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(54) Titre : ENSEMBLE DE PANNEAUX POUVANT ETRE DEVERROUILLES VERTICALEMENT, PROCEDE ET DISPOSITIF ASSOCIES  
(54) Title: SET OF PANELS THAT CAN BE VERTICALLY UNLOCKED, A METHOD AND A DEVICE THEREFORE

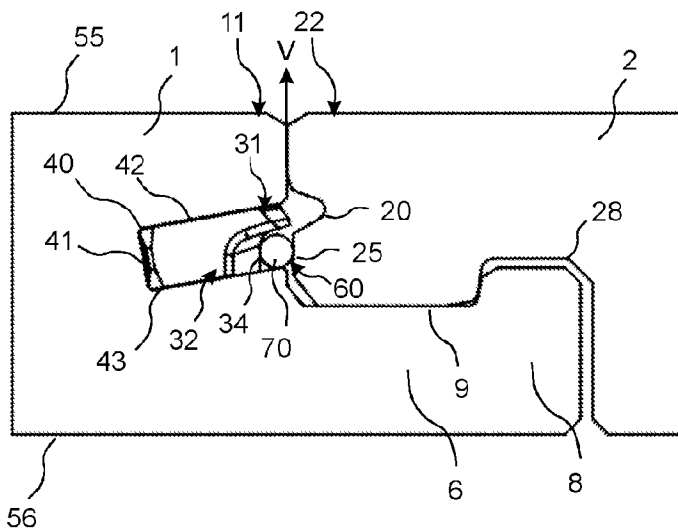


FIG. 3B

(57) **Abrégé/Abstract:**

The present invention relates to set of essentially identical panels (1, 2), such as building panels, provided with a mechanical locking system including a displaceable tongue (30) arranged in a displacement groove (40) having a first opening at a first edge (11) of a first panel (1). The tongue (30) is configured to be displaced in the displacement groove (40) along a displacement axis to attain a locking state wherein a first portion (31) of the tongue (30) cooperates with a first tongue groove (20) having a second opening at a second edge (22) of an adjacent second panel (2), for vertical locking of the first and the second edge (11, 22). A second portion (32) of the tongue (30) is configured to cooperate with the second edge (22) of the adjacent second panel (2) via an elongated element (70) for vertical unlocking of the first and the second edge (11, 22).

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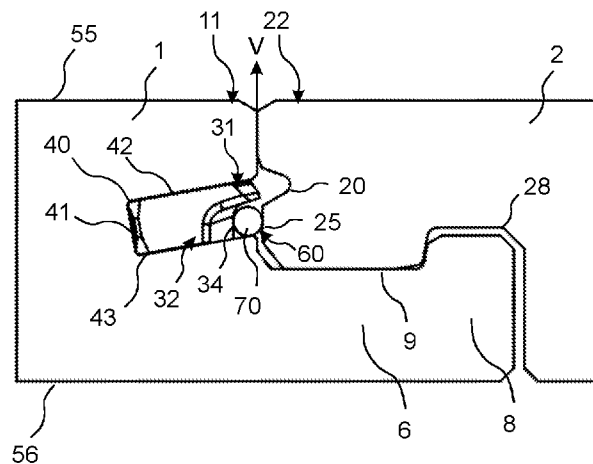


FIG. 3B

(57) **Abstract:** The present invention relates to set of essentially identical panels (1, 2), such as building panels, provided with a mechanical locking system including a displaceable tongue (30) arranged in a displacement groove (40) having a first opening at a first edge (11) of a first panel (1). The tongue (30) is configured to be displaced in the displacement groove (40) along a displacement axis to attain a locking state wherein a first portion (31) of the tongue (30) cooperates with a first tongue groove (20) having a second opening at a second edge (22) of an adjacent second panel (2), for vertical locking of the first and the second edge (11, 22). A second portion (32) of the tongue (30) is configured to cooperate with the second edge (22) of the adjacent second panel (2) via an elongated element (70) for vertical unlocking of the first and the second edge (11, 22).

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## SET OF PANELS THAT CAN BE VERTICALLY UNLOCKED, A METHOD AND A DEVICE THEREFORE

### Field of the invention

Embodiments of the present invention relates to a panels such as a building panels, floorboards, wall panels, ceiling panels, furniture components or the like, which are provided with a mechanical locking system.

