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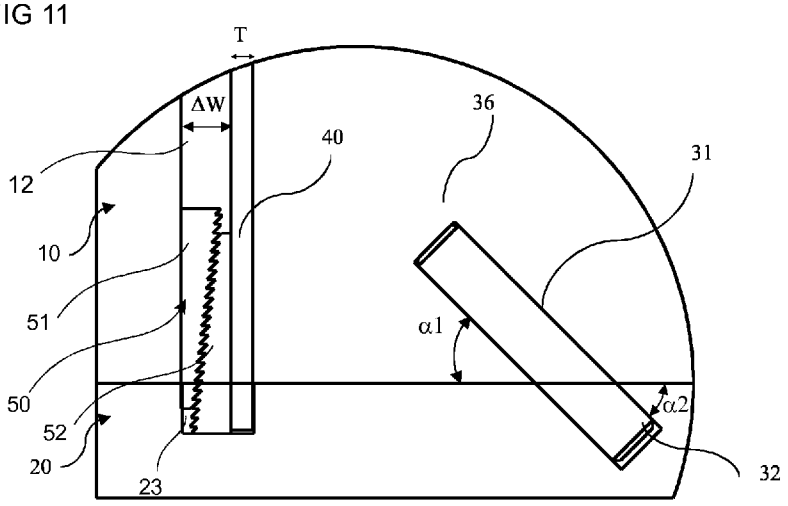
(54) **Title:** SET OF PANELS WITH A MECHANICAL LOCKING DEVICE

FIG 11



(57) **Abstract:** A set including a first panel (10), a second panel (20) and a mechanical locking device for locking the first panel (10) to the second panel (20), wherein the first panel (10) includes a first edge surface (11), the second panel (20) includes a second panel surface (22), the mechanical locking device includes at least one rod-shaped element (31) at the first edge surface (11) and at least one insertion groove (32) at the second panel surface (22), wherein the rod -shaped element (31) is configured to be inserted into the insertion groove (32), said set is also comprising a back panel (40) configured to be inserted in and to cooperate with at least one of the first and second panel grooves (12, 23), and at least one locking gear (50) is configured to cooperate with the back panel (40) and the first and/or second panel groove (12, 23), for locking of the first panel (10) to the second panel (20).

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SET OF PANELS WITH A MECHANICAL LOCKING DEVICE

Technical field of the invention

Embodiments of the present invention relate to panels that may be arranged perpendicular to each other and locked together with a mechanical locking device. The panels may be assembled and locked together to obtain a furniture product, such as a bookshelf, a cupboard, a wardrobe, a box, a drawer or a furniture component.

Technical background

A furniture product provided with a mechanical locking device is known in the art, as evidenced by WO2015/038059. The furniture product comprises a first panel connected perpendicular to a second panel by a mechanical locking device comprising a flexible tongue in an insertion groove.

The above description of various known aspects is the applicant's characterization of such, and is not an admission that any of the above description is considered as prior art.

Embodiments of the present invention address a need to provide panels that may be easily assembled.

Summary of the invention

It is an object of certain aspects of the present invention to provide an improvement over the above described techniques and known art; particularly to facilitate assembling of panels configured to be assembled without the need of using any tools.

A further object of at least certain aspects of the present invention is to facilitate assembling of panels configured to be assembled with a locking device that is easy to manufacture and to use, which reduces the risk of incorrect installation thereof.

A further object of at least certain aspects of the present invention is to facilitate assembling of panels configured to be assembled in a more stable and aesthetic way.

At least some of these and other objects and advantages that will be apparent from the description have been achieved by a set comprising a first panel, a second panel and a mechanical locking device for locking the first panel to the second panel, wherein the first

panel comprises a first edge surface, the second panel comprises a second panel surface, the first edge surface is facing and/or is parallel with the second panel surface in a locked position of the first and the second panel, the mechanical locking device comprises at least one rod-shaped element at the first edge surface and at least one insertion groove at the second panel surface, the rod-shaped element is configured to be inserted into the insertion groove, the rod-shaped element extends at a first angle from the first edge surface, the insertion groove extends into the second panel surface at a second angle from the second panel surface, the mechanical locking device further comprises a first panel groove on a first panel surface on the first panel, and/or a second panel groove on the second panel surface of the second panel, a back panel configured to be inserted in and to cooperate with, the first and second panel groove, wherein the first angle is within the range of about 30° to about 60°, or within the range of about 40° to about 50°, or about 45°, and at least one locking gear configured to cooperate with the first and/or second panel groove, for locking of the first panel to the second panel.

The locking gear 50 may be configured to cooperate with the back panel 40 for locking the back panel 40 to the first panel 10 and or to the second panel 20.

According to an aspect a width of the first and/or second panel groove minus a thickness of the back panel is larger than or essentially the same as an extension of the rod-shaped element along the first edge surface.

According to an aspect the rod-shaped element is arranged in a rod element groove in the first edge surface.

According to an aspect a width of the first panel groove is essentially the same as the width of the second panel groove.

According to an aspect, when the first and the second panel are in an assembled state, but before the locking gear locks the first panel to the second panel and the first and second panel enters the final locked position, the first panel groove and the second panel groove are displaced about 0,1 mm to about 0,6 mm, or about 0,2 mm to about 0,3 mm, in relation to each other.

According to an aspect the first panel comprises a second edge surface, the second panel comprises a third edge surface, the first panel groove is substantially parallel to the second edge surface and the second panel groove is substantially parallel to the third edge surface.

According to an aspect the first panel groove extends substantially along the entire second edge surface and the second panel groove extends essentially along the entire third edge surface.

According to an aspect the first panel groove and/or the second panel groove is bottom-ended.

According to an aspect the locking gear is flexible.

According to an aspect the locking gear comprises a spring.

According to an aspect the locking gear comprises a wedge element.

According to an aspect an extension of the back panel from the first edge of the first panel, when one first panel, one second panel and one back panel have been assembled, is less than an extension of the rod shaped element from the first edge surface.

According to an aspect the core of the first panel and/or of the second panel may be a wood-based core, such as MDF, HDF, OSB, WPC, plywood or particleboard. The core may also be a plastic core comprising thermosetting plastic or thermoplastic, e.g., vinyl, PVC, PU or PET. The plastic core may comprise fillers.

The first panel and/or the second panel may also be of solid wood.

The first panel and/or the second panel may be provided with a decorative layer, such as a foil or a veneer, on one or more surfaces.

At least some of the above identified and other objects and advantages that may be apparent from the description have been achieved by a locking device for a furniture product in accordance with the above.

Brief description of the drawings

These and other aspects, features and advantages of which embodiments of the invention are capable of, will be apparent and elucidated from the following description of embodiments and aspects of the present invention, reference being made to the accompanying drawings, in which

FIG. 1A shows a 3D view from above of a set in an unassembled state of an aspect of the invention.

FIG. 1B shows a side view of an embodiment of the rod-shaped element

FIG. 2 shows a 3D view from above of a set in an unassembled state of an aspect of the invention.

FIG. 3 shows a 3D view from above of a set in an unassembled state of an aspect of the invention.

FIG. 4A shows a 3D side view of a set in an assembled state of an aspect of the invention.

FIG. 4B shows a side view of a set in a partly assembled state of an aspect of the invention.

FIGS. 5A-5C show an enlargement of a part of a set in an assembled state, where part of the first and second panel together with a locking gear is enlarged.

FIG. 6 shows a 3D view of an enlargement of a part of a set in an assembled state.

FIG. 7 shows a side view of a set in an assembled state of an aspect of the invention.

FIG. 8 shows an enlargement of a part of the set in an assembled state according to an aspect of the invention.

FIG. 9 shows a side view of an enlargement of a set in an assembled state of an aspect of the invention.

FIG. 10 shows a side view of a set in an assembled state of an aspect of the invention.

FIG. 11 shows a side view of an enlargement of part of the set shown in fig. 10.

FIG. 12A shows a side view of an enlargement of part of the set shown in fig. 10.

FIG. 12B shows a side view of an embodiment of first panel.

FIG. 13 shows a side view of a set in an unassembled state of an aspect of the invention.

FIG. 14 shows an enlargement of part of the set shown in FIG. 13.

FIG. 15 shows a view of a set comprising two of the first panel, two of the second panel and one back panel in an unassembled state of an aspect of the invention.

FIGS. 16-18 show enlargements of a locking gear of an aspect of the invention.

FIGS. 19A-19D show enlargements of parts of a set during assembling.

Detailed description

Specific embodiments of the invention will now be described with reference to the accompanying drawings. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. The terminology used in the detailed description of the embodiments illustrated in the accompanying drawings is not intended to be limiting of the invention. In the drawings, like numbers refer to like elements.

The terminology used herein is for the purpose of describing particular aspects of the disclosure only, and is not intended to limit the disclosure. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

In the drawings and specification, there have been disclosed exemplary aspects of the disclosure. However, many variations and modifications may be made to these aspects without substantially departing from the principles of the present disclosure. Thus, the disclosure should be regarded as illustrative rather than restrictive, and not as being limited to the particular aspects discussed above. Accordingly, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, for example, definition of dimensions such as width or breadth or height or length or diameter depends on how exemplary aspects are depicted, hence, if depicted differently, a shown width or diameter in one depiction is a length or thickness in another depiction.

It should be noted that the word "comprising" does not necessarily exclude the presence of other elements or steps than those listed and the words "a" or "an" preceding an element do not exclude the presence of a plurality of such elements. It should further be noted that any reference signs do not limit the scope of the claims, that the example aspects may be implemented at least in part by means of both hardware and software, and that several "means", "units" or "devices" may be represented by the same item of hardware.

The different aspects, alternatives and embodiments of the invention disclosed herein may be combined with one or more of the other aspects, alternatives and embodiments described herein. Two or more aspects may be combined.

Embodiments of the invention are shown in FIGS. 1 – 18 including a set comprising a first panel 10, a second panel 20 and a mechanical locking device for locking of the first panel 10 to the second panel 20. The first panel 10 comprises a first edge surface 11 a first panel surface 13. The second panel 20 comprises a second panel surface 22. The first edge surface 11 is facing or parallel to the second panel surface 22 in a locked position of the first and the second panel 10, 20. The mechanical locking device comprises at least one element 31 at the first edge surface 11 and at least one insertion groove 32 at the second panel surface 22. The element 31 may be rod-shaped. The rod-shaped element 31 is configured to be inserted into the insertion groove 32. The rod-shaped element 31 extends at a first angle $\alpha 1$ from the first edge surface 11 and the insertion groove 32

extends into the second panel surface 22 at a second angle α2 from the second panel surface 22. When there are more than one element 31, each element 31 may be arranged parallel to each other element 31. When there are more than one insertion groove 32, each insertion groove 32 may be arranged parallel to each other insertion grooves 32. The mechanical locking device further comprises a first panel groove 12 on the first panel surface 13 on the first panel 10, and/or a second panel groove 23 on the second panel surface 22 of the second panel 20, a back panel 40 configured to be inserted in and to cooperate with, the first and second panel groove 12, 23, wherein the first angle α1 is within the range of about 30° to about 60°, or within the range of about 40° to about 50°, or about 45°. The mechanical locking device also comprises at least one locking gear 50 configured to cooperate with at least the first and second panel groove 12, 23, for locking of the first panel 10 to the second panel 20.

The locking gear 50 may be configured to cooperate with the back panel 40 for locking the back panel 40 to the first panel 10 and or to the second panel 20.

The second panel 20 may comprise a fourth edge surface 25 and the insertion groove 32 may be positioned adjacent the fourth edge surface 25. The set may be configured for locking the first panel 10 to the second panel 20 with the first panel surface 13 parallel or essentially parallel to the fourth edge surface 25.

The first panel 10 and the second panel 20 may be panels for a furniture product and may be a part of a frame of a furniture product.

The set may be configured for locking the first panel 10 to the second panel 20 with the first panel 10 perpendicular or essentially perpendicular to the second panel surface 22.

FIGS. 1A-3, 13-15 disclose embodiments of the set in an unassembled state. FIGS. 4A-12B disclose embodiments of the set in an assembled state. The set may be assembled by displacing the first panel 10 relative the second panel 20 in an assembly direction 111, 112, 114 which is essentially parallel with the first panel surface 13.

The assembly direction 111, 112, 114 may be essentially parallel with the first angle α1 and/or the second angle α2. The insertion groove 32 may be a drill hole. The drill hole may be a bottom-ended drill hole.

