion 5 and a second side portion 7 complementary to and opposite the first side portion 5, and a third side portion 9 and fourth side portion 11 complementary to and opposite the third side portion 9. The sides portions 5, 7, 9, 11 are provided with a force fit coupling means in the form of a tongue-and-groove arrangement for allowing a plurality of boards to be lockingly interconnected.

[0033] The ceiling board 1 has typically a rectangular shape but may alternatively have a square shape. For practical reasons, the following discussion is related to a rectangular ceiling board 1 as shown for example in fig. 3a, wherein the first side portion 5 and the corresponding second side portion 7 are longer than the third side portion 9 and the corresponding fourth side portion 11. The side portions 5, 7 will hereinafter therefore be denoted "longitudinal edges" while the third and fourth side portions 9, 11 will be denoted "end edges".

[0034] Fig. 1a shows a cross-sectional view through B-B in fig. 3a. The first side portion 5 of the ceiling board 1 is provided with a groove 50 defined by a lip 52 forming part of the first surface 3, and a cheek 54 forming part of the second surface 4 of the board. A cavity 53 is formed between the lip 52 and a portion of the cheek 54.

[0035] An end portion of the cheek 54 is provided with a protrusion or rib 56 extending, in a position of use of the ceiling board 1, downwardly from the cheek 54 along the first side portion 5.

[0036] The second side portion 7 on the opposite side of the first side portion 5 is provided with a tongue 70 for engaging the groove 50 of an adjacent ceiling board 1' as shown in fig. 1b.

[0037] In fig. 1b, the protrusion or rib 56 of the ceiling board 1 is accommodated in a retaining channel or recess 72 of the adjacent ceiling board 1'. A side portion 74 of the recess 72 abuts against a slanted side wall 57 of the rib 56 to form a contact face 12 between the two ceiling boards 1, 1'. The contact face 12 prevents the two boards from separating against forces acting transversely to the rib 56 and the recess 72. Thus, the contact face 12 forms part of a force fit securing against disengagement of the two interconnected ceiling boards 1, 1'.

[0038] To keep the ceiling boards 1, 1' co-planar in a position of use, a height or thickness TT of the tongue 70 is identical to a height CT between a lower surface of the cheek 54 and an upper surface of the lip 52, as shown in fig. 1a. Thus, the tongue 70 accommodated in the groove secures the two ceiling boards 1, 1' against forces which act transversely relative to a plane (first and second

surfaces 3, 4) of the ceiling boards 1, 1'.

[0039] From the above, it should be clear that the tongue-and-groove arrangement forms a force fit in the form of a snap-in or click-in coupling.

[0040] The lip 52 of the groove 50 is provided with an end face 58 having a lower portion being perpendicular to the plane of the ceiling board 1. Similarly, a lower end face 78 of the tongue 70 is perpendicular to the plane of the ceiling board 1. When coupled together, said end faces 58, 78 abut against each other and provide a transition zone 14 between two adjacent ceiling boards 1, 1'.

[0041] One condition for achieving the desired inconspicuous transition between adjacent ceiling boards is that the milling tolerances are extremely narrow. In a prototype of a ceiling board made from particle board, the tolerances of the tongue and the mating portion of the cavity 53 of the groove 50, is as narrow as 5/100 mm. Further, the slanted side wall 57 of the rib 56, the side portion 74 of the recess 72 and the end faces 58, 78 are also milled with extremely narrow tolerances so that when the rib 56 abuts against the side portion 74, the end faces 58, 78 abut exactly against each other and form the transition zone 14. In said prototype the milling of said items are produced with tolerances as narrow as 5/100 mm.

[0042] In a prototype of the ceiling board 1, the side wall 57 of the rib 56 and the side portion 74 of the recess are slanted 60° with respect to the first surface 3 of the ceiling board.

[0043] An embodiment wherein the ceiling boards 1 were provided with a wallpaper 6, very good results were achieved by means of a wallpaper 6 being composed of a basic material comprising about 50 - 80% cellulose and 20 - 30% synthetical, non-woven fibers, and a binding agent. The basic material constituted about 60% of the wallpaper material. The rest of the wallpaper material comprised about 40% inorganic filler, acrylic polymers and 1 - 3% additives. The wallpaper 6 had a density in the range of 130 - 150 grams/m².

[0044] In an embodiment wherein the ceiling boards 1 are provided with a wallpaper 6, the fiber fabric or wallpaper 6 is applied to the ceiling board prior to forming the side portions 5, 7, 9, 11, i.e. the tongues and grooves, of the ceiling board material itself in a milling machine. While milling the tongues and grooves, the wallpaper is also milled at the periphery thereof by means of a cutting tool adapted for cutting some, but not all, of the fibers of the wallpaper. One would imagine that a wallpaper being cut to be flush with the end faces 58, 78 would provide a substantially invisible transition zone. However, the inventor has found that by doing so, it is not possible to provide a transition zone 14 fulfilling the applicant's desired inconspicuousness between the ceiling boards 1, 1'.

[0045] Turning now to fig. 2c showing in greater detail A of fig. 1a. In the embodiment wherein the ceiling board 1 are provided with a wallpaper 6, the inventor has surprisingly found that it is an advantage with respect to the

desired inconspicuousness of the transition zone 14 between two adjacent ceiling boards 1, 1' to cut the wallpaper 6, 6' so that at least some of the fibers 61, 61' at a periphery of the wallpaper 6, 6' protrude beyond each one of the four side portions of the first surface 3 of the ceiling board 1 so that, in a position of use, fibers 61, 61' of two adjoining ceiling boards 1, 1' interdigitate. Interdigitating fibers 61, 61' seems to provide a reinforcement or "binder" of any paint applied to the wallpaper 6, 6' after the ceiling boards 1, 1' have been interconnected.

[0046] To prevent any fibers 61, 61' from protruding upwards at the border area between the wallpaper 6, 6' and the ceiling board material itself, and thereby possibly preventing a tight fit between the end faces 58, 78, it is preferred that a fiber cutting is bevelled from an outer, visual portion of the wallpaper 6, 6' towards a contact face between the wallpaper 6, 6' and the first surface of the ceiling boards themselves. In fig. 2c, a cutting line for the fibers 61, 61' protruding from the left wallpaper 6 is indicated by bevelled line 63, while a cutting line for the fibers 61' protruding from the right wallpaper 6' is indicated by bevelled line 63'.

[0047] In a prototype of the ceiling board 1 provided with the wallpaper 6, an angle of the bevelled lines 63, 63' is approximately -30° and 30° with respect to an end face of the wallpaper 6 being coplanar with the end faces 58, 78 forming part of the transition zone 14.

[0048] The protrusion of the longest fibers 61, 61' at a lower, visible surface of the wallpaper 6, 6' is very small, typically less than 0.5 mm, preferably in the range of 0.2 - 0.3 mm.

[0049] In an alternative embodiment of the ceiling board 1, the first surface 3 of the ceiling board 1 may be provided with a coating in the form of primer instead of a wallpaper 6 as discussed above. The primer should be applied to the first surface 3 of the ceiling board 1 prior to milling the grooves and tongues in the side portions 5, 9 and 7, 11, respectively. This is important because any primer applied after said milling of the side portions would interfere with the tongues and grooves. The desired tolerances discussed above would not be achievable and the end-result would most likely be visible transition zones 14 between the interconnected ceiling boards 1. To achieve inconspicuous transition zones 14 a substantive finishing process would then be necessary.

[0050] Figures 2a and 2b show a groove-and-tongue arrangement of the third side portion 9 and fourth side portion 11 of the ceiling board 1, respectively, i.e. a cut through C-C in fig. 3a. The major difference between the side portions 5, 7 or longitudinal edges shown in figures 1a and 1b and the side portions 9, 11 or end edges shown in figures 2a and 2b, is that the cheek protrusion 56' of the third side portion 9 is smaller than the cheek protrusion 56 of the first side portion 5. In a prototype of the ceiling board 1, the cheek protrusion 56' of the third side portion 9 is in the range of 0.45 - 0.5 mm, while the cheek protrusion 56 of the first side portion 5 is in the range of 5,5 - 6 mm. The purpose of this difference will be appre-

ciated in view of figures 3a - 3e illustrating a method for mounting a plurality of ceiling boards as discussed above.