5

### Technical background

Building panels provided with a mechanical locking system comprising a displaceable and resilient tongue cooperating with a tongue groove for vertical locking are known and disclosed in, e.g., WO2006/043893 and WO2007/015669.

10 The tongue is a separate part and is made of, e.g., plastic and inserted in a displacement groove at an edge of a panel. The tongue is pushed into the displacement groove during a vertical assembling of the panels and springs back into the tongue groove of an adjacent panel when the panels have reached a locked position.

15 Further known locking system comprises a tongue provided with, e.g., a wedge element. Two adjacent panels' edges are locked by displacing the tongue along the adjacent edges, see e.g., is disclosed in WO2008/004960.

A known system for unlocking panels comprises, and is disclosed in WO2014/209213.

20 Although WO2014/209213 provides a well-functioning system, there is still room for improvements.

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.

25

### Summary of the invention

It is an object of certain embodiments of the present invention to provide an improvement over the above described techniques and known art. Particularly the ease of assembling and disassembling panels may be improved by embodiments of the inventive concept. Also, the inventive concept may bring about advantages in the manufacturing of the panels, in particular in terms of manufacturing tolerances of the edge-portions of the panels, as will become apparent herein.

30

At least some of these and other objects and advantages that will be apparent from the description have been achieved by aspects of the inventive concept. In a first aspect, there is provided a set of essentially identical panels, such as building panels, provided with a mechanical locking system comprising:

35

a displaceable tongue arranged in a displacement groove having a first opening at a first edge of a first panel. The tongue is configured to be displaced in the displacement groove along a displacement axis to attain a locking state wherein a first portion of the tongue cooperates with a first tongue groove having a second opening at a second edge of an adjacent second panel, for vertical locking of the first and the second edge. A second portion of the tongue is configured to cooperate with the second edge of the adjacent second panel via an elongated element for vertical unlocking of the first and the second edge.

The arrangement may bring about an advantage in that the tolerances necessary to achieve a reliable unlocking mechanism are provided by the tongue and the elongated element.

In one embodiment, a first engagement portion of the second portion is configured to engage with the elongated element and delimits an unlocking groove configured to receive the elongated element such as to cause the tongue to be displace along the displacement axis to attain an unlocking state for said vertical unlocking of the first and the second edge.

In a further embodiment, a second engagement portion of the second edge is configured to engage with the elongated element and delimits the unlocking groove, preferably the second engagement portion being provided external the first tongue groove, more preferably externally of and below the first tongue groove.

In a yet further embodiment, the first engagement portion and/or the second engagement portion are planar and extend in parallel or substantially in parallel, preferably side by side and in parallel. It may thereby be achieved that the elongated element is not urged in a transverse direction thereof, such as up or down. Also, linear translation of the tongue may be obtained.

In a still further embodiment, the unlocking groove is configured to attain the unlocking state upon receiving an elongated element having a constant cross-sectional width in the longitudinal direction of the elongated element.

The displacement groove may comprise a bottom surface, an upper surface and a lower surface, preferably the lower surface being parallel to the upper surface and/or parallel to the displacement axis of the tongue.

In one embodiment, the second engagement portion extends below a plane of the lower surface.

A dimension in the direction of a normal of a plane of the lower surface, between the lower surface and the first portion, may correspond at least to a maximum diameter of the elongated element, such as a maximum diameter of a portion of the elongated element intended to be received in the unlocking groove.

In one embodiment, a dimension in the direction of the normal of a plane of the lower surface, between the lower surface and the first portion, corresponds at least to a dimension along the displacement axis between the first engagement portion and an outermost point of the tongue.

5 A dimension in the direction of the normal of the plane of the lower surface, between the said plane and the first portion may correspond at least to a distance, such as a greatest distance, along the displacement axis between the second engagement portion and an outermost point of the tongue in the locking state, preferably the said greatest distance is measured between an outermost point of  
10 the second engagement portion and an outermost point of the tongue.

The dimension in the direction of a normal of a plane of the lower surface, between the lower surface and the first portion may be measured between a point on a lower surface of the first portion of the tongue, said point being aligned, in the direction of the normal of the plane of the lower surface, with an uppermost point  
15 of the elongated element.