The insertion groove 32 may have a diameter D2.

The insertion groove 32 may comprise a chamfer 60 or a rounding, which is configured to guide the rod shaped element during assembling, as shown in FIGS. 13 and 14.

The rod-shaped element 31 may be arranged in a rod element groove 36 on the first edge surface 11 on the first panel 10 or on the second panel surface 22 on the second panel 20.

The rod-shaped element 31 may have a diameter D1. The diameter D2 of the insertion groove 32 may be larger than the diameter D1 of the rod-shaped element 31. The diameter D2 of the insertion groove 32 may be about 0.3 to about 0.8 mm larger than the diameter D1 of the rod-shaped element 31 for optimal assembly.

The locking gear 50 may be assembled to the set of panels when the first panel 10, the second panel 20 and the back panel 40 have been assembled, and is inserted in the first panel groove 12 and and/or the second panel groove 23, and thereby locks the first panel 10 to the second panel 20.

The locking gear 50 may lock the back panel 40 to the first panel groove 12 and and/or the second panel groove and thereby hinders the first panel 10 to be displaced in relation to the second panel 20 in a direction opposite to the assembly direction

In one aspect, the locking gear 50 cooperates with the back panel 40 for locking of the back panel 40 to the first panel 10 and/or the second panel 20.

The first panel groove 12 on the first panel surface 13 may comprise a width W1.

The second panel groove 23 on the second panel surface 22 may comprise a width W2.

The width W1 of the first panel groove 12 may be essentially the same as the width W2 of the second panel groove 23.

FIG. 4B shows that the back panel 40 may be assembled to the first 10 and second 20 panel by displacing the back panel 40 relative the first 10 and second 20 panel in an assembly direction 113 which is essentially perpendicular to the second panel surface 22 of the second panel 20. A thickness T of the back panel 40 may be essentially the same as the width W1, W2 of the first 12 and/or second 23 panel groove.

There may be a play between the back panel 40 and the first 12 and/or second 23 panel groove which may facilitate a displacement of an edge of the back panel 40 in the first 12 and/or second 23 panel grooves. The play may be in the range of about 0 mm to about 0,5mm, or about 0,1 mm to about 0,2.

In one aspect the width W1, W2 of the first 12 and/or second 23 panel groove minus a thickness T of the back panel 40, i.e., ΔW, is equal to or larger than an extension H of the back panel 40 in relation to the first panel 10 or second panel 20 after a first panel 10, a second panel 20 and a back panel 40 have been assembled, i.e., $\Delta W \geq H$, see figure 10-14.

In one aspect H is less than an extension D of the rod shaped element 31 from the first edge surface 11.

The rod shaped element 31 may have an extension E along the first edge surface 11.

In one aspect, if a set comprising two of the first panel 10 and two of the second panel 20 are to be assembled, at least one panel 10, 20 may have a width W1, W2 of the first 12 and/or second 23 panel groove that allows for a displacement of an extension H of the back panel 40, see FIG. 10 and 12A, within the first 12 and/or second 23 panel groove. The displacement may be equal to or larger than ΔW. In one aspect, all panels have the same width W1, W2 of the first 12 and second 23 panel groove to facilitate the production of the panels.

A length of the back panel 40 may be designed to avoid the extension H of the back panel 40. An edge of the back panel 40 may be essentially flush with the first edge 11 surface of the first panel 10

FIG. 12B shows a side view of an embodiment of first panel 10 with the first 12 panel groove. The first 12 panel groove may comprise a width W1 and a height H1.

According to an aspect, when the first panel 10 and the second panel 20 are in an assembled state, but before the locking gear 50 locks the first panel 10 to the second panel 20 and the first panel 10 and the second panel 20 enters the final locked position, the first panel groove 12 and the second panel groove 23 may be displaced about 0,1 mm to about 0,6 mm, or about 0,2 mm to about 0,3 mm, in relation to each other.

The first panel 10 may comprise a second edge surface 14 and the second panel 20 may comprise a third edge surface 24. The first panel groove 12 may be substantially parallel to the second edge surface 14 and the second panel groove 23 may be substantially parallel to the third edge surface 24. The first panel groove 12 may further extend substantially along the entire second edge surface 14 and the second panel groove 23 may extend essentially along the entire third edge surface 24.

The first panel groove 12 and/or the second panel groove 23 may be bottom-ended.

The first 12 and/or second 23 panel groove may be formed by mechanical cutting, such as milling or sawing.

The first panel groove 12 may be formed in the first panel surface 13 and in a core of the first panel 10. The second panel groove 23 may be formed in the second panel surface 22 and in a core of the second panel 20.

In one aspect the locking gear 50 may be at least one wedge that is inserted in the first 12 and/or second 23 panel grooves to lock the first 10 and/or second 20 panels and/or the back panel 40 in position, as shown in FIGS. 5-6 and 10-11.

FIGS. 5A-C show an embodiment of the locking gear 50 which comprises a first wedge shaped edge 61 and a second wedge shaped edge 62. The first wedge shaped edge 61 may be inserted in the in the first panel groove 12 and the second wedge shaped edge 62 may be inserted in the in the second panel groove 23 to lock the first panel 10, the second panel 20 and the back panel 40 to a locked position.

FIGS. 6 and 11 show an embodiment of the locking gear 50 which comprises a first wedge part 51 and a second wedge part 52.

The locking gear 50 may be made of, e.g., wood based material, metal, a polymer material, etc.

The locking gear 50 may, in one aspect, be rectangular, square or triangular.

The locking gear 50 may be made of, e.g., wood based material, metal, a polymer material, etc.

In one aspect the locking gear 50, as shown in FIGS. 7-9 and 16-18, may comprise a lever arm 54 and an eccentric locking head 53 at a first end of the lever. The locking gear 50

may comprise at an opposite second end of the lever 54 a locking part 56. If the eccentric head 53 is inserted in the first panel groove 12, the locking part 53 may be is inserted in the second panel groove 23, and vice versa.

The lever arm 54 may be elastic to enable bending during the insertion of the locking part 53 may in the first panel groove 12 or the second panel groove 23. The bending of the lever arm 54 may create a locking force between the locking part and the first panel groove 12 or the second panel groove 23.

An outer part 53 of the eccentric locking head 53 may be thicker than a part of the eccentric locking head 53 adjacent the first end of the lever.

An outer part 53 of the eccentric locking head 53 may comprise a friction connection 59 configured to cooperate with the first panel groove 12 or the second panel groove 23.

The locking gear 50 may comprise a polymer material, such as a thermoplastic material, or a metallic material.

FIG. 9 shows an aspect of the invention, where a first panel 10 and a second 20 panel is assembled, where the rod-shaped element 31 extends at a first angle α1 of 47°. The diameter D2 of the insertion groove 32 may be about 0.3 to about 0.8 mm larger than the diameter D1 of the rod-shaped element 31 for optimal assembly.

The first edge surface 11 may comprise two or more of said rod-shaped element 31 and the second panel surface 22 may comprise two or more of said insertion groove 32, and vice versa, which may be arranged linearly, wherein each of the rod-shaped elements 31 is configured to be inserted into one insertion groove 32.

A cross cut of the insertion groove 32, in a plane parallel to the second panel surface 22, which nay have a shape that matches a cross cut of the rod-shaped element 31, in a plane parallel to the first edge surface 11. An advantage of this may be that an improved locking of the first panel 10 to the second panel 20 is obtained and that the assembly of the set of panels is done easily.

The rod-shaped element 31 and the insertion groove 32 are disclosed more in detail in FIGS. 1B, 9, 11 and 14, which show cross cuts along the rod-shaped element 31 and the insertion groove 32. The rod-shaped element 31 extends at a first angle α1 from the first

edge surface 11 and the insertion groove 32 extends into the second panel surface at a second angle α2 from the second panel surface 22, as shown in FIG. 14.

FIG. 1B shows an embodiment of the rod-shaped element 31 which may be of an elongated shape and comprise a length direction 86, a width direction 85 and a centre line 81 extending in the length direction.

According to an aspect the rod-shaped element 31 is configured to be inserted in the rod element groove 36 on the first edge surface 11.

According to an aspect the rod-shaped element 31 is configured to be inserted in the rod element groove 36 on the second panel surface 22.

According to an aspect the rod-shaped element 31 may be configured to be attached in the rod element groove 36 by friction.

According to an aspect the rod-shaped element 31 may be configured to be glued in the rod element groove 36.

According to an aspect the rod-shaped element 31 and, the rod element groove 36 and the insertion groove 32 may have a substantially circular shape, although other shapes, such as triangular, rectangular, square, etc., are possible.

According to an aspect, when $\alpha 1 \neq \alpha 2$, the extension D of the rod-shaped element 31 may be varied to direct where the largest locking force generated from the locking gear 50 is to be achieved.

According to an aspect, which is shown in FIG. 13, a first edge surface 11 may have at least one element 31, while the opposite edge surface may have at least one insertion groove 32.

According to a further aspect, a first edge surface 11 may have a combination of at least one element 31 and at least one insertion groove 32. A corresponding second panel surface 22 may have a corresponding combination of at least one insertion groove 32 and at least one element 31.

According to an aspect, which is shown in FIG. 14, the position of at least one rod shaped element 31 may be positioned at first distance 83 from the second edge surface 14. The first distance may be measured from the second edge surface 14 to a centre line 81 of

the rod shaped element 31. The corresponding insertion groove 32 may be positioned at a second distance 84 from the third edge surface 24. The second distance may be measured from the third edge surface 24 to a centre line 82 of the insertion groove 32.The first distance may be different from the second distance which may increase the locking force.

The difference between the first distance and the second distance may be in the range of about 0,1mm to about 0,5 mm.

According to an aspect the rod-shaped element 31 is made from one or more of a wood based material, a polymer material, which may comprise reinforcement, such as glass fibre or a metal.

According to an aspect the rod shaped element 31 may have a waxed surface to facilitate assembly.

The rod-shaped element 31 may, according to an aspect, be configured to cooperate, in a locked position, with the bottom surface of the insertion groove 32.

The sidewalls of the insertion groove 32 may comprise material of the core of the first panel 10 or the second panel 20, dependent on in which panel the insertion groove 32 is made and in which panel the rod-shaped element 31 is attached. According to an aspect they may also be enforced with, e.g., metal or glass fibre.

According to an aspect first panel groove 12 and/or the second panel groove 23 may be impregnated/enforced with a liquid.

According to an aspect the first panel 10 and the second panel 20 may be assembled by displacing the first panel 10 relative the second panel 20 in a direction which is essentially parallel with the first panel surface 13.

According to an aspect the first panel 10 comprises two or more of said first edge surfaces 11 according to the above. Put in another way, one or more rod-shaped elements 31 may be positioned at two or more of the edges of the first panel 10, as disclosed in FIGS. 2-3 and 10.

According to an aspect the first panel 10 may comprise two or more of said first edge surface 11 according to the above. Put in another way, one or more of said rod-shaped

elements 31 may be positioned at two or more of the edges of the first panel 10, as disclosed in FIGS. 2-4, 9, 11, 12 and 16.

According to an aspect the second panel 20 may comprise two or more of said fourth edge surface 25 according to the above. Put in another way, one or more of said insertion grooves 32 may be positioned adjacent two or more of the edges of the second panel 10, as disclosed in FIGS. 1A, 2-3, 13 and 15.

According to an aspect, as shown in FIG. 15, two of the first panels 10, two of the second panels 20, and one back panel 40 may be assembled.

A left embodiment of the of the first panel 10 may be assembled to a bottom embodiment of the second panel 20 by displacing the left embodiment of the first panel 10 relative the bottom embodiment of the second panel 20 in the assembly direction 111. A right embodiment of the of the first panel 10 may be assembled to the bottom embodiment of the second panel 20 by displacing the right embodiment of the first panel 10 relative the bottom embodiment of the second panel 20 in the assembly direction 112. An embodiment of the back panel 40 may be assembled to the left and right embodiment of the first panel 10 and the bottom embodiment of the second panel 20 by displacing the embodiment of the back panel 40 in an assembly direction 113 which is essentially perpendicular to the second panel surface 22 of the bottom embodiment of the second panel 20. A top embodiment of the second panel 20 may be assembled to the left and right embodiment of the first panel 10 and the embodiment of the back panel 40 by displacing the top embodiment of the second panel 20 in the assembly direction 114.