[0051] To achieve the desired inconspicuous transitions between the boards 1, the respective side portions 5, 7 and 9, 11 must be fitted exactly. This is achieved as follows:

The first ceiling board 1 shown in fig. 3a forms the basis for the rest of the ceiling boards mounted in an X- and Y-direction as shown in figures 3b - 3e. In fig. 3a, the X-direction is in parallel with the longitudinal edges, while the Y-direction is in parallel with the short edges. It should be emphasized that it is extremely important that all ceiling boards are interconnected without any deviations from the X-direction, and thus also the Y-direction determined by the first ceiling boards; any individual corrections of the ceiling boards succeeding the first ceiling board must be avoided.

[0052] In fig. 3a, a first ceiling board 1 is brought adjacent to a corner of the ceiling so that the ceiling board is arranged with the groove portions 50 of the tongue-and-groove arrangement facing away from a corner of a ceiling. To avoid any excess and/or to adapt the ceiling board to the furring strips FS of the supporting structure, at least the tongues facing against walls defining the ceiling may be cut, as will be appreciated by a person skilled in the art.

[0053] The first ceiling board is aligned with respect to a predetermined guiding line G determining the X-direction. The guiding line G may typically be made by means of a chalk line applied against the second furring strip FS for supporting the groove portion 50 of the longitudinal edge of the ceiling board 1. When the first ceiling board 1 is aligned with the guiding line, the ceiling board is secured to the furring strips FS of the ceiling supporting structure by mechanical fastening means, here in the form of screws (shown before penetrating the ceiling board), at least some of which penetrating the cheek of the grooves. In the portion of the plate facing against the periphery of the ceiling, the screw penetrates through the plates from the first surface as the screws will be covered by cornice.

[0054] In fig. 3a the ceiling board 1 is temporarily supported by a supporting rod SR.

[0055] In fig. 3b, a tongue of a subsequent ceiling board 1' is brought towards and engaged with a groove of the first ceiling board 1, i.e. the ceiling boards are connected in an X-direction of the ceiling.

[0056] To fully align the subsequent ceiling board 1' with respect to the secured first (or previous) ceiling board 1, a mounting rail 100 having at least a tongue profile 110 (see fig 4) mating with the groove 50 of the ceiling boards, 1, 1', is provided. The tongue profile 110 of the mounting rail 100 is tailored to abut against a bottom portion of the cavity 53 (see fig. 1a) of the groove 50 of the ceiling boards. As shown in fig. 3c, the mounting rail 100 is engaged to overlap the transition 14 of the ceiling boards 1, 1', i.e. to overlap the interconnected tongue and groove of the short edges of the ceiling boards 1, 1'.

To align the ceiling boards in the X-direction, the subsequent ceiling board 1' is adjusted in a Y-direction with respect to the secured ceiling board 1 so that the tongue profile 110 of the mounting rail 100 fully abuts the bottom portion of the cavity 53 of the groove 50 of the connected ceiling boards 1, 1' throughout its length. When aligned by means of the mounting rail 100, the subsequent ceiling board is secured to the supporting structure by means of screws, at least some of which protruding the cheek of the grooves as discussed above. In fig. 3c, the adjustment of the subsequent ceiling board 1' with respect to the already secured ceiling board 1, is provided by means of an impact block 150 that is described in further detail below with respect to fig. 5. The impact block 150 is also used to apply a force against the end edge of the subsequent ceiling board 1' prior to securing this to the supporting structure as discussed above.

Any further ceiling boards are connected to a previous ceiling board in the same way as described above, until a first row of ceiling boards is mounted in the X-direction. To secure a tight fit of the last ceiling board in the X-direction, a crowbar is used as shown in fig. 3c.

[0057] Fig. 3e shows the start of mounting a second row of ceiling boards. The second row is mounted in parallel with the first row. In the embodiment shown the ceiling board of the second row has been cut to allow the transition of the end edges of the second row to be displaced with respect to the transition 14 (see fig. 3c) of the end edges of the first row. However, it should be noted that such displacement is preferred but is not strictly required since the transition between the ceiling boards will be inconspicuous.

A tongue (not visible in the figure) of the first ceiling board 1 in the second row is interlocked with a portion of the continuous groove 50 provided by the aligned plurality of ceiling boards of the first row. This is achieved by abutting the tongue of the second row against the groove 50 of the first row while the second row ceiling board 1 is arranged obliquely (not shown), for example at an angle of 30° with respect to a plane of the first row of ceiling boards that have been secured to the supporting structure SF. Thereafter, each board in the second row is brought into the same plane as the first-row ceiling boards. To secure a complete interlocking, i.e. fully activating the force fit, between the second-row ceiling board with the first-row ceiling board, a force may be applied towards the groove 50 of the second-row ceiling board. To avoid any damage to said groove, an impact block 150 is connected to the groove and an impact force is applied against the impact block for example by means of a hammer H.

[0058] When the force fit has been fully activated, the first ceiling board 1 in the second row is secured to the ceiling supporting structure SF by mechanical fastening means at least some of which penetrating the cheek of the grooves as for the first ceiling board in the first row.

[0059] When the second row's first ceiling board 1 has been secured to the ceiling supporting structure SF, a

mounting process of a subsequent second-row ceiling board is commenced by interlocking a second side portion 7 tongue 70 of a subsequent second-row ceiling board with a portion of the continuous first side portion groove 50 of the previous row of ceiling boards, said interlocking taking place adjacent, but not in contact with a third side portion groove 50 of the previous ceiling board in the same row. When the subsequent second-row ceiling board is in the same plane as the secured ceiling boards, a force is applied in an X-direction of said subsequent ceiling board to engage a fourth side portion tongue 70 of the subsequent ceiling board with a third side portion groove 50 of the previous ceiling board in the same row to provide a force fit and securing the ceiling board in the row to the ceiling supporting structure SF by a mechanical fastening means that penetrates the cheek 54 of the third and first side portion grooves 50.

[0060] Thus, each subsequent ceiling board in the second row (and subsequent rows) is interconnected with the previous board by means of a displacement in an X-direction, i.e. in a direction being in parallel with a plane of the secured ceiling boards. This is made possible by means of the very limited protrusion 56' as shown in figures 3a and 3b.

[0061] To avoid any damage to the short edge groove 50, i.e. groove 50 formed in the fourth side portion 11, the impact block 150 as mentioned above is connected to the groove 50 and an impact force is applied against the impact block 150 for example by means of a hammer H. Subsequent ceiling boards are connected in the same manner until the row of ceiling boards is installed throughout the length of the ceiling in the X-direction and until the ceiling boards completely cover the ceiling in the X- and Y-direction. Since the first row is fully aligned by means of the mounting rail 100, any alignment by means of the mounting rail 100 of the second and further rows is superfluous. Thus, the second and subsequent rows may be installed quickly, and the result is a ceiling without inconspicuous transitions both in an X-direction and a Y-direction.

[0062] Preferably, an adhesive such as a curable glue is applied to an upper surface of the tongues 70 immediately prior to interconnecting a ceiling board with a secured ceiling board. Such a glue prevents, when cured, any individual movements of the ceiling boards. Further, prior to curing, the glue provides a slip agent reducing friction between the tongue-and-groove arrangement thus establishing the force fit.

[0063] Turning now to fig. 4 showing a mounting rail 100 forming part of a kit of tools for use when mounting the ceiling boards.

[0064] The mounting rail 100 is provided with a body 102 which forms a handle configured for being gripped by an operator. The handle 102 is provided with a protrusion 104 provided with a tongue profile 110 being tailored for abutting against at least a bottom portion of the cavity 53 of the longitudinal edge groove 50 of the ceiling boards 1, 1' disclosed herein. To fulfil its purpose of fully

aligning two subsequent ceiling boards in the first row, a length of the mounting rail is at least 50% of a length of the longitudinal edge of the ceiling board 1. In a prototype of the mounting rail 100 tailored for mounting a ceiling board having a length of 1.2 meter, the length of the mounting rail 100 is 1.0 meter. In general, the longer mounting rail 100, the better. However, for practical reasons it is considered unnecessary that a length of the mounting rail 100 exceeds twice the extension of the plate in an X-direction.