In one embodiment, the second portion and the diameter of the elongated element are configured to cooperate such that the tongue is displaced along the displacement axis at least to the extent that an outermost point of the second engagement portion and an outermost point of the first portion do not overlap, preferably to the extent that there is provided a play in a horizontal plane between  
20 the outermost point of the second engagement portion and the outermost point of the first portion.

The second portion may comprise a chamfered edge portion forming a guiding surface configured to guide the elongated element in the transverse direction of the tongue, preferably a chamfered longitudinal edge portion.  
25

In one embodiment, the second edge comprises a chamfered edge portion for guiding said elongated element towards the tongue.

The elongated element may have a rotationally symmetric cross-section in a transverse plane thereof, by an angle of less than 120 degrees, preferably  
30 less than 90 degrees, more preferably being circular.

The locking system may be configured such that in the unlocking state, the elongated element is at least partially arranged in the displacement groove.

An engagement direction may be directed downwards and in parallel with vertical plane formed by an upper part of the first edge and an upper part of the  
35 second edge.

In the locking state, the first portion of the tongue may be configured to protrude from the displacement groove and/or from the first edge, such as an upper part thereof, a distance along the horizontal plane, which may be transverse

the engagement direction, not greater than the distance between a lower surface of the displacement groove and the first portion of the tongue in the direction of a normal of the lower surface of the displacement groove.

5 In one embodiment, the unlocking groove is disposed at least partially between the tongue groove and the lower surface of the displacement groove.

10 In one embodiment, the second engagement portion forms part of a second unlocking surface of the second edge facing a first unlocking surface of the second portion of the tongue. The second unlocking surface may extend in an engagement direction and at least passed a mid-point between the first portion of the tongue and the plane of the lower surface of the displacement groove. The second unlocking surface may extend at least to the plane of the lower surface of the displacement groove. The first and second unlocking surfaces may be planar and/or vertical. Optionally, the first and second unlocking surfaces may each have an extension configured such that the elongated element is not urged to displace  
15 in the engagement direction above or below the displacement groove.

The extension of the second portion in a direction along the normal of the lower surface of the displacement groove may exceed the extension of the first portion in a direction along the said normal.

20 The first engagement portion may be provided at a recess of the tongue. The recess may be provided between the first portion and the lower surface of the displacement groove.

25 The recess may have a concave shape. An advantage of providing the recess with a concave shape may be that the elongated element maintains a desired position in the unlocking groove, such as during insertion of the elongated element in the unlocking groove and/or during disassembling of the first and second panel.

The first opening and the second opening are preferably horizontally open and a vertical height of the first opening is preferably greater than a vertical height the second opening.

30 A maximum height of the displacement groove may be greater than a maximum height of the first tongue groove. The maximum height of the first tongue groove may be in the range of about 20% to about 75% of the maximum height of the displacement groove, preferably in the range of about 20% to about 50% of the maximum height of the displacement groove.

35 The mechanical locking system may comprise a first locking strip, at the first or the second edge, provided with a first locking element configured to cooperate for horizontal locking with a first locking groove at the other of the first or second edge.

The panels may be floorboards, wall panels, ceiling panels, a furniture component or the like.

5 The core of the panels may be a wood-based core, preferably made of MDF, HDF, OSB, WPC, plywood or particleboard. The core may also be a plastic core comprising thermosetting plastic or thermoplastic e.g. vinyl or PVC. The plastic core may comprise fillers. The thinner first tongue groove may, for a panel with a core comprising plywood, be easier to arrange at a favourable position in relation to the layers in the plywood core.

10 The front face, such as an upper surface, of the panels is preferably provided with a decorative layer and the back face is preferably provided with a balancing layer.

15 The edge of the panels, of which parts of the locking system, such as the first and the second locking strip, the first and the second locking element, the first and the second locking groove, the displacement groove and the first and the second tongue groove, may be made, may be comprised of one or more of the above-mentioned core materials.

In a second aspect, the inventive concept pertains to a kit comprising the set according to any one of the embodiments of the first aspect and an elongated element configured for vertical unlocking of the first and second edge.

20 In a third aspect, the inventive concept pertains to a method for vertical unlocking a set of essentially identical panels, such as building panels, provided with a mechanical locking system comprising:

25 a displaceable tongue arranged in a displacement groove having a first opening at a first edge of a first panel, the tongue configured to be displaced in the displacement groove along a displacement axis to attain a locking state wherein a first portion of the tongue is configured to cooperate with a first tongue groove with a second opening at a second edge of an adjacent second panel, for vertical locking of the first and the second edge; and

30 wherein the method comprises: inserting an elongated element in an unlocking groove delimited by a first engagement portion of the second portion of said tongue and further delimited by a second engagement portion of the second edge of the second panel disposed externally the tongue groove, to thereby cause the tongue to be displaced along the displacement axis to attain an unlocking state for vertical unlocking of the first and the second edge.