A length 93 of the back panel 40 which in the locked position may be inserted in the panel groove 12 of the first panel 10 may be essentially the same or greater than a length 94 of the first panel 10 at the second edge surface 14 of the first panel. The length 93 of the back panel 40 may be equal to the length 94 of the first panel 10 plus about half the height H1 of the panel groove 12 to about two times the height H1 of the panel groove 12 or equal to the length 94 of the first panel 10 plus the height H1 of the panel groove 12. FIG. 15 shows the length 93 of the back panel 40 which extend between an upper edge 87 of the back panel and a lower edge 88 of the back panel.

FIGS. 19A-D show enlargements of parts of a set during assembling. FIG. 19A shows an embodiment in a first position in which the back panel 40 is inserted in the panel groove 12 of the first panel 10. The upper edge 87 of the back panel 40 is below the first edge surface 11 of the first panel. FIG. 19C shows that in this first position the lower edge 88 of the back panel may contact a lower surface 89 of the panel groove 23 of the lower second panel 20. FIG. 19B shows the embodiment in a second position in which, an upper second panel 20 has been displaced 114 and assembled to the first panel 10, and the back panel 40 has been displaced to a position in which the upper edge 87 of the back panel 40 is within the panel groove 23 of the upper second panel 20. FIG. 19D shows that in this second position the lower edge 88 of the back panel may be at a distance 91 from the lower surface 89 of the panel groove 23 of the lower second panel 20. The lower edge 88 of the back panel 40 may be positioned at a distance 91 from the second panel surface 22 of the second panel. The distance may be within the range of about 1/3 to about 2/3 a height H2 of the panel groove 23 of the second panel, or about half the height H2 of the panel groove 23 of the second panel.

The height H2 of the panel groove 23 of the lower second panel groove may be greater than the height H2 of the panel groove 23 of the upper second panel groove. The set may be rotated such that the gravity causes the displacement of the back panel to obtain the position in which the upper edge 87 of the back panel 40 is within the panel groove 23 of the upper second panel 20.

The back panel may be displaced by gravity or by hand and the position in which the upper edge 87 of the back panel 40 is within the panel groove 23 of the upper second panel 20 may be maintained by arranging a positioning element 92 between the back panel and the panel groove 12 of the first panel and/or between the back panel and the panel groove 23 of the second panel.

Embodiments of the first panel groove 12 may comprise a width W1 which is essentially the same as a thickness T of the back panel 40. A part of the first panel groove 12 may be wider which may allow an embodiment of the locking gear 50 to be positioned between the back panel and the first panel groove 12 to maintain the position in which the upper edge 87 of the back panel 40 is within the panel groove 23 of the upper second panel 20.

Embodiments of the second panel groove 24 may comprise a width W2 which is essentially the same as a thickness T of the back panel 40. A part of the second panel groove 23 may be wider which may allow an embodiment of the locking gear 50 to be positioned between the back panel 40 and the second panel groove 23 to maintain the position in which the upper edge 87 of the back panel 40 is within the panel groove 23 of the upper second panel 20.

The back panel may be displaceable and the position in which the upper edge 87 of the back panel 40 is within the panel groove 23 of the upper second panel 20 may be maintained by an embodiment of the locking device 4 disclosed in WO2019125292 or WO2019125291.

The core of the first panel 10 and/or of the second panel 20 may be a wood-based core, such as MDF, HDF, OSB, WPC, plywood or particleboard. The core may also be a plastic core comprising thermosetting plastic or thermoplastic, e.g., vinyl, PVC, PU or PET. The plastic core may comprise fillers.

The first panel 10 and/or the second panel 20 may also be of solid wood.

The first panel 10 and/or the second panel 20 may be provided with a decorative layer, such as a foil or a veneer, on one or more surfaces.

According to an aspect the set of panels are resilient panels. The resilient panels may comprise a core comprising thermoplastic material. The thermoplastic material may be foamed.

The thermoplastic material may comprise polyvinyl chloride (PVC), polyester, polypropylene (PP), polyethylene (PE), polystyrene (PS), polyurethane (PU), polyethylene terephthalate (PET), polyacrylate, methacrylate, polycarbonate, polyvinyl butyral, polybutylene terephthalate, or a combination thereof. The core may be formed of several layers.

The aspects described above may comprise a decorative layer, such as a decorative foil comprising a thermoplastic material. The thermoplastic material of the decorative layer may be or comprise polyvinyl chloride (PVC), polyester, polypropylene (PP), polyethylene (PE), polystyrene (PS), polyurethane (PU), polyethylene terephthalate (PET), polyacrylate, methacrylate, polycarbonate, polyvinyl butyral, polybutylene terephthalate, or a

combination thereof. The decorative foil is may be printed, for example by direct printing, rotogravure, or digital printing. According to an aspect the decorative layer comprises melamine, a high pressure laminate (HPL) or a veneer.

The aspects described above may comprise a wear layer such as a film or foil. The wear layer may comprise thermoplastic material. The thermoplastic material may be polyvinyl chloride (PVC), polyester, polypropylene (PP), polyethylene (PE), polystyrene (PS), polyurethane (PU), polyethylene terephthalate (PET), polyacrylate, methacrylate, polycarbonate, polyvinyl butyral, polybutylene terephthalate, or a combination thereof.

The aspects described above may comprise a wood base core, such as HDF, MDF, plywood, particleboard, OSB or Masonite.

The different aspects, embodiments and alternatives described above may be combined with one or more of the other described aspects, embodiments and alternatives.

CLAIMS

1. A set comprising a first panel (10), a second panel (20) and a mechanical locking device for locking the first panel (10) to the second panel (20), wherein

- the first panel (10) comprises a first edge surface (11),

- the second panel (20) comprises a second panel surface (22),

- the first edge surface (11) is facing or parallel to the second panel surface (22) in a locked position of the first and the second panel (10, 20),

- the mechanical locking device comprises at least one rod-shaped element (31) at the first edge surface (11) and at least one insertion groove (32) at the second panel surface (22),

- the rod-shaped element (31) is configured to be inserted into the insertion groove (32),

- the rod-shaped element (31) extends at a first angle (α1) from the first edge surface (11),

- the insertion groove (32) extends into the second panel surface (22) at a second angle (α2) from the second panel surface (22),

- the mechanical locking device further comprises at least one of a first panel groove (12) on a first panel surface (13) on the first panel (10), and a second panel groove (23) on the second panel surface (22) of the second panel (20),

-a back panel (40) configured to be inserted in and to cooperate with at least one of the first panel groove (12) and the second panel groove (23),

-wherein the first angle (α1) is within the range of about 30° to about 60°, or within the range of about 40° to about 50°, or about 45°, and

-at least one locking gear (50) configured to cooperate with the back panel (40) and at least one of the first panel groove (12) and the second panel groove (23), for locking of the first panel (10) to the second panel (20).

2. The set as claimed in claim 1, wherein a width (W1, W2) of at least one of the first panel groove (12) and the second panel groove (23) minus a thickness (T) of the back panel (40) is larger than or essentially the same as an extension (E) of the rod-shaped element (31) along the first edge surface (11).

3. The set as claimed in any of the preceding claims, wherein the rod-shaped element (31) is arranged in a rod element groove (36) in the first edge surface (11).

4. The set as claimed in any of the preceding claims, wherein the width (W1) of the first panel groove (12) is essentially the same as the width (W2) of the second panel groove (23).

5. The set as claimed in any of the preceding claims, wherein the first panel (10) comprises a second edge surface (14), the second panel (20) comprises a third edge surface (24), the first panel groove (12) is substantially parallel to the second edge surface (14) and the second panel groove (23) is substantially parallel to the third edge surface (24).

6. The set as claimed in any of the preceding claims, wherein the first panel groove (12) extends substantially along the entire second edge surface (14) and the second panel groove (23) extends essentially along the entire third edge surface (24).

7. The set as claimed in any of the preceding claims, wherein at least one of the first panel groove (12) and the second panel groove (23) is bottom-ended.

8. The set as claimed in any of the preceding claims, wherein the locking gear (50) is configured to further cooperate with the back panel (40), for locking of the back panel (40) to the first (10) and/or second (20) panel.

9. The set as claimed in any of the preceding claims, wherein the locking gear (50) is flexible.

10. The set as claimed in any of the preceding claims, wherein the locking gear (50) comprises a spring.

11. The set as claimed in any of claims 1-9, wherein the locking gear (50) comprises a wedge element.

12. The set as claimed in any of the previous claims, wherein an extension (H) of the back panel from the first edge (11) of the first panel (10), when one first panel, one second panel and one back panel have been assembled, is less than an extension of the rod shaped element (31) from the first edge surface (11) of the first panel (10).