[0065] In fig. 4, the tongue profile 110 of the mounting rail 100 is configured for complementarily fitting the groove 50 of the longitudinal edge of the ceiling board 1 (see fig 1a) so that the mounting rail 100 is configured for interlocking with said groove 50 by means of a force fit, thereby being self-supported in a position of use. The mounting rail 100 shown in a position of use in figures 3c and 3d is further provided with a lip 108 configured for abutting against a first surface 3 of the ceiling board so that the mounting rail 100 is self-supported with respect to the ceiling board even without a tongue profile being configured for completely interlocking with said groove 50 of the ceiling board 1.

[0066] A self-supported mounting rail 100 has the advantage that it can be left temporarily in place without being held by an operator.

[0067] The kit of tools further comprises an impact block 150 as shown in fig. 5. The impact block 150 is provided with a tongue profile 152 complementarily fitting with the grooves of the first side portion 5 and second side portion 9 of the ceiling board 1. The tongue profile 152 comprises a protrusion 154 configured for abutting in a position of use against a bottom portion of the cavity 53 in the grooves 50 of the ceiling board 1, and a face 156 configured to abut against an end face of the cheek 54 of the grooves 50. The impact block 150 is further provided with a lip 158 configured to abut against a portion of the first surface 3 of the ceiling board 1. Between the protrusion 154 and the lip 158, the impact block 150 comprises an indentation or gap 159 which in a position of use of the impact block 150 accommodates a portion of the lip 52 forming part of the first surface 3 of the ceiling board 1 so that the impact block 150 is self-supported with respect to the groove 50 of the ceiling board 1. To avoid any damage to the end face 58 of the lip 52 of the ceiling board 1, a depth of the gap 159 is larger than an extent of the lip 52 so that there is a clearance between a bottom portion of the gap 159 and the end face 58 of the lip 52. Thus, when an impact force is applied against the impact block 150 for example by means of a hammer H (see fig. 3c), the impact force is transferred to the bottom portion of the cavity 53 of the groove 50 and the end face of the cheek 54 of the groove, both of which are invisible when the ceiling boards have been mounted.

[0068] A self-supported impact block 150 has the advantage that it can be left temporarily in place without being held by an operator.

[0069] From the disclosure herein, it should be appre-

ciated that the ceiling boards 1, 1' may be interconnected so that the transitions 14 of abutting the ceiling boards will be inconspicuous to a degree that hitherto has not been possible. After having aligned a first row of ceiling boards in an X-direction, subsequent boards may be easily and quickly mounted by one person.

[0070] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements.

Claims

1. A ceiling board (1) for use in a ceiling wherein, in a position of use, transitions between adjoining boards of the same kind appear inconspicuous, the ceiling board (1) comprises:

a first surface (3) for facing an interior of a room, and a second surface (4) opposite the first surface (3) for abutting against a supporting structure (SF); and four side portions (5, 7, 9, 11) defining the first and second surfaces (3, 4), wherein

the side portions comprise a first side portion (5) and a second side portion (7) complementary to and opposite the first side portion (5), and a third side portion (9) and fourth side (11) portion complementary to and opposite the third side portion (9), the side portions provided with a force fit coupling means in the form of a tongue (70) and groove (50) arrangement for allowing a plurality of boards (1, 1') to be lockingly interconnected, wherein the first surface (3) of ceiling board (1) is further provided with a wallpaper (6) comprising non-woven fibers, the wallpaper (6) adhered to said first surface (3), **characterized in that** at least some of the fibers (61) at a periphery of the wallpaper (6) protrude beyond the four side portions (5, 7, 9, 11) of the first surface (3) of the ceiling board (1) so that, in a position of use, fibers (61, 61') of two adjoining ceiling boards (1, 1') interdigitate and provide a substantially inconspicuous appearance of the transitions (14) between adjacent ceiling boards (1, 1').

2. The ceiling board (1) according to claim 1, wherein the wallpaper (6) is bevelled from an outer, visual portion of the wallpaper towards a contact face between the wallpaper (6) and the first surface (3) of

the ceiling board (1), so that the protrusion of the fibers (61) at the periphery decreases towards the ceiling board to which the wallpaper (6) is adhered.

3. The ceiling board (1) according to claims 1 or 2, wherein the groove (50) of the tongue-and-groove arrangement (50, 70) is arranged at the first side portion (5) and the third side portion (9) of the ceiling board (1), the groove (50) defined by a lip (52) forming part of the first surface (3) of the ceiling board (1), and a cheek (54) forming part of the second surface (4) of the ceiling board (1), wherein an end portion of the cheek (54) is provided with a cheek protrusion (56, 56') extending towards the first surface (3) of the ceiling board (1), wherein the cheek protrusion (56) of the third side portion (9) is smaller than the cheek protrusion (56) of the first side portion (5).
4. The ceiling board (1) according to claim 3, wherein, measured from a bottom portion of a cavity (53) of the groove (50), a length of the cheek (54) forming part of the first side portion (4) of the ceiling board (1) is the same as a length of the cheek (56') forming part of the third side portion (9).
5. A method for mounting a plurality of ceiling boards (1, 1') according to any one of the previous claims, to a supporting structure (SF) of a ceiling extending in an X- and Y-direction to provide a ceiling substantially with inconspicuous transitions (14) between the ceiling boards (1, 1'), the method comprising:
 - a) bringing a first ceiling board (1) adjacent to a corner of the ceiling, the ceiling board (1) arranged with the groove portions (50) of the tongue-and-groove arrangement facing away from a corner of a ceiling;
 - b) aligning the first board (1) with respect to a predetermined guide line (G); and then securing the ceiling board (1) to a ceiling supporting structure (SF) by mechanical fastening means at least some of which penetrating the cheek (54) of the grooves (50);
 - c) in the X-direction of the ceiling, inserting a tongue (70) of a subsequent ceiling board (1') fully into the groove (50) of the secured board, **characterised in that** the method further comprises:
 - d) providing a mounting rail (100) having at least a tongue profile (110) mating with the groove (50) of the ceiling boards (1, 1'), the tongue profile (110) of the mounting rail (100) being tailored to abut against a bottom portion of a cavity (53) of the groove (50) of the ceiling boards (1, 1'), and engaging the mounting rail (100) to overlap the transition (14) of the ceiling boards (1, 1') and adjusting the subsequent ceiling board (1') with

respect to the secured ceiling board (1) so that the tongue profile (110) of the mounting rail (100) fully abuts against the bottom portion of the cavity (53) of the connected ceiling boards (1, 1') throughout its length to align the ceiling boards (1, 1') in the X-direction; and

- e) securing the subsequent board (1') to the supporting structure (SF) by mechanical fastening means at least some of which protruding the cheek (54) of the grooves (50); and
- f) repeating steps c) to e) until a first row of ceiling boards (1, 1') is installed throughout the length of the ceiling in the X-direction.

6. The method according to claim 5 further comprising after step f), the steps of:

- g) installing a second row of ceiling boards (1) in parallel with the first row by interlocking a tongue (70) of the first ceiling board (1) in the second row with a portion of the a continuous groove provided by the aligned plurality of ceiling boards (1, 1') of the first row;
- h) securing the first ceiling board (1) in the second row to the ceiling supporting structure (SF) by mechanical fastening means, at least some of which penetrating the cheek (54) of the grooves (50);

- i) interlocking a tongue (70) of a subsequent ceiling board (1) with a portion of the continuous groove of the previous row of ceiling boards (1, 1'), said interlocking taking place adjacent to a groove (50) of the previous ceiling board (1) in the same row, and then
- j) applying a force in an X-direction of said subsequent ceiling board (1') to engage a tongue (70) of the subsequent ceiling board (1') with a groove (50) of the previous ceiling board (1) in the same row to provide a force fit and securing the ceiling board in the row to the ceiling supporting structure SF) by mechanical fastening means that penetrate the cheek (54) of the grooves (50);
- k) repeating steps i) and j) until the row of ceiling boards (1, 1') is installed throughout the length of the ceiling in the X-direction; and
- l) repeating steps i) to k) until the ceiling boards (1, 1') cover the ceiling in the X- and Y-direction.