35 In a fourth aspect, the inventive concept pertains to a device 69 for unlocking a mechanical locking system of building panels assembled by means of the mechanical locking system. The mechanical locking system configured for horizontal and vertical locking of adjacent building panels. The locking system

comprising at a first edge of a first building a displaceable locking tongue configured to displace in a displacement groove provided in the first edge of the first building panel. The locking tongue being configured to displace between a locking position and an unlocking position. In the locking position, the locking tongue is configured in a protruding position wherein protruding from the displacement groove for cooperating with a tongue groove provided in an adjacent edge of a second adjacent building panel. In the unlocking position, the locking tongue is configured in a retracted position. The unlocking device comprises an elongated element (70) and a positioning element (71). The positioning element is configured to be received in the displacement groove.

Further embodiments and advantages being described in following description and the appended claims.

### **Brief description of the drawings**

The present invention will by way of example be described in more detail with reference to the appended schematic drawings, which shows embodiments of the present invention.

FIG. 1A-1B show cross sections of known locking systems with a separate and displaceable tongue.

FIGS. 2A-2B show a perspective view of panels according to embodiments of the inventive concept.

FIGS. 3A-3B show schematic side-views of panels according to an embodiment of the inventive concept.

FIGS. 3C shows a schematic cross-sectional view of panels according to an embodiment of the inventive concept.

FIGS. 4A-4C show cross-sectional views of the panels of FIG.3A-B.

FIG. 5A shows a perspective view of a displaceable tongue according to an embodiment of the inventive concept.

FIG. 5B shows a top view of details of a displaceable tongue of FIG. 5A.

FIG. 6 shows a schematic view of a short edge of a panel according to an embodiment of the inventive concept.

FIG. 7A-7B shows a schematic illustration of further embodiments of the inventive concept.

FIGS 8A-8C show a schematic illustration of the embodiments of FIG.7.

FIG. 9A shows a perspective view of a device for disassembling assembled building panels, according to an embodiment of the inventive concept.

FIG. 9B shows a side view of a positioning element according to an embodiment of the inventive concept.

FIG. 9C shows another side view of the embodiment of FIG.9B.

FIG. 9D shows a perspective view of the embodiment of FIG.9B.

FIG. 10 shows a cross view of a positioning element arranged in a displacement groove of a building panel, according to an embodiment of the inventive concept.

FIGS.11A-11C schematically illustrate a method of disassembling assembled building panels, according to an embodiment of the inventive concept, wherein: FIG. 11A shows two assembled building panels and the device of FIG.9A arranged in a displacement groove of one of the building panels; FIG. 11B shows at least a portion of the elongated element of the device of FIG.9A having been inserted in an unlocking groove shown in FIG.11A; FIG.11C shows a first and second building panel being disassembled by means of a vertical displacement of a second edge of a second panel relative a first edge of a first panel.

### Detailed description

A known mechanical locking system for building panels, which comprises a displaceable tongue 30' cooperating with a first tongue groove 20' for vertical locking of a first edge of a first panel 1' with a second edge of a second panel 2' is shown in FIGS 1A-1B. The tongue 30' is a separate part and is made of, e.g., plastic, and inserted in a displacement groove 40' at the first edge of the first panel 1'. The tongue 30' is pushed into a displacement groove 40' during a vertical assembling of the first and the second edges of the panels 1', 2' and springs back into a first tongue groove 20' at the second edge of the second panel 2' when the panels have reached a locked position. A third and a fourth edge of the panels are provided with a locking system, which enables assembling to an adjacent panel (not shown) by an angling movement, to obtain a simultaneous assembling of the first and the second edges and the third and the fourth edges.

Embodiments of the inventive concept are shown in FIGS. 2A-2B, 3A-3C, 4A-4B, 5A-5B, 6, 7A-7B, 8A-8C, 9A-9D, 10, and 11A-11C. A locking system is formed at a first edge 11 of a first panel 1, and a second edge 22 of an adjacent second panel 2 for locking the first 11 and the second edges 22 in a vertical and/or horizontal direction.