FIG 19A

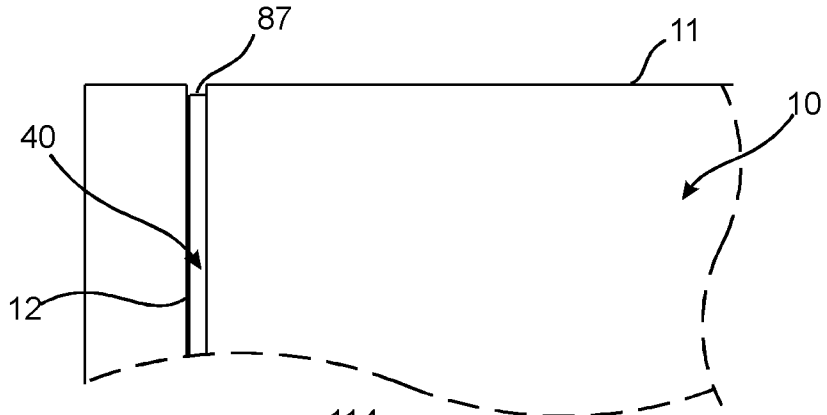


FIG 19B

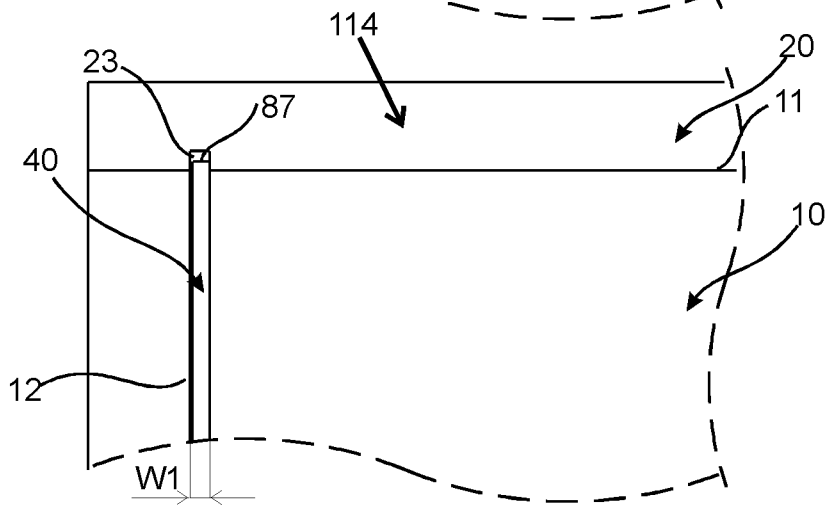


FIG 19C

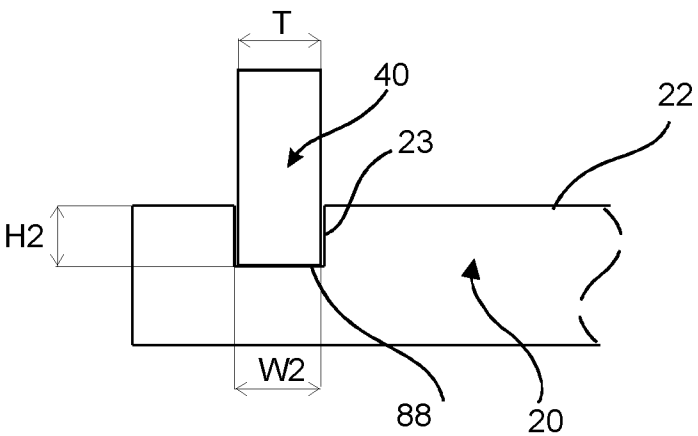


FIG 19D

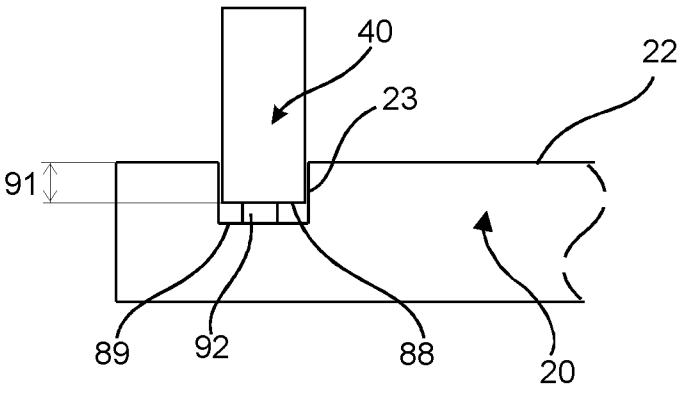


FIG 1A

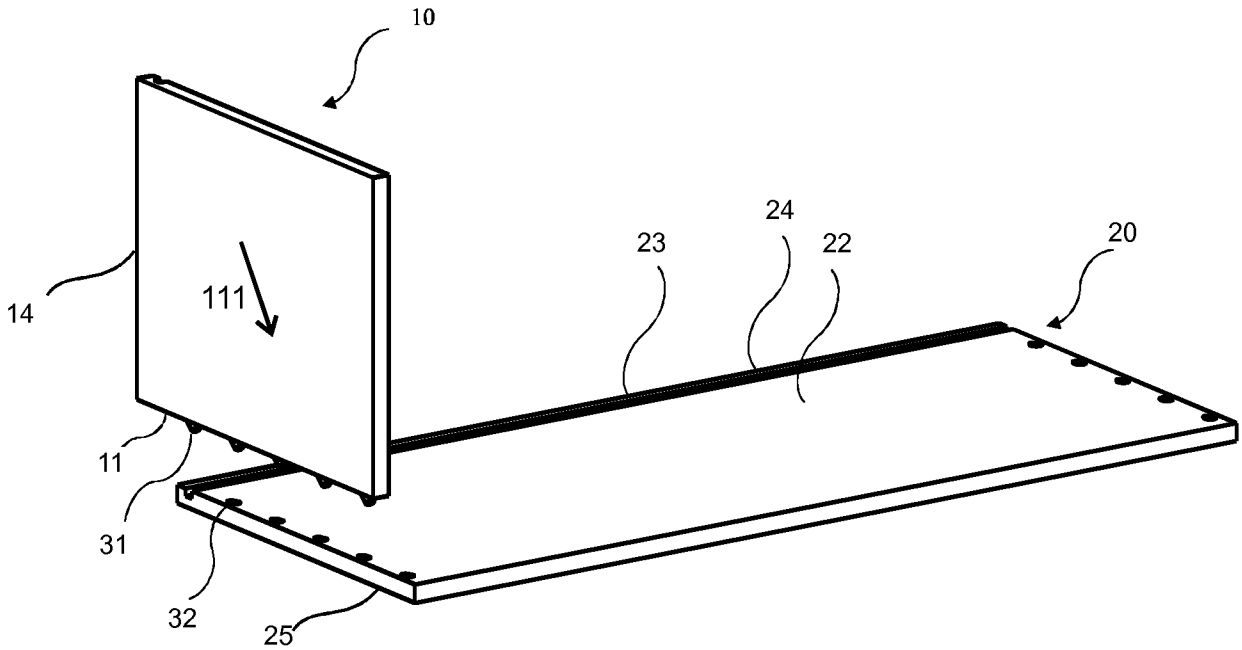


FIG 1B

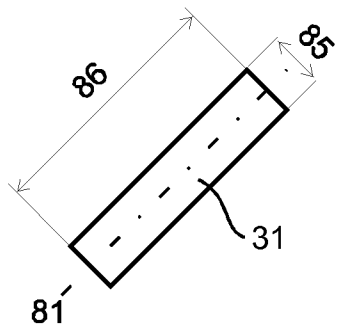


FIG 2

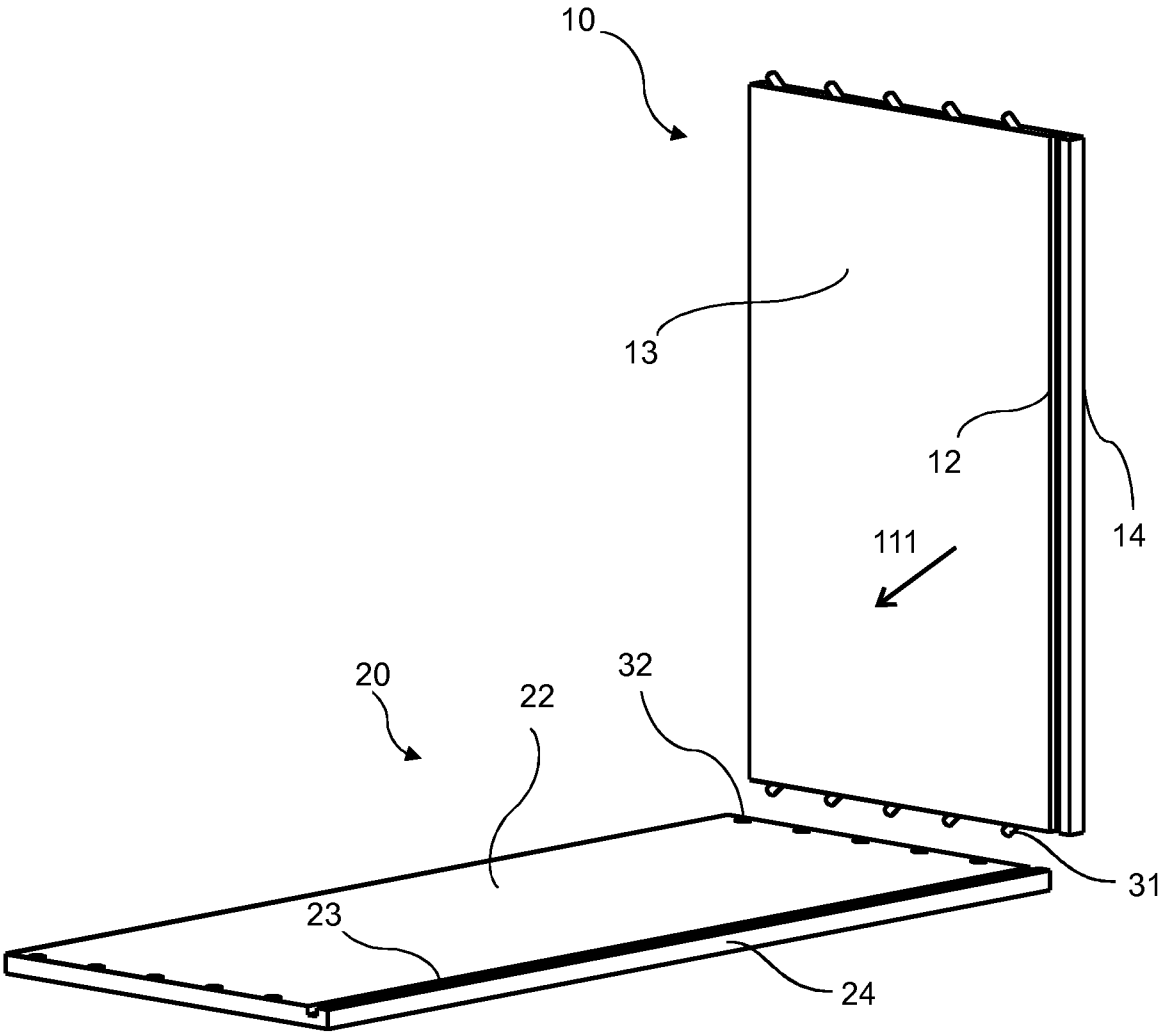


FIG 3

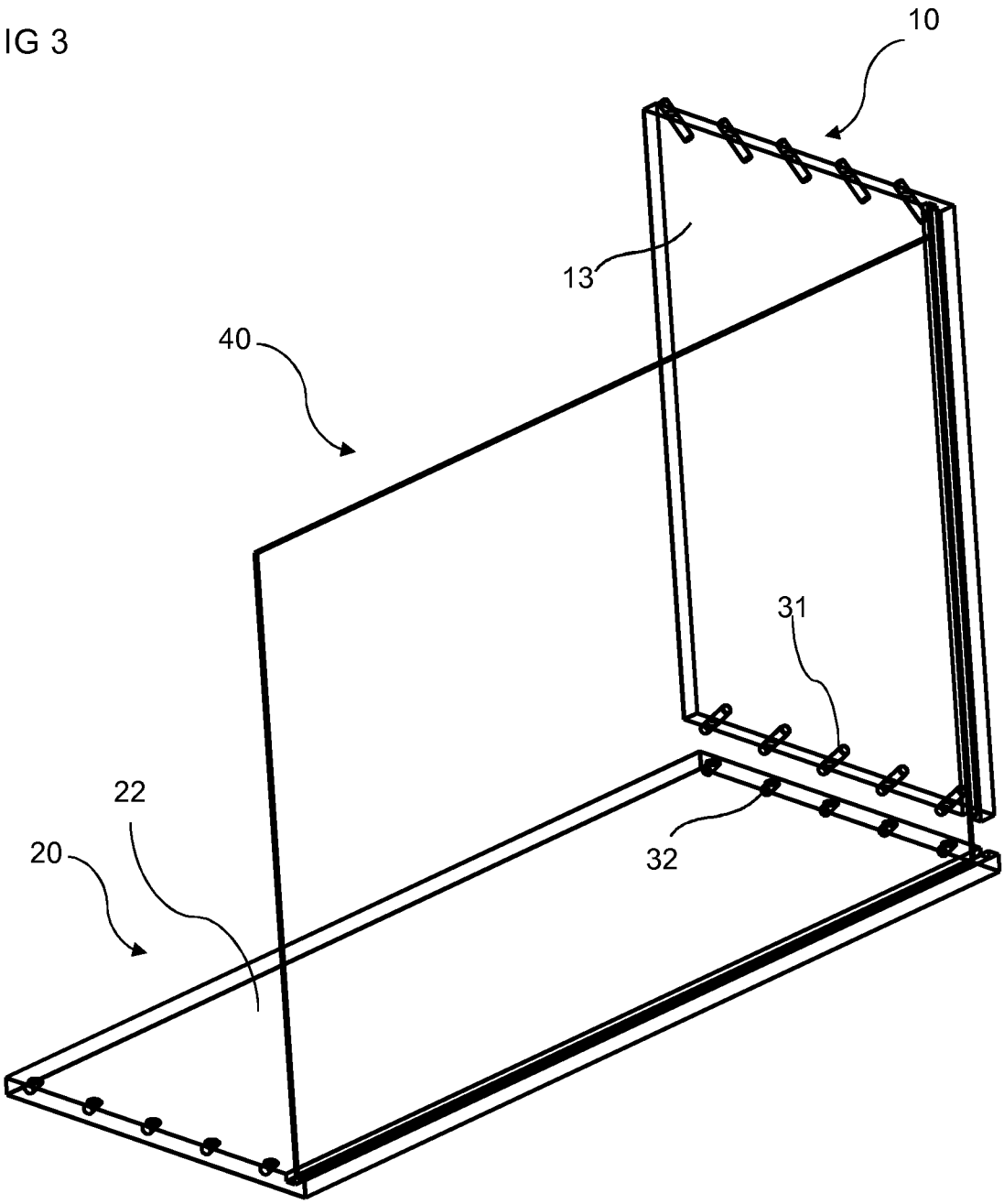