7. The method according to claim 6, wherein the force in step j) is applied by means of an impact block provided with a tongue profile (152) complementarily fitting with the grooves (50) of the ceiling board (1) so that the impact block (150) interlocks with said grooves (50) by means of a force fit, thereby being

self-supported in a position of use.

8. The method of any one of claims 6 or 7 further comprising the additional step of applying in at least some of the steps c), g) and i) an adhesive to a portion of the tongue of groove (50) abutting in a position of use against the cheek (54) of the secured ceiling board (1). 5

9. A kit of tools for use in the method according to claims 6 and 7, **characterised in that** the kit of tools comprises: 10
 - a mounting rail (100) for aligning two ceiling boards (1, 1') having side portions (1, 3, 5, 7) provided with a force fit in the form of tongue (70) and groove (50) arrangement for allowing a plurality of ceiling boards (1, 1') to be interconnected in an X- and Y-direction against a supporting structure (SF), the mounting rail (100) having a tongue profile (110) tailored for abutting against at least a bottom portion of a cavity (53) of the groove (50) of the ceiling board (1, 1'), the mounting rail (100) having a length being at least 50% of a length of the groove (50) in an X-direction of the ceiling board (1, 1) so that the mounting rail (100) can align a second board (1') with respect to a first board (1) secured to a supporting structure SF); and 15 20 25 30
 - an impact block (150) having a tongue profile (152) fitting with the grooves (50) of the ceiling board (1). 35

10. The kit of tools according to claim 9, wherein the tongue profile (152) of the impact block (150) is complementary fitting with the grooves (50) of the ceiling board (1) so that the impact block (150) is configured for interlocking with said grooves (50) by means of a force fit, thereby being self-supported in a position of use. 40

11. The kit of tools according to claim 9, wherein the mounting rail (100) has a tongue profile (100) complementary fitting with the groove (50) of the ceiling board (1) so that the mounting rail (100) is configured for interlocking with said groove by means of a force fit, thereby being self-supported in a position of use. 45

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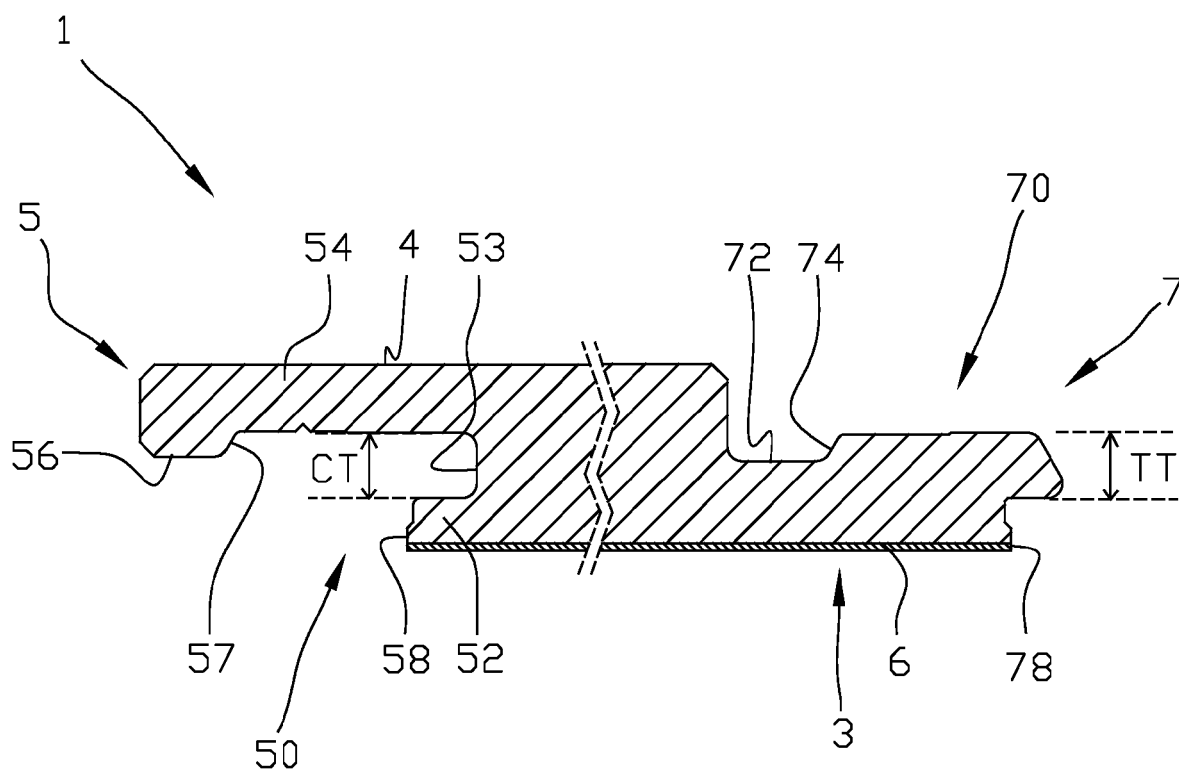