FIGS 2A-2B show an illustration of an embodiment of the inventive concept comprising a mechanical locking system comprising a dedicated unlocking groove 60 configured to receive an elongated element 70 for vertical unlocking of the first and second edges 11, 22.

FIGS 3A-3B show side views of embodiments of the displaceable tongue 30 during unlocking of a first and a second panel 1, 2.

An upper part of the first edge 11 and an upper part of the second edge 22 may form a vertical plane V.

5 The second panel 2 with the first tongue groove 20 is lowered in relation to the second panel 2 with the displaceable tongue 30, which is pushed into a displacement groove 40 by the lowered panel 2. The displaceable tongue 30 springs back, and into the first tongue groove 20, when the panels have reached an assembled position, and locks the first 1 and the second 2 panels vertically.

10 An embodiment of the locking system enables assembling of panels at the adjacent edges by a vertical movement. The locking system is preferably formed by mechanical cutting, such as milling, drilling and/or sawing, of the edges of the panels and provided with a displaceable tongue 30, preferably made of a polymer-based material such as thermoplastic, alternatively the tongue 30 may be made  
15 of metal. The displaceable tongue 30 may be bendable and may be provided with protruding flexible parts, such as biasing feathering means. Obtaining small satisfactory tolerances in the forming of the locking system, in particular the machining of the panels, are typically costly and time consuming. Embodiments of the present disclosure may facilitate that manufacturing tolerances of the  
20 locking system may be essentially provided by the tongue 30 and the deactivating elongated element 70, such as a stick. The stick may be made of a stiff and bendable material, such as metal. The tongue 30 and the elongated element 70 may thus be manufactured such that the elongated element 70 may cause displacement of the tongue 30 in the unlocking direction to the extent that play  $dH$   
25 (See FIG.4B) in the direction of the plane H, such as a horizontal plane, is provided between the first portion 31 of the tongue 30 and a second engagement portion 25 independent of the tolerances of the first 11 and second edge 22, for vertical unlocking of the first and second edges 11, 22. In some embodiments,  $dH$  may be zero. Thereby, embodiments of the inventive concept may provide for  
30 improvements in terms of cost-efficiency since it may be less costly to manufacture the tongue 30 and the deactivating elongated element 70 with high precision.

The displaceable tongue 30 is arranged in the displacement groove 40 at the first edge 11 of the first panel 1. The tongue 30 cooperates with a first tongue groove 20, which is formed at the second edge 22 of a second panel 2, for vertical  
35 locking of the panel 1, 2. A corresponding configuration may be provided at a first edge 21 of the second panel 2. A first locking strip 6 with a vertically protruding first locking element 8 is formed in the first edge 11 of the first panel 1. The locking

element 8 cooperates with a first locking groove 28, formed in the second edge 22 of the second panel 2, for horizontal locking of the panels 1, 2.

The tongue 30 may be displaceable in the displacement groove 40 along a displacement axis Ax corresponding to a locking direction to attain a locking state wherein a first portion 31 of the tongue 30 is configured to cooperate with the first tongue groove 20 having an opening at a second edge 22 of an adjacent panel, such as second panel 2, for vertical locking of the first edge 11 and the second edge 22.

The tongue 30 may be displaced in the displacement groove 40, in particular, a first portion 31 and a second portion 32 of the tongue 30 are configured to be displaced inside the displacement groove 40. The first 31 and second 32 portions of the tongue 30 may form an integral body. The tongue 30 may be linearly translated in the displacement groove 40. Linear translation may include a minor amount of non-linear translation, such that the translation is primarily linear.

As shown for instance in FIG.3A-3B and 4A-4B, the displacement groove 40 comprises a bottom surface 41, an upper surface 42 which may be disposed adjacent the first portion 31 of the tongue 30, and a lower surface 43 which may be disposed adjacent the second portion 32 of the tongue 30. Plane Px of the lower surface 43 may be parallel to a displacement axis Ax. Consequently, the tongue 30 may be displaced along the displacement axis Ax relative to and/or against the lower surface 43, optionally also the upper surface 42. The tongue 30 may be displaced, typically linearly translated, along the displacement axis Ax in a locking direction to attain the locking state and in an unlocking direction to attain an unlocking state, as will be explained herein. Typically, the tongue 30 at least to some extent rests on the bottom surface 43. Accordingly, the direction of the normal Ny of the plane Px of the bottom surface 43 thus extends transverse or with a right-angle relative the plane Px in a direction towards the upper surface 42 of the displacement groove 40.