FIG 4A

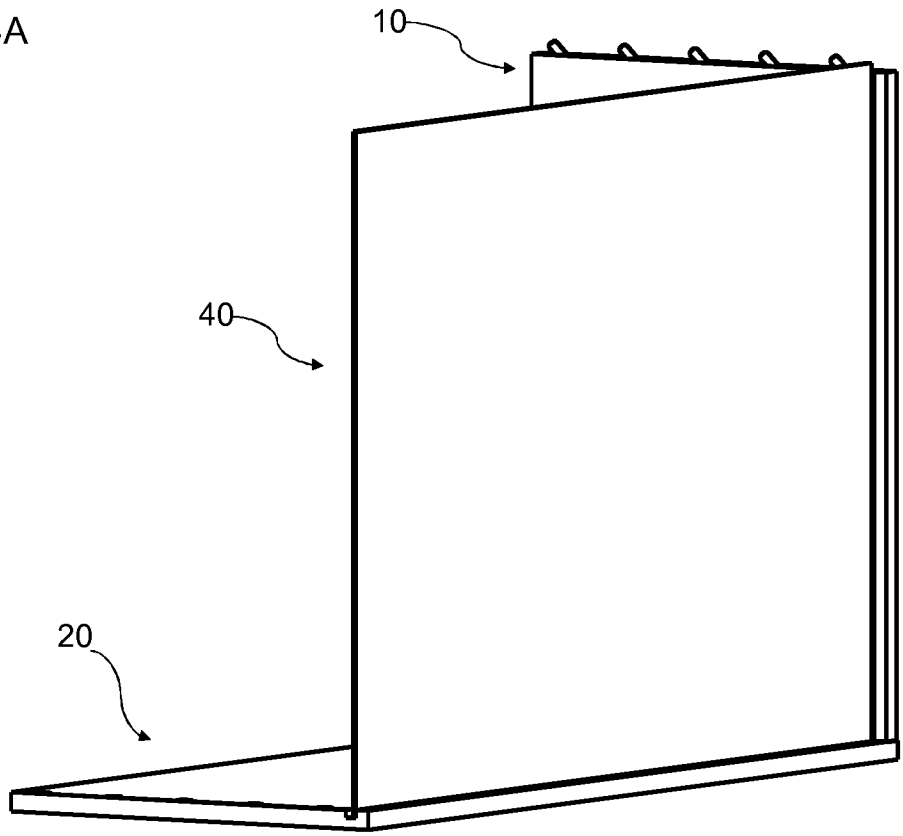


FIG 4B

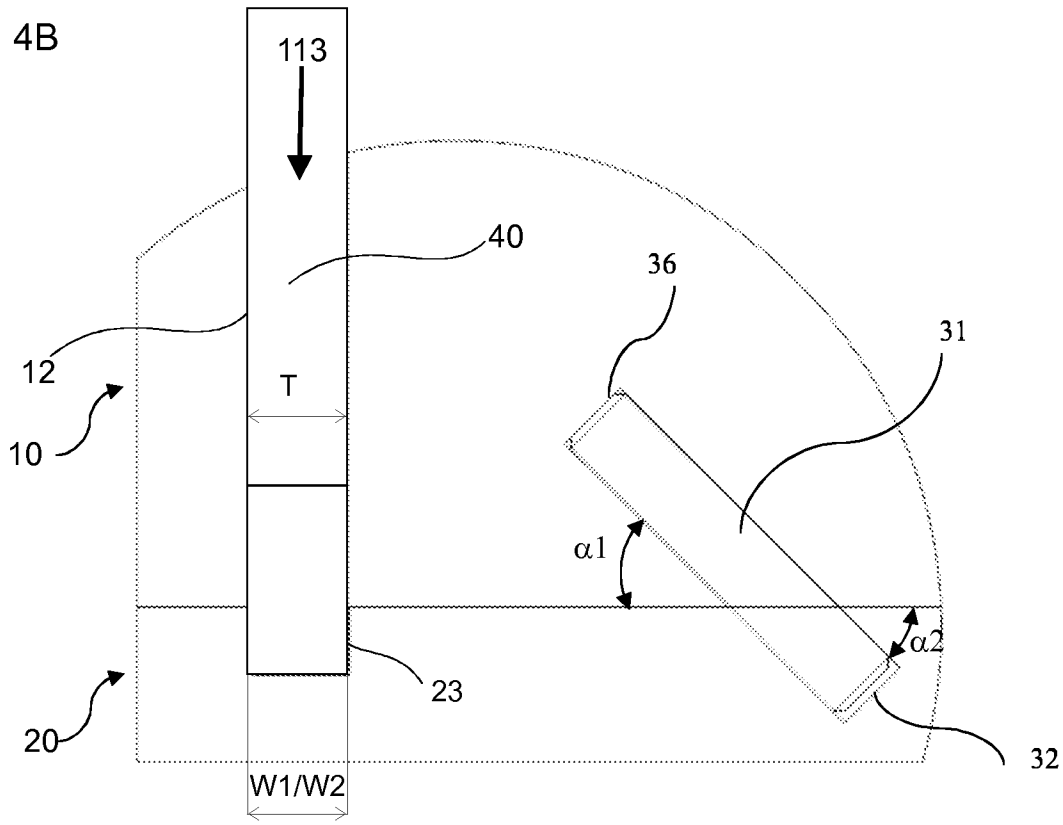


FIG 5A

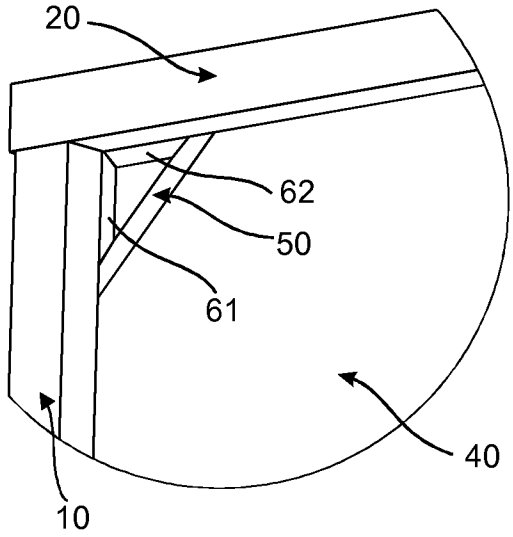


FIG 5B

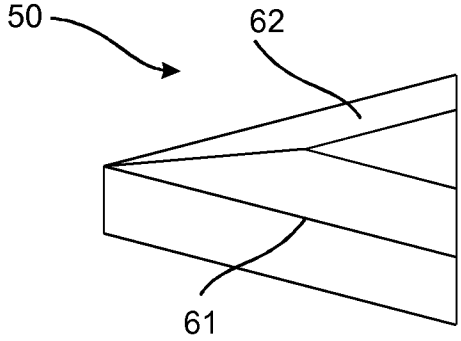


FIG 5C

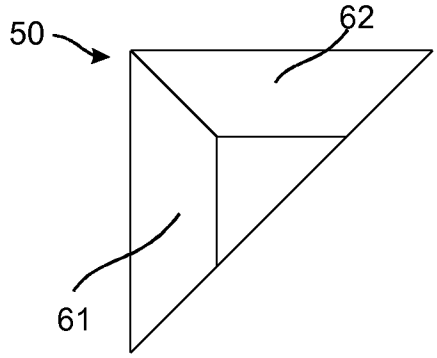


FIG 6

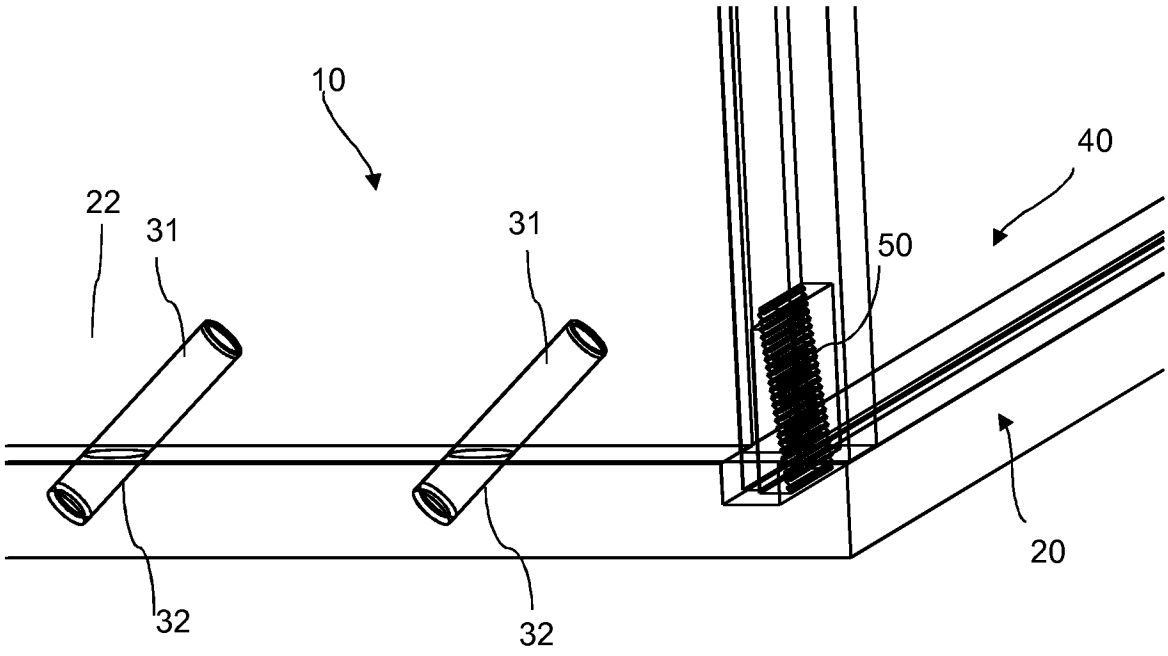


FIG 7

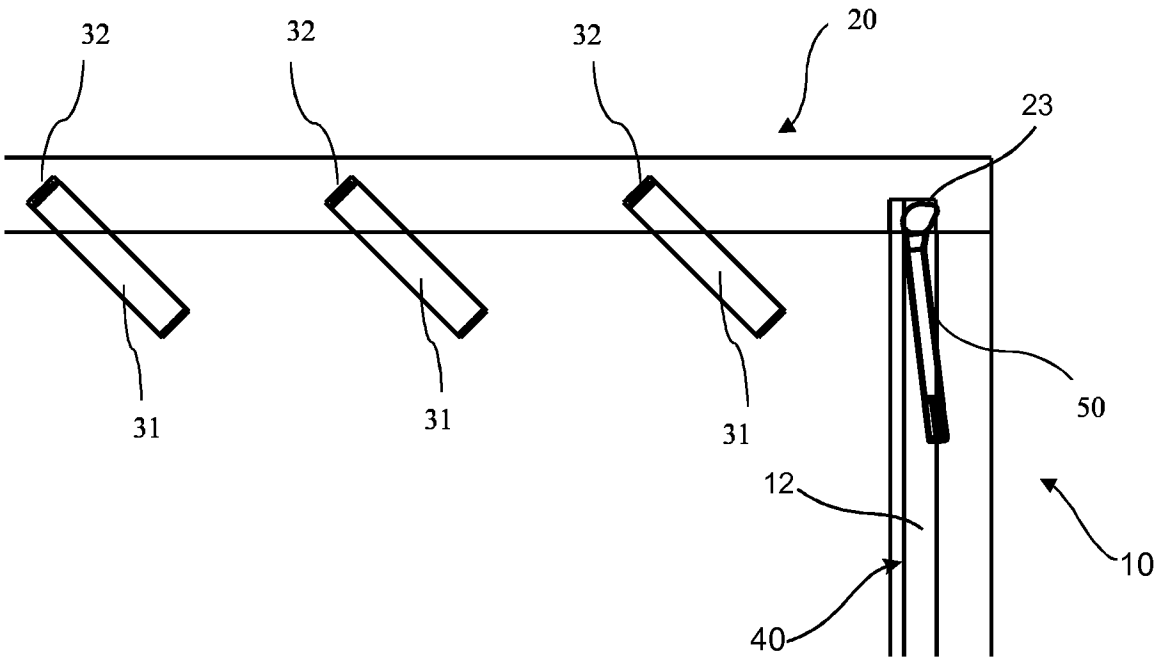


FIG 8

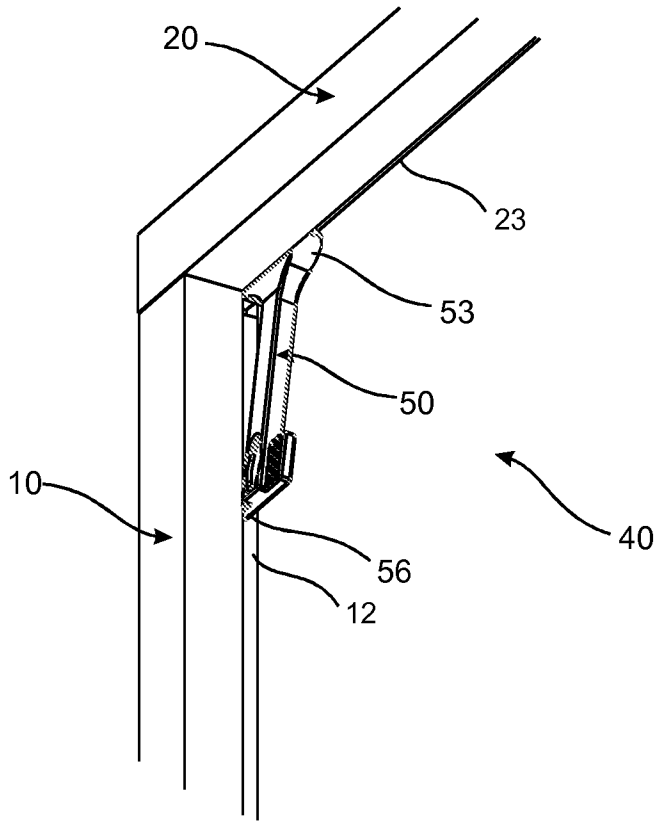