Fig. 1a

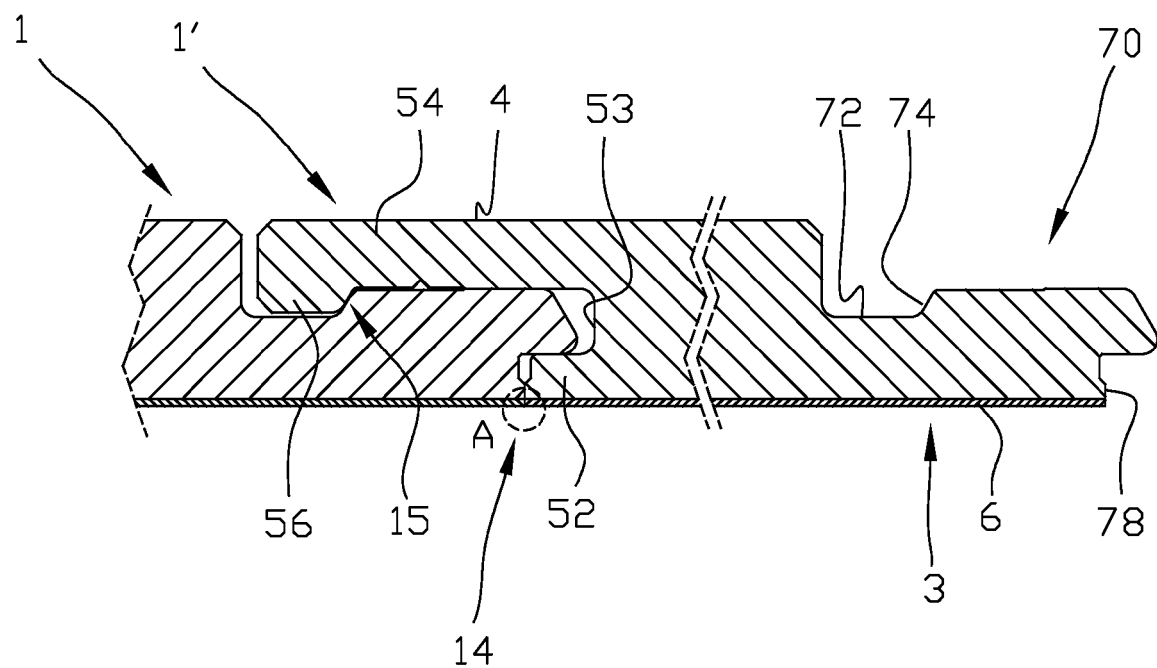
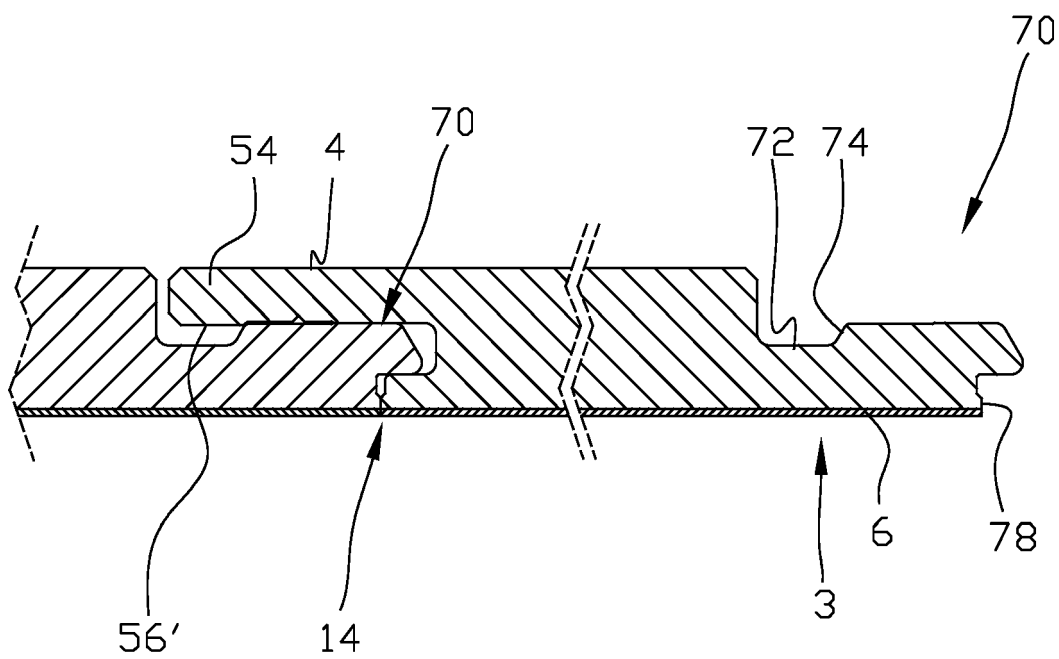
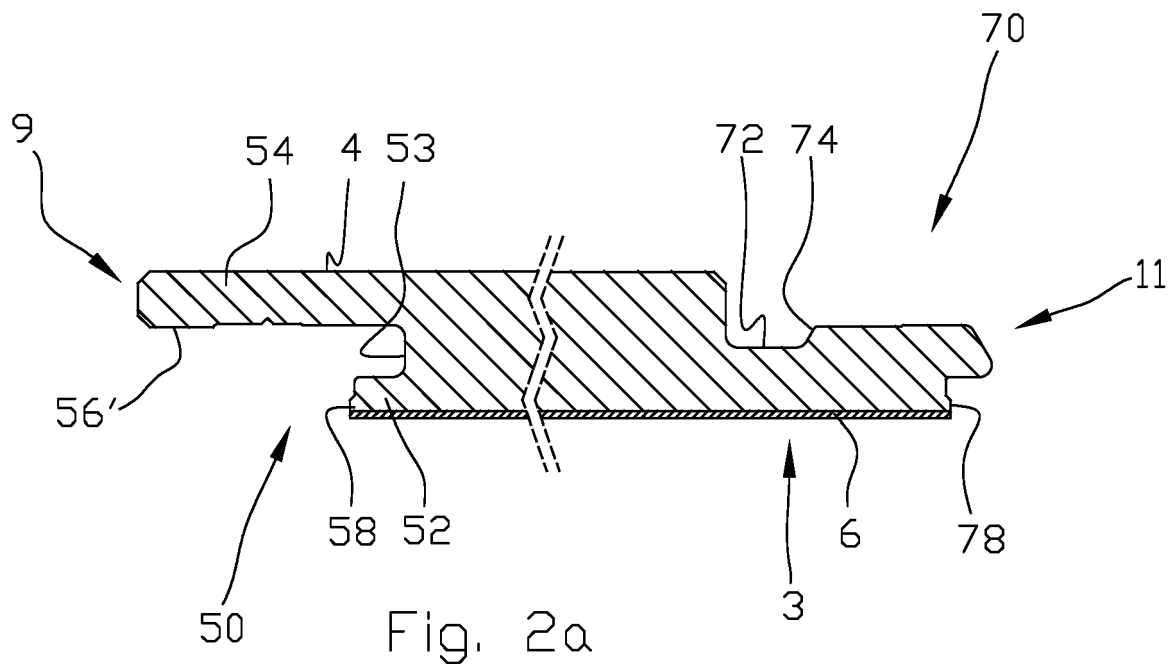