The first portion 31 may comprise or constitute an upper and outer portion of the tongue 30 and the second portion 32 may comprise or constitute a lower and outer portion of the tongue 30. In this context, "upper" may refer to adjacent the upper surface 42 of the displacement groove 40, correspondingly "lower" may refer to adjacent the lower surface 43 of the displacement groove 40 and "outer" may refer to opposite the bottom surface 41 of the displacement groove 40.

As shown in FIGS 3A-4B, the displacement axis Ax, and thus also the displacement groove 40, may be inclined an angle  $\phi$  relative a horizontal plane H. Typically, the plane of the first panel 1 and/or an upper 55 surface and/or a lower

56 surface of the panel may be parallel the horizontal plane H. The upper surface 55 of the panel 1, 2 may be a visible surface. The displacement groove 40 may be inclined downwards, such as in the engagement direction E, as the displacement groove 40 extends into the first panel 1, as shown in FIGS 3A-4B.

5 FIG.3A shows the tongue 30 in the locking state. In the locking state, at least the first portion 31 of the tongue 30 protrudes outside the displacement groove 40 and at least partially into the tongue groove 20. The first portion 31 may comprise a protruding tongue nose of the displaceable tongue 30.

10 The second portion 32 may or may not protrude outside the displacement groove 40, typically the second portion 32 does not or does not substantially protrude from the displacement groove 40 in the locking state and/or the unlocking state.

The first portion 31 may have an extension along the displacement axis Ax exceeding that of the second portion 32. The second portion 32 may have an extension in the normal direction Ny exceeding that of the first portion 31.

15 The tongue 30 further comprises a recess 33, which may recess inwards underneath the tongue nose of the tongue 30 to form a concavity extending in the longitudinal direction of the tongue 30, such as the longest extension of the tongue 30. It follows that there may be a gradual curved transition between the first portion 31 and the second portion 32 as illustrated in FIGS 3A-B which curve may have a radius of curvature configured to substantially correspond to a radius of the elongated element 70. The recess 33 may at least partially surround the unlocking groove 60.

25 The second portion 32 of the tongue 30 of the first panel 1, provided adjacent the first portion 31, may be configured to cooperate with an edge portion of an adjacent second panel 2 for vertical unlocking of the first 1 and second 2 panels. The second portion 32 of the tongue 30 may be provided above or below the protruding tongue nose, preferably below the first portion 31 in the engagement direction, such as downwards in FIGS 3A-3B, 4A-4B. More in particular, the second portion 32 is configured to cooperate with a portion of the second edge 22 via an elongated element 70 which may abut the second portion 32 and the second edge 22 simultaneously. The second portion 32 comprises a first engagement portion 34 and the second edge 22 comprises a second engagement portion 25 for engaging the elongated element 70.

35 The mechanical locking system comprises an unlocking groove 60 for vertical unlocking of the first edge 11 of the first panel 1 and the second edge 22 of an adjacent panel, such as the second panel 2.

As shown in FIGS 2A-B, the first edge 11 and the second edge 12 of the first panel 1 may be the short edges of a panel, such as the first panel 1, and the third edge 13 and the fourth edge 14 may be the long edges of a panel, such as the first panel 1. This may apply mutatis mutandis for an adjacent panel, such as the second panel 2 having respective first 21, second 22, third 23, and fourth edges 24.

The unlocking groove 60 is delimited by surfaces of elements, such as two, three or four surfaces, provided by portions of one or more of the first portion 31 of the tongue 30, the second portion 32 of the tongue 30, the second edge 22 of the second panel 2 and the lower surface 43 of the displacement groove 40.

Thus, the second portion 32, the second edge 22 and the lower surface 43 of the displacement groove 40 may form the unlocking groove 60 configured to receive the elongated element 70.

Typically, the unlocking groove 60 is delimited in the normal direction  $N_y$  by means of the first portion 31 of the tongue 30, such as the protruding tongue nose, and further delimited by the second portion 32 of the tongue 30 and by a portion of the second edge 22 of the second panel 2.

The unlocking groove 60 is configured to receive an