FIG 9

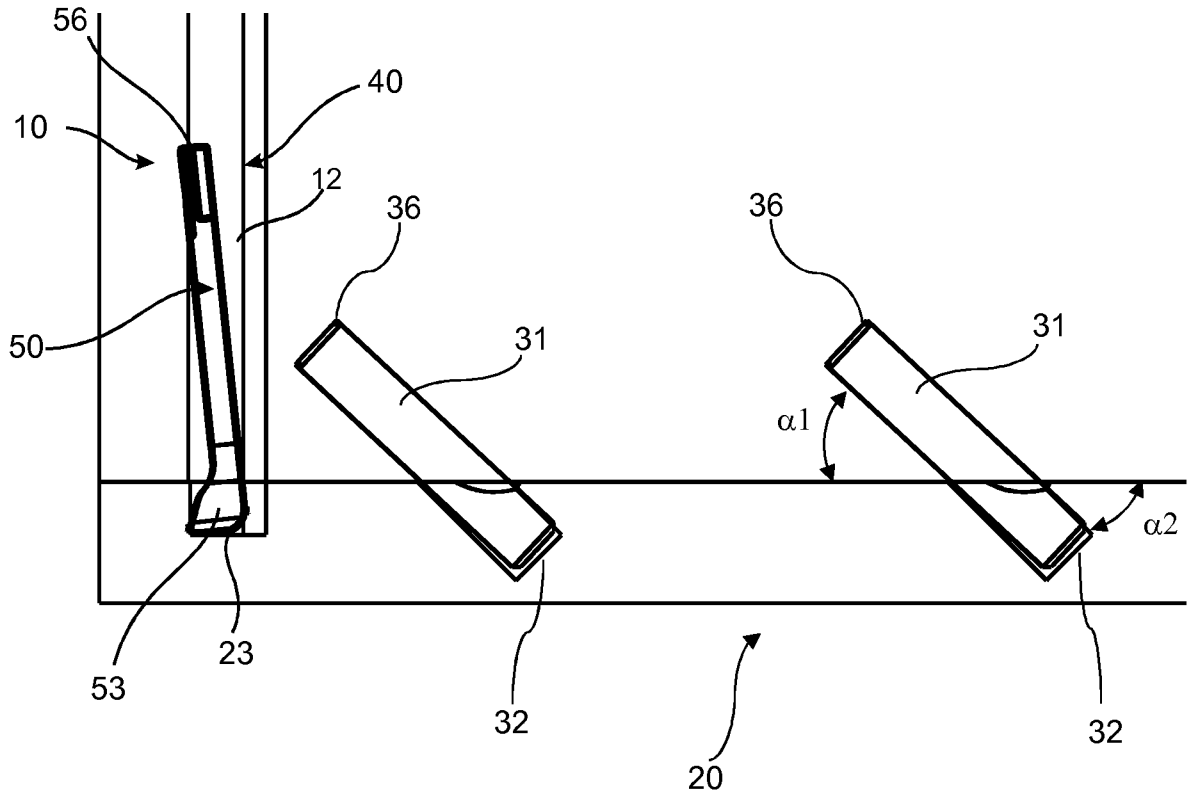


FIG 10

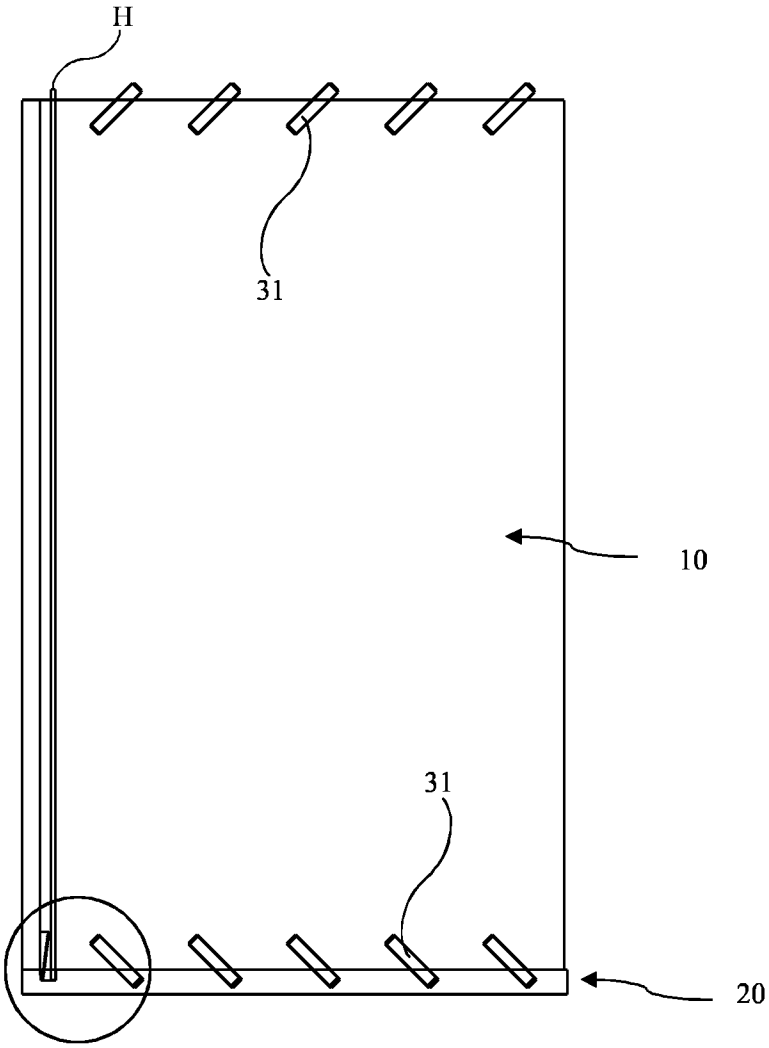


FIG 11

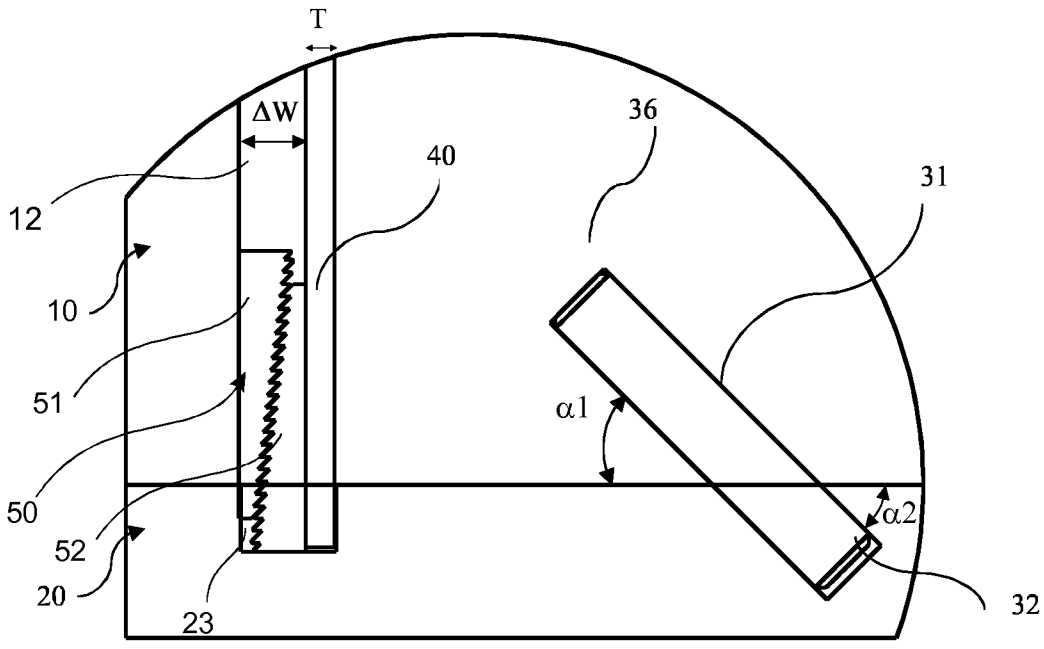


FIG 12A

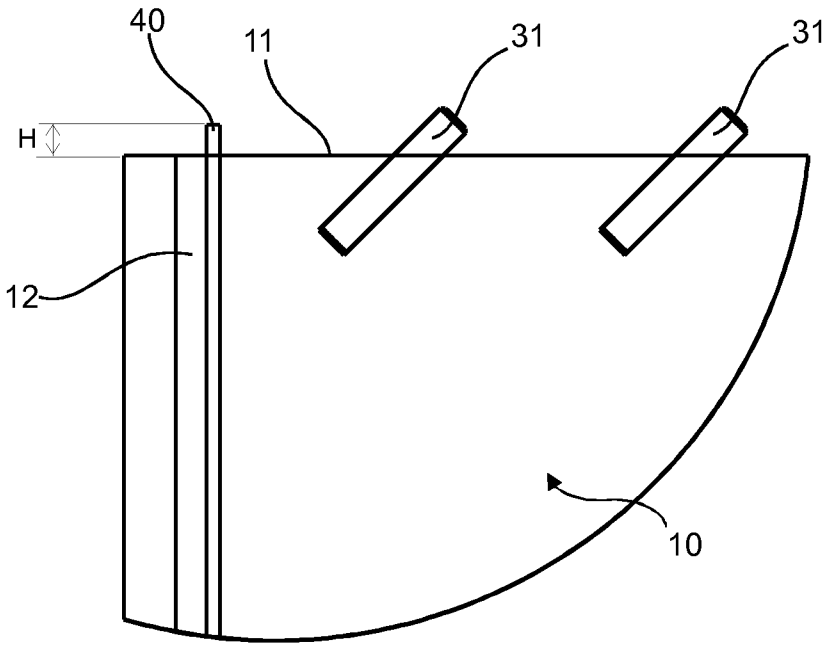


FIG 12B

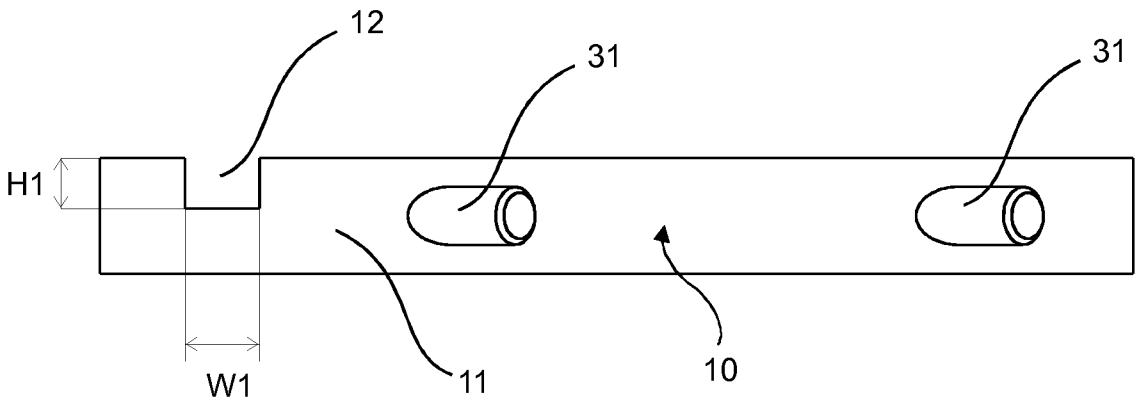


FIG 13

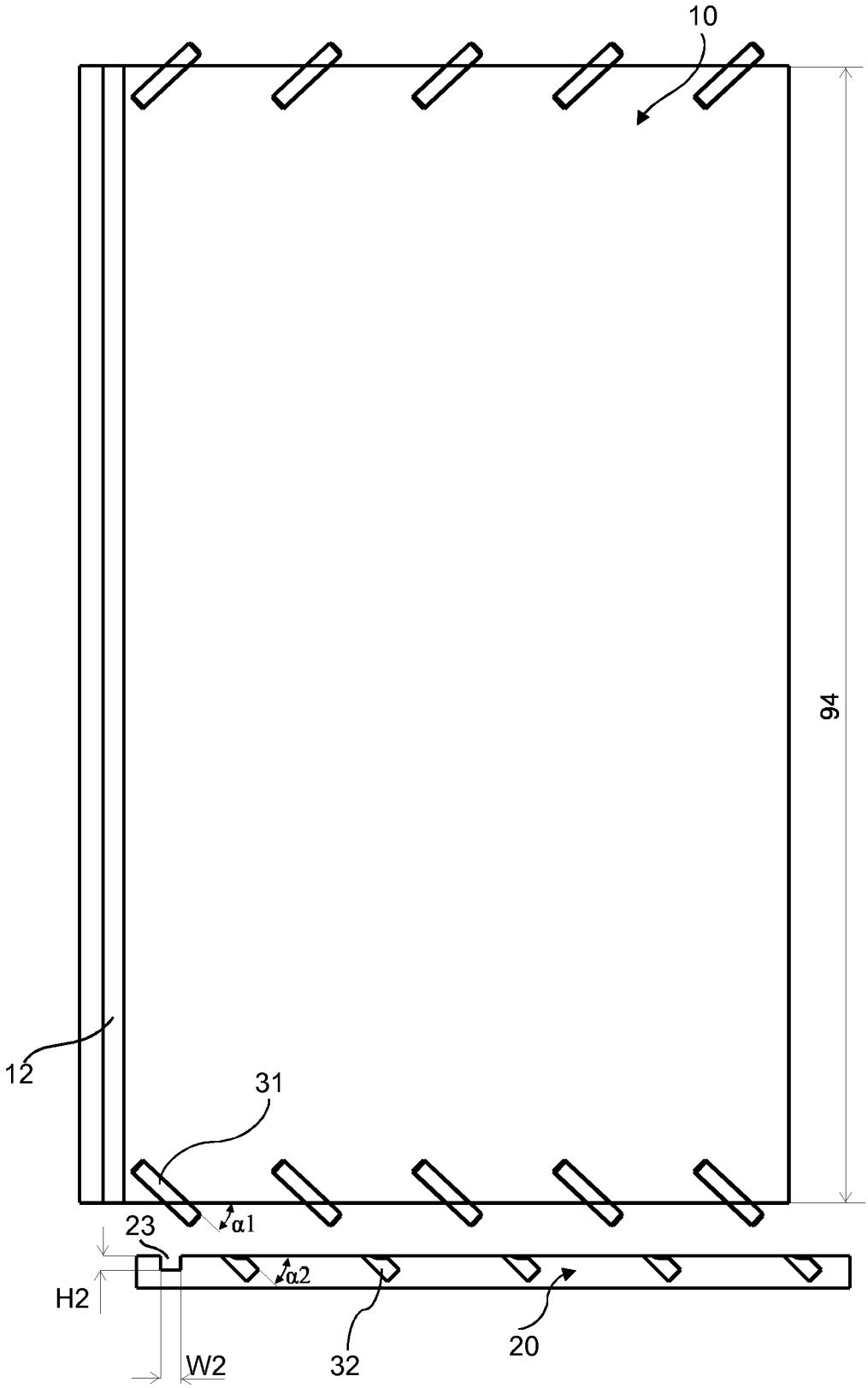
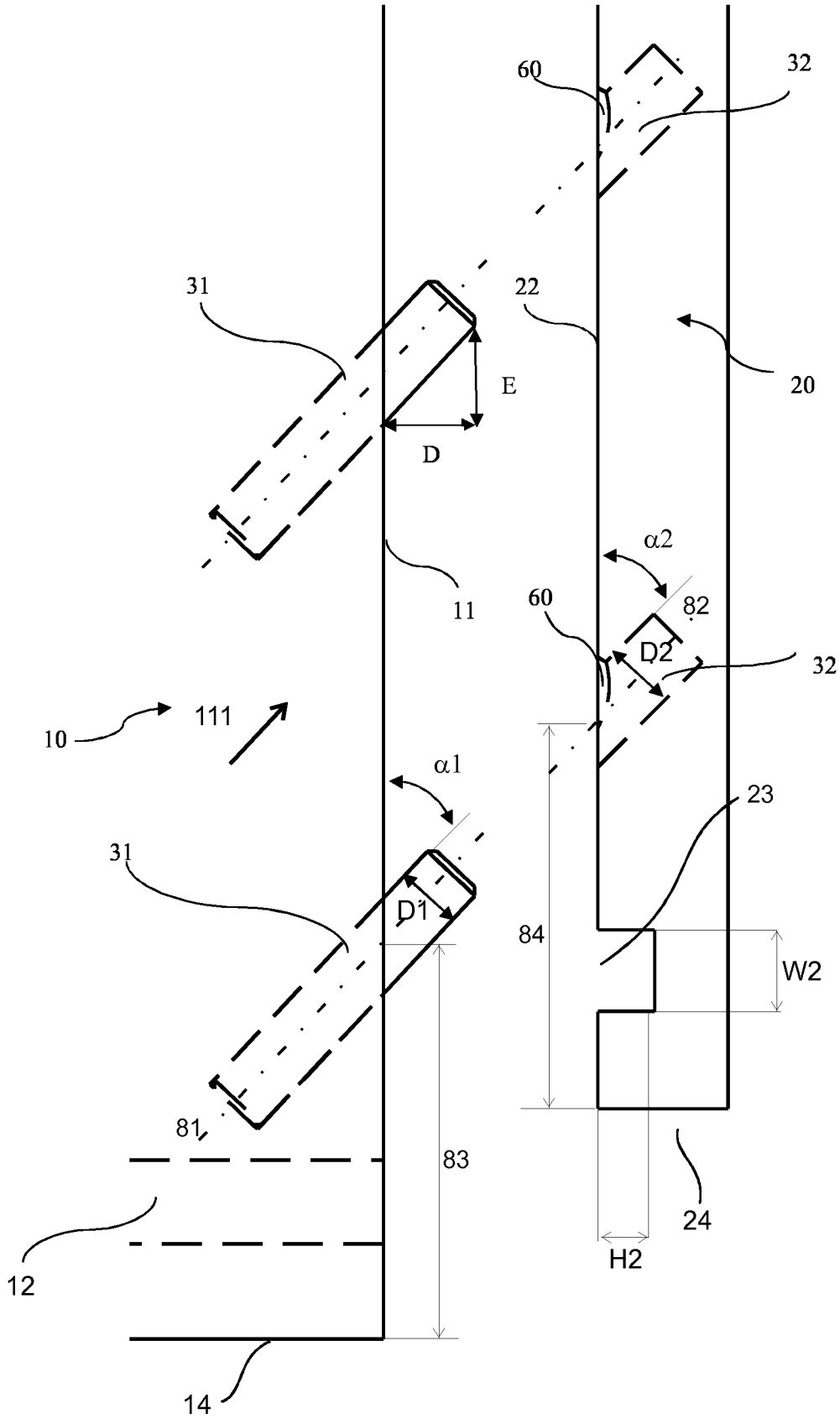


FIG 14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α2