Fig. 1b



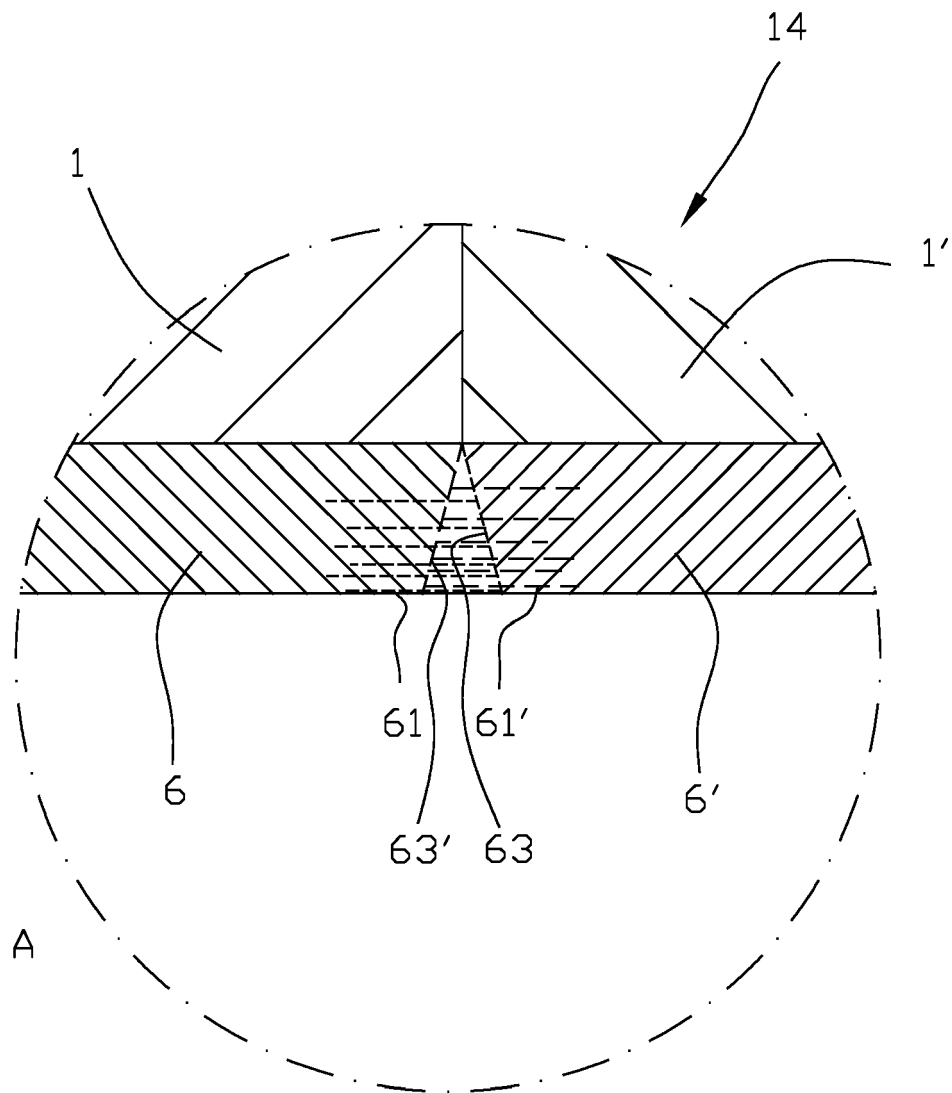


Fig. 2c

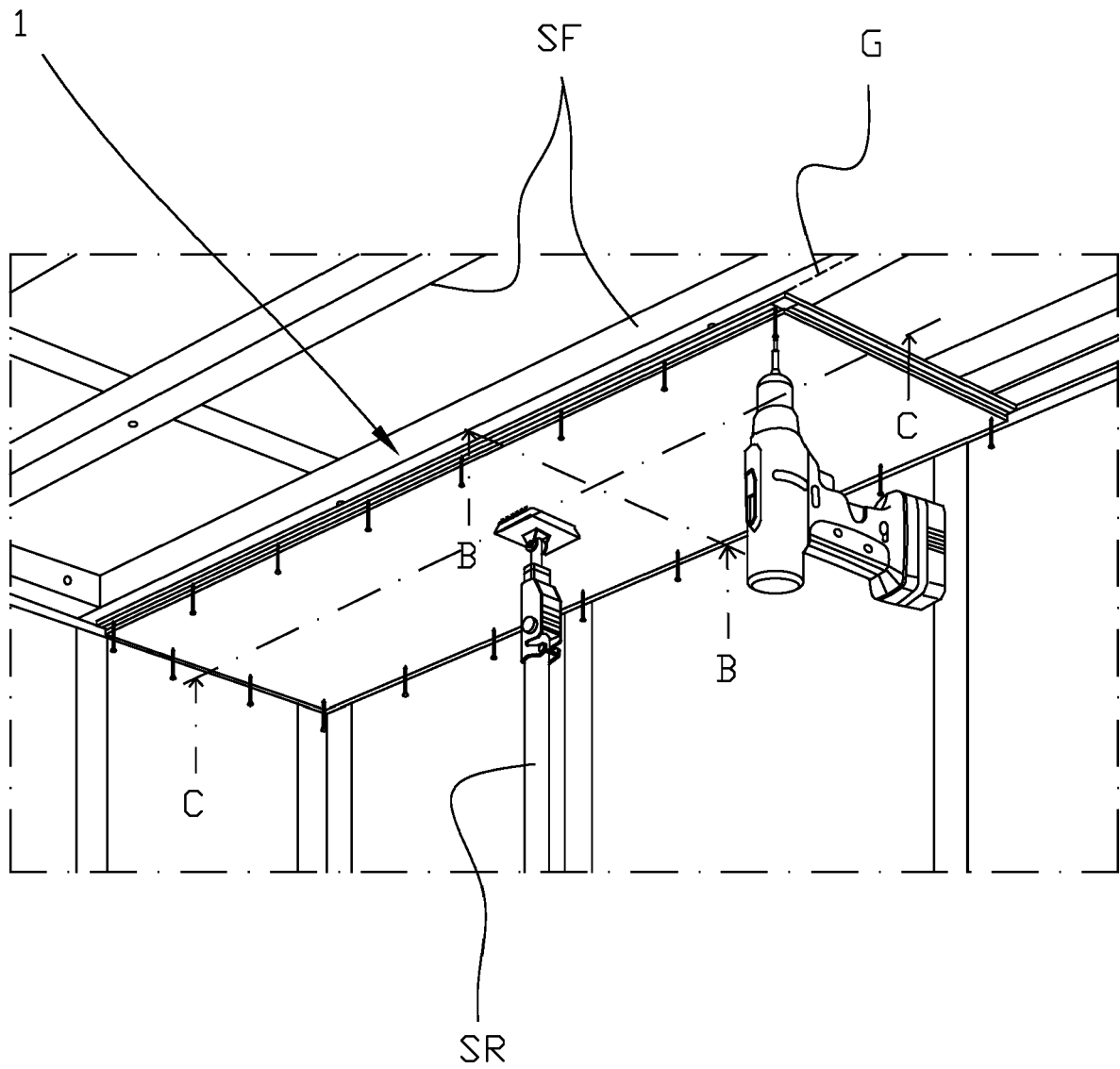


Fig. 3a

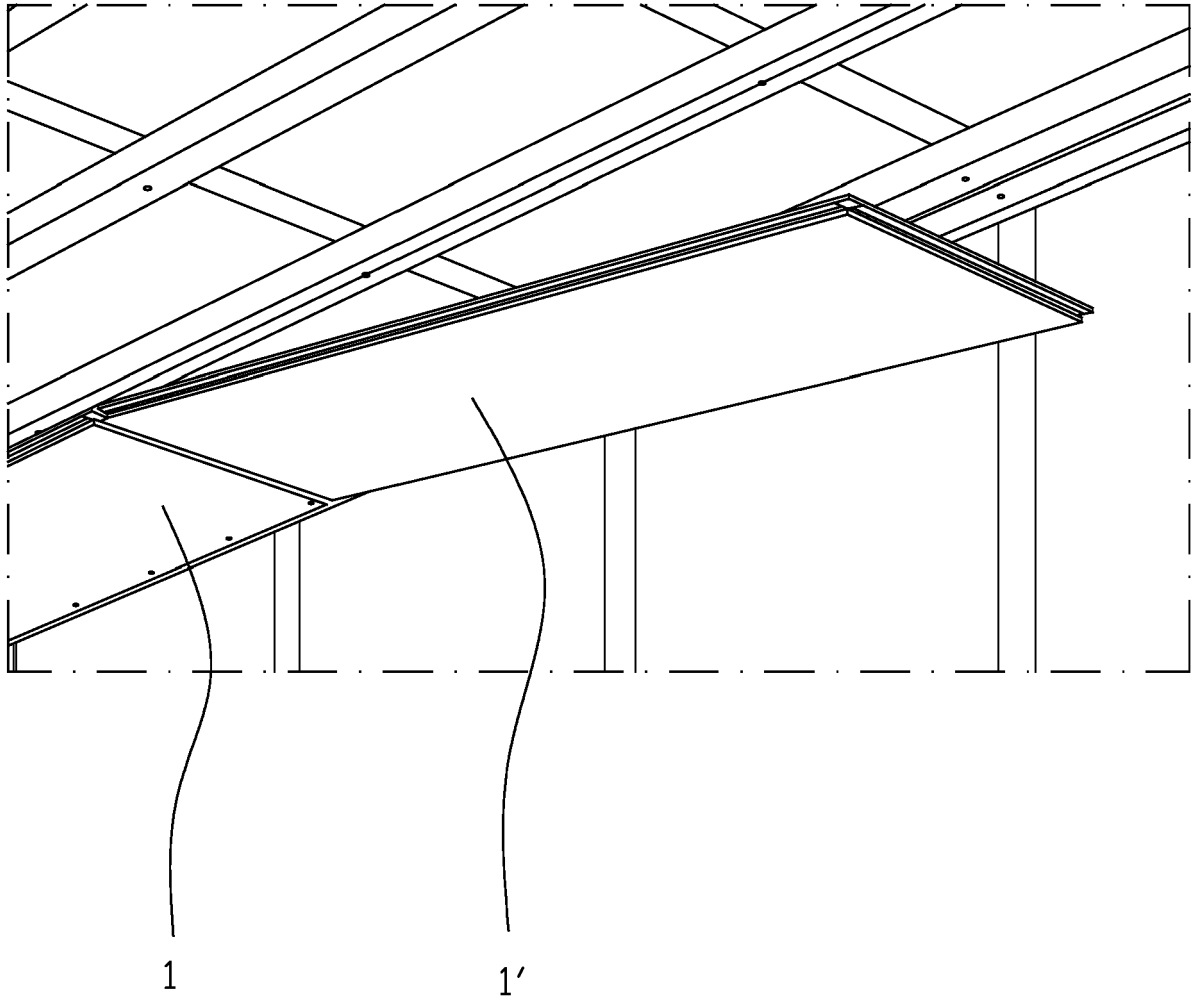


Fig. 3b