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D2
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α1
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D1
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W2
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12
H2
14

FIG 15

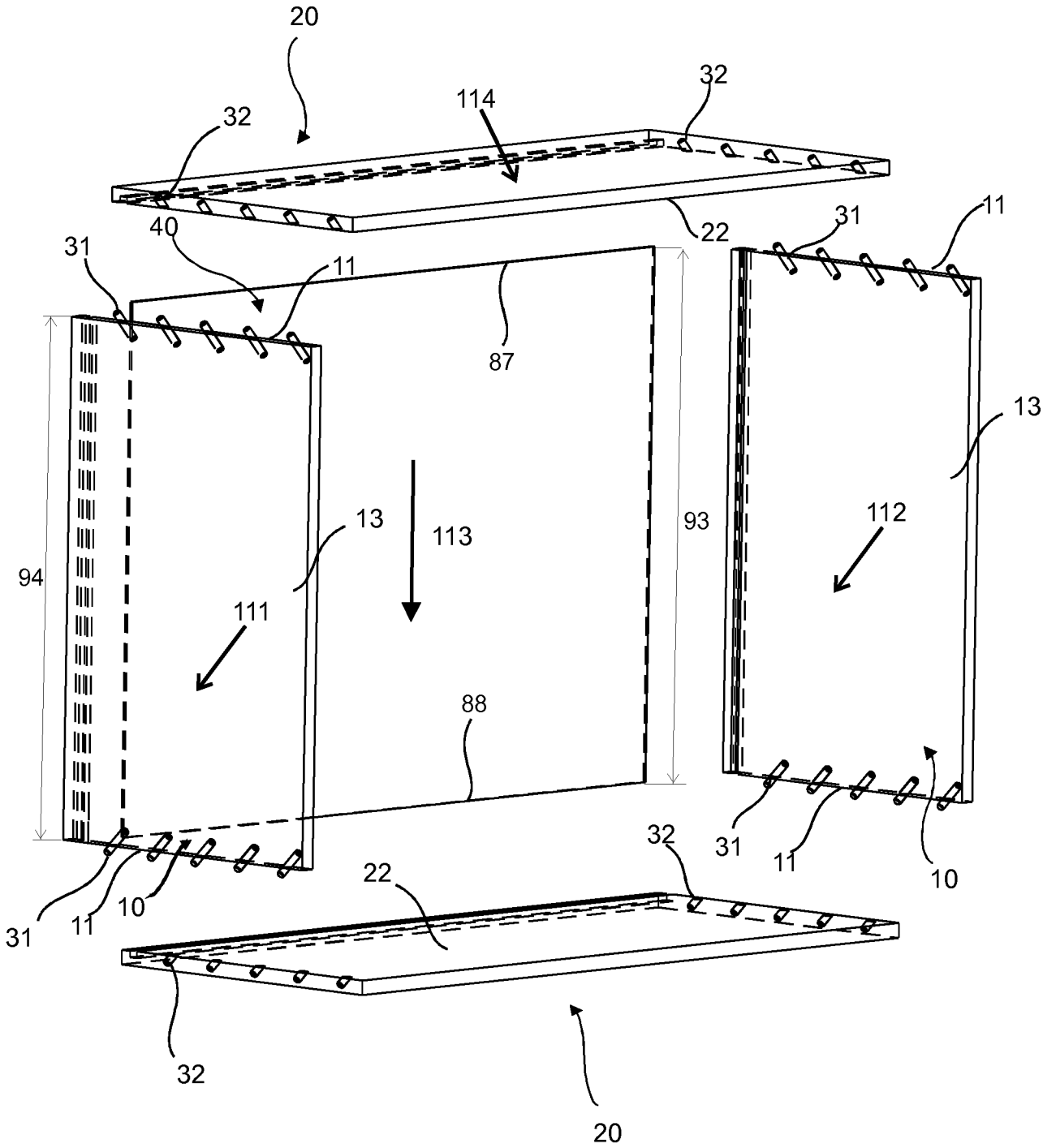
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FIG 16

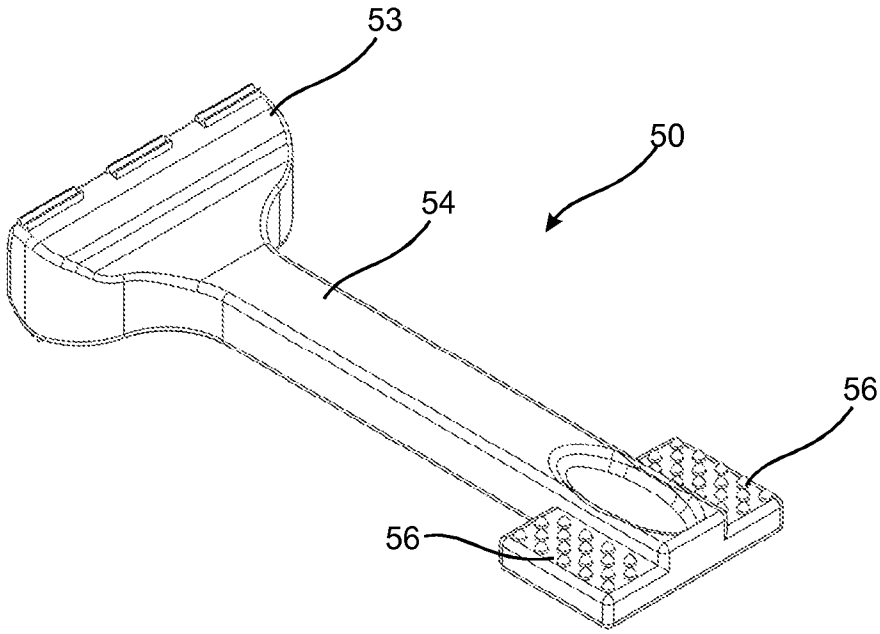


FIG 17

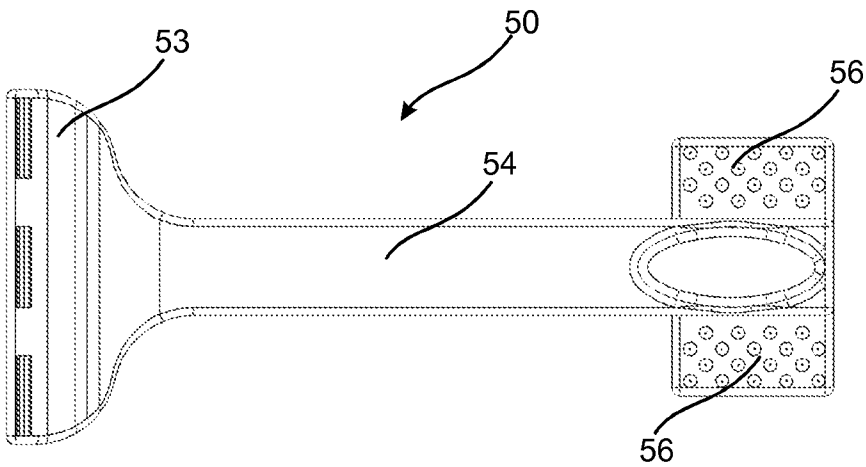


FIG 18

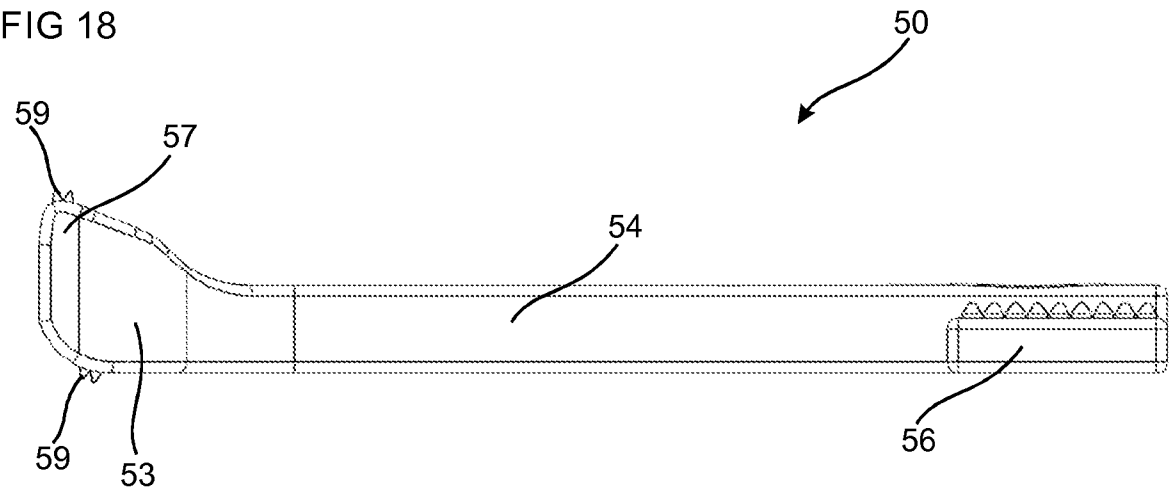


FIG 19A

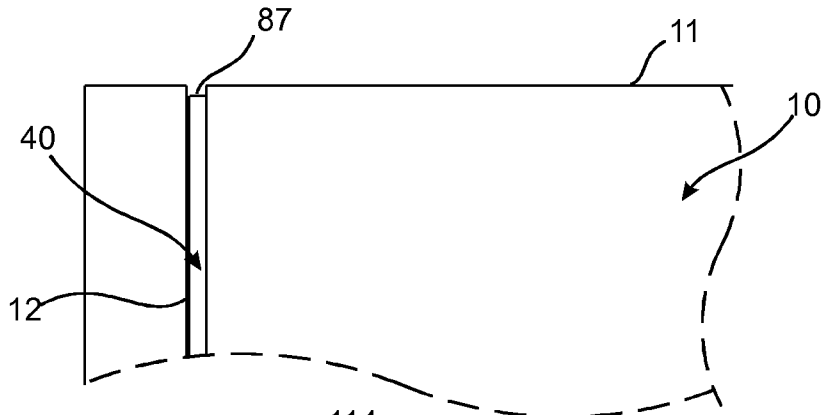


FIG 19B

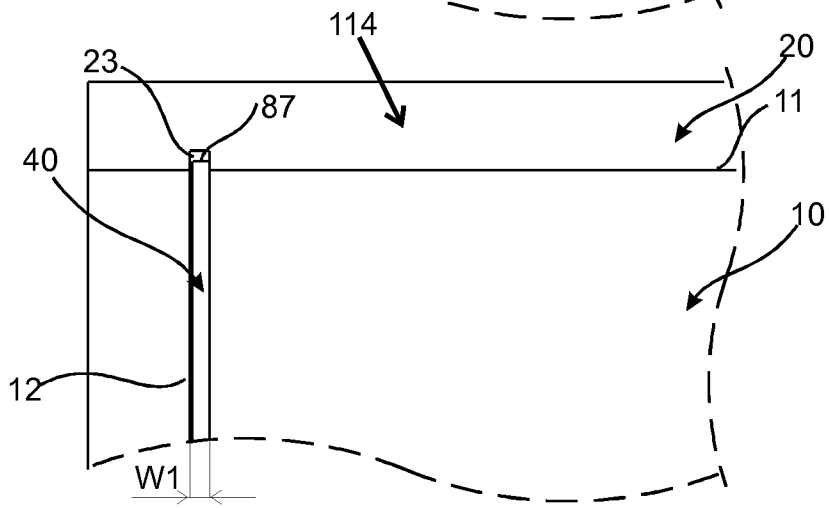


FIG 19C

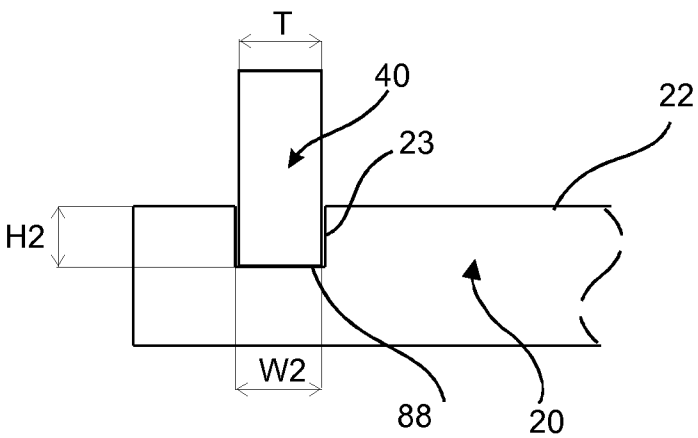
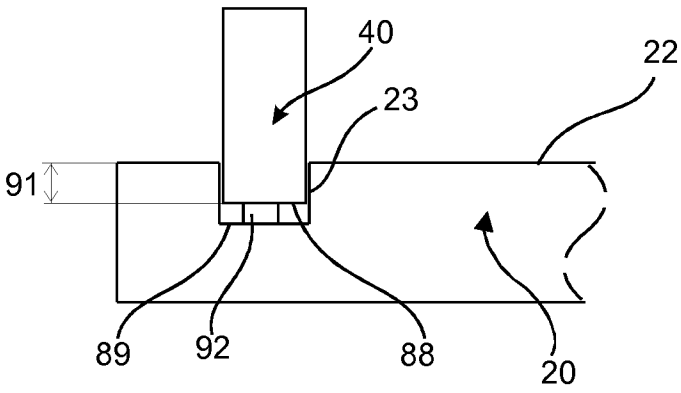


FIG 19D



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/050802

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A47B, F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009136195 A1 (SELF ENERGISING COUPLING COMPA ET AL), 12 November 2009 (2009-11-12); page 3, line 8 - page 3, line 22; page 4, line 32 - page 5, line 4; page 9, line 16 - page 9, line 23; page 15, line 28 - page 16, line 15; figure 21; claims 1,9-10	1-12
	--	
Y	WO 2015105451 A1 (VÄLINGE INNOVATION AB), 16 July 2015 (2015-07-16); page 1, line 5 - page 1, line 8; page 1, line 17 - page 1, line 23; page 2, line 11 - page 2, line 18; page 3, line 5 - page 3, line 22; figures 1-7; claims 1-3,7-9	1-12
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16-10-2019	18-10-2019

Name and mailing address of the ISA/SE	Authorized officer
Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Jennie Svensson Telephone No. + 46 8 782 28 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/050802

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, Y	US 20190191870 A1 (DERELÃV PETER), 27 June 2019 (2019-06-27); paragraphs [0002], [0007]-[0020], [0102]-[0103]; figures; claims 1-26	1-12
	--	
A	DE 202005019986 U1 (FIF MOEBEL VERTRIEBS GMBH), 23 February 2006 (2006-02-23); abstract; figures	1-12
	--	
A	WO 2016187533 A1 (STACK RICHARD), 24 November 2016 (2016-11-24); abstract; figures	1-12
	--	
A	WO 2018080387 A1 (VAELINGE INNOVATION AB), 3 May 2018 (2018-05-03); abstract; figures	1-12
	--	
A	DE 102015103429 A1 (ELSA PROFIL), 15 October 2015 (2015-10-15); abstract; figures	1-12
	--	
A	GB 2315988 A (ULTIMATE SYSTEMS LIMITED), 18 February 1998 (1998-02-18); abstract; figures	1-12
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International application No.
PCT/SE2019/050802

Continuation of: second sheet

International Patent Classification (IPC)

F16B 12/10 (2006.01)
A47B 47/00 (2006.01)
F16B 5/00 (2006.01)
F16B 12/12 (2006.01)
F16B 12/24 (2006.01)
F16B 12/26 (2006.01)

WO	2009136195	A1	12/11/2009	AU	2009245519	A1	12/11/2009
				BR	PI0912242	A2	20/10/2015
				CA	2761364	A1	12/11/2009
				CN	102046043	A	04/05/2011
				EP	2299871	A1	30/03/2011
				RU	2010149176	A	20/06/2012
				US	20110121560	A1	26/05/2011
WO	2015105451	A1	16/07/2015	AU	2014376417	B2	09/08/2018
				CA	2934862	A1	16/07/2015
				CL	2016001695	A1	16/12/2016
				CN	105874223	A	17/08/2016
				CR	20160304	A	25/04/2019
				DK	3092416	T3	06/05/2019
				EA	201691380	A1	30/11/2016
				EP	3501339	A1	26/06/2019
				JP	2017510758	A	13/04/2017
				KR	20160107224	A	13/09/2016
				MX	2016008804	A	08/09/2016
US	20190191870	A1	27/06/2019	WO	2019125292	A1	27/06/2019
DE	202005019986	U1	23/02/2006	NONE			
WO	2016187533	A1	24/11/2016	CA	2986912	A1	24/11/2016
				EP	3298289	A1	28/03/2018
				US	20180249828	A1	06/09/2018
				US	20190053619	A1	21/02/2019
				US	10136726	B2	27/11/2018
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