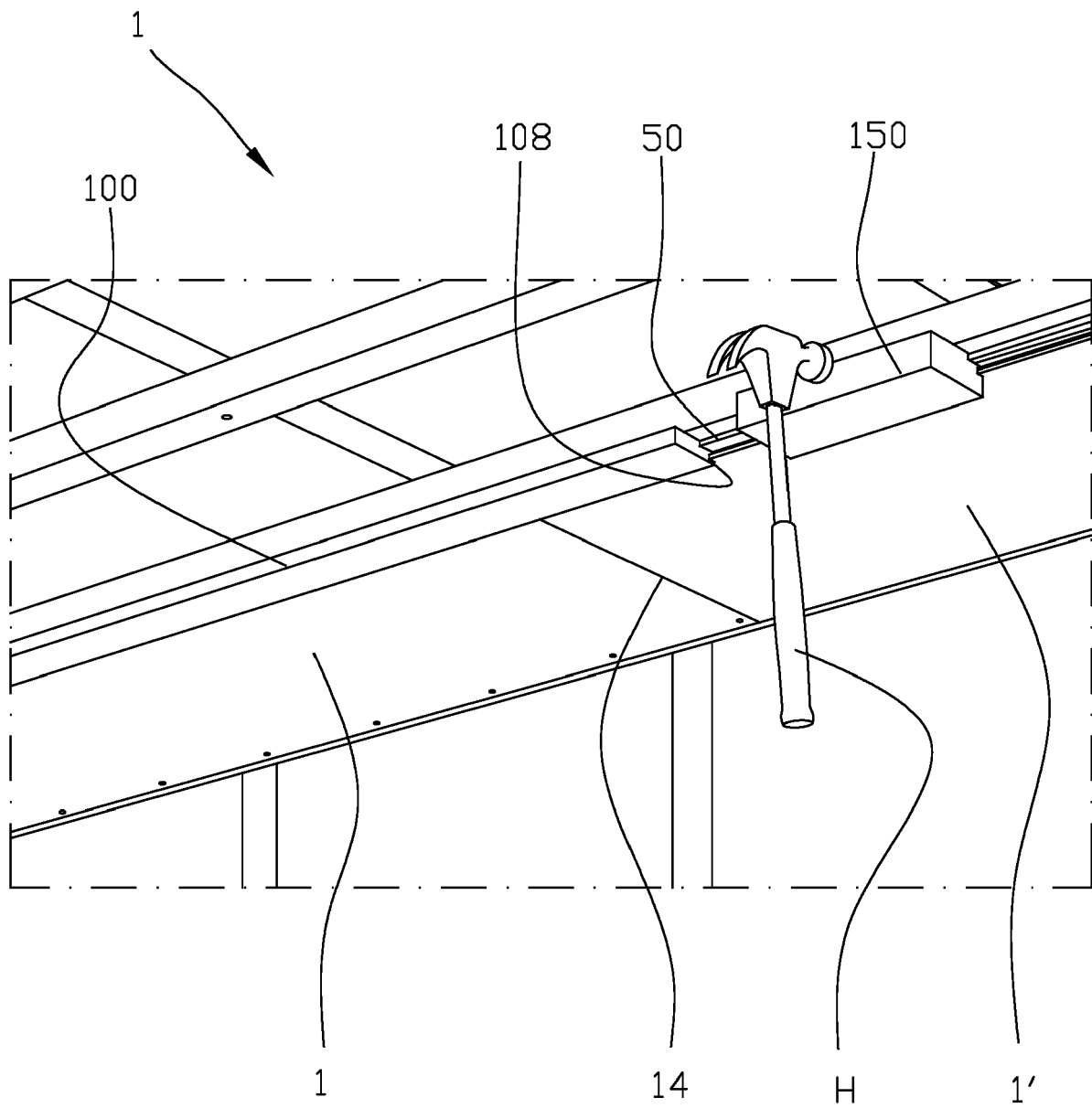


Fig. 3c

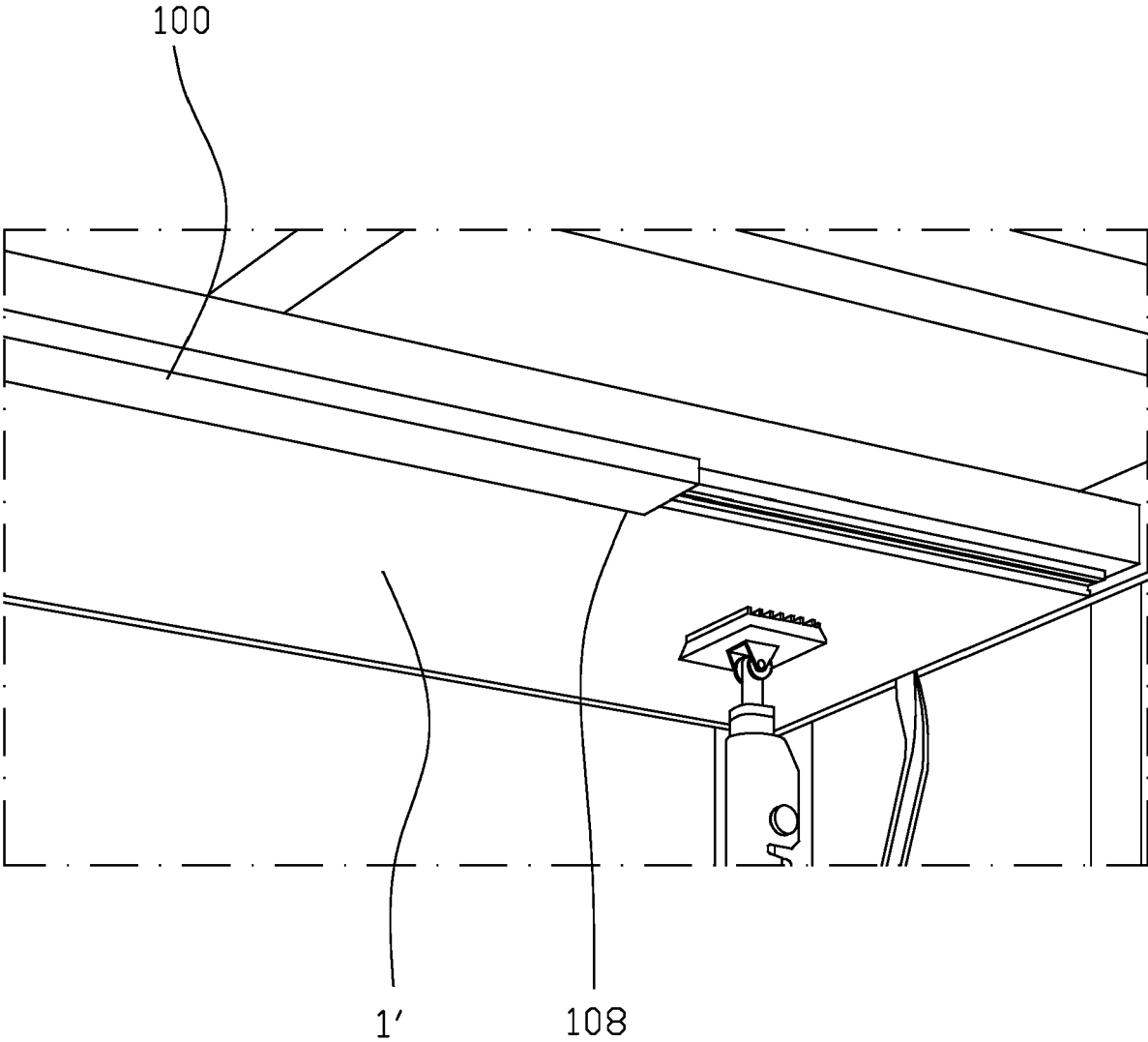


Fig. 3d

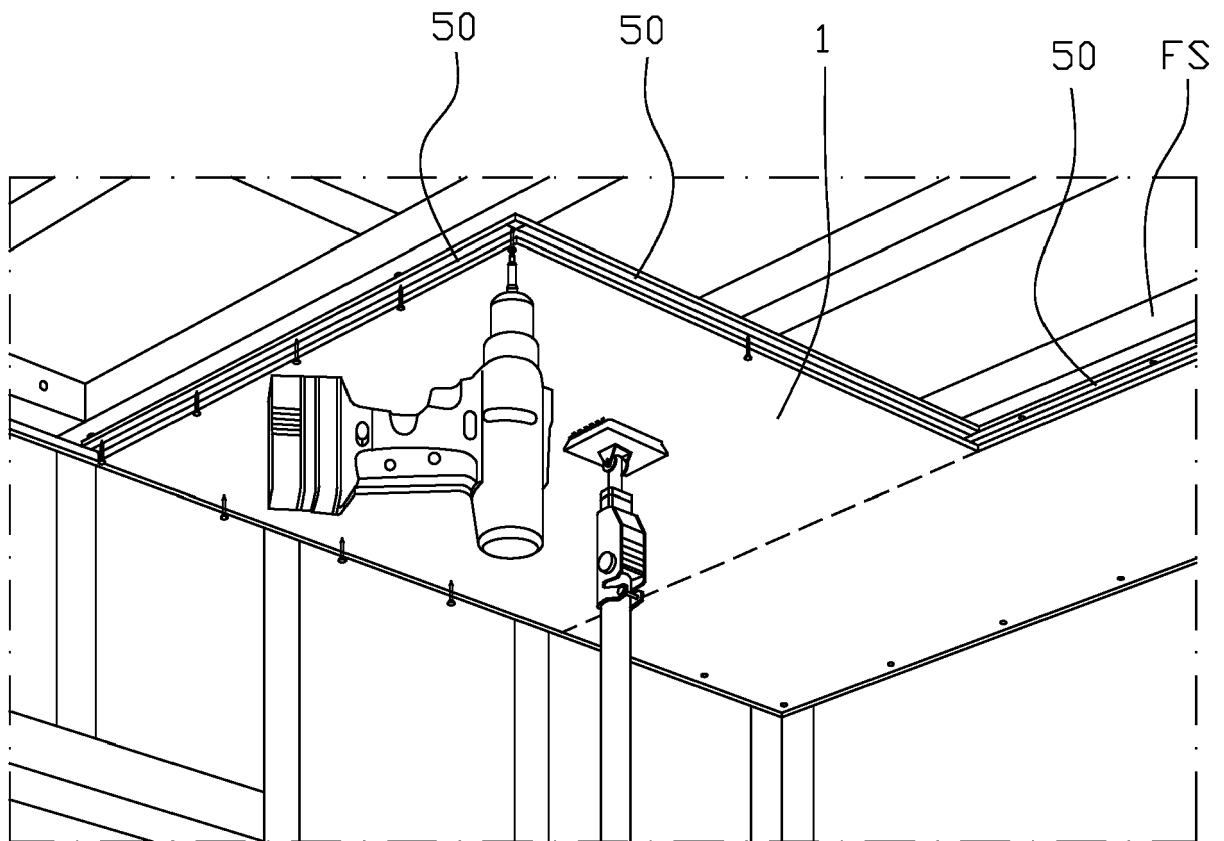


Fig. 3e

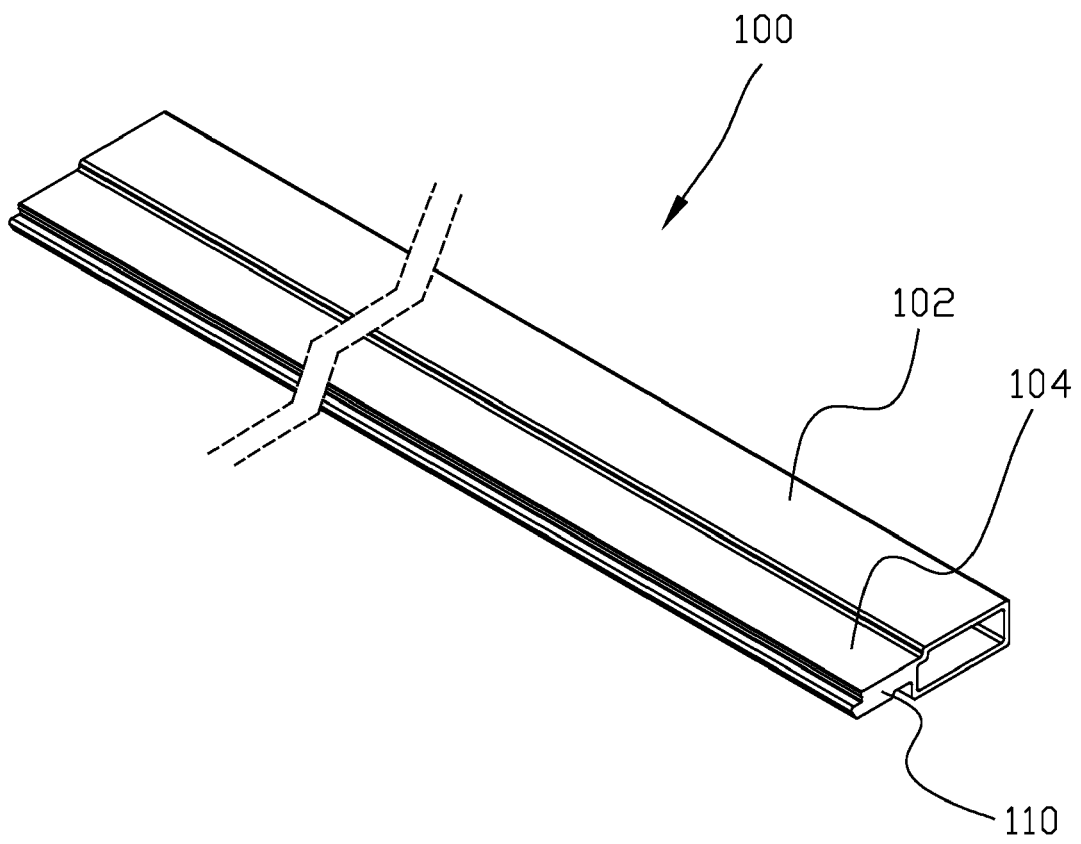


Fig. 4

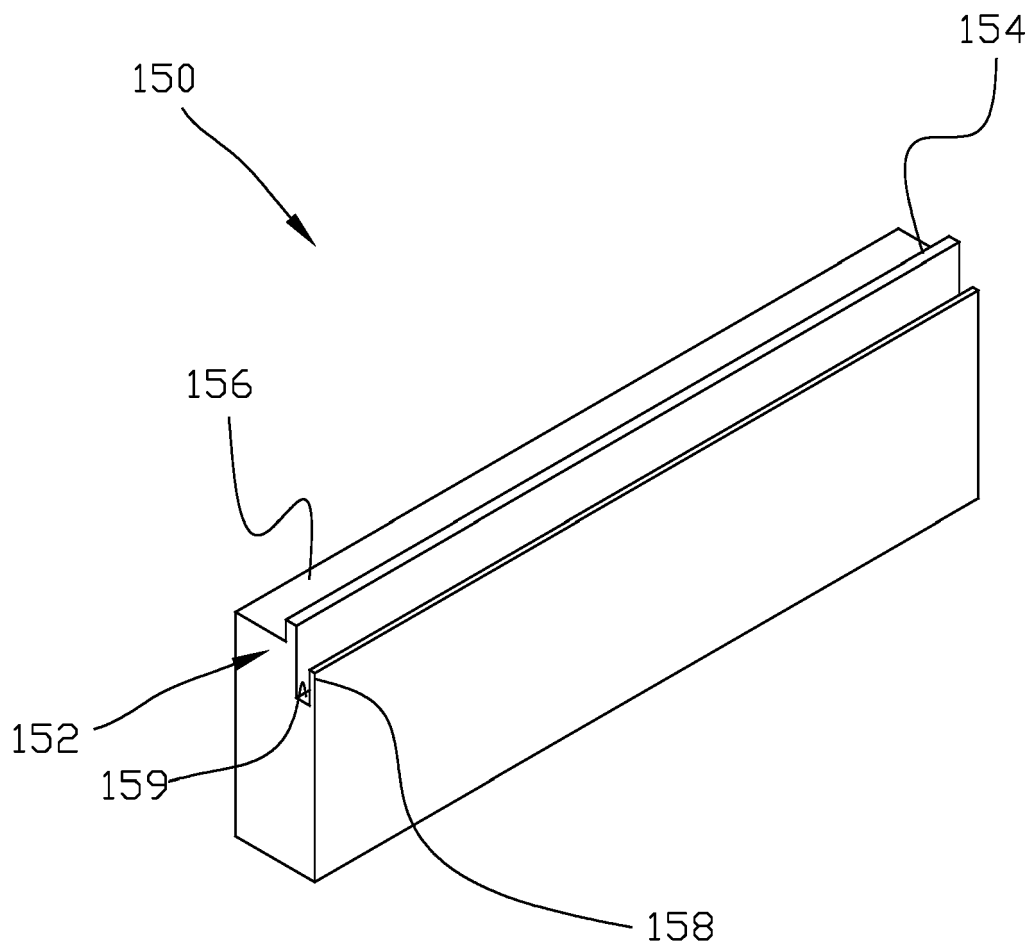


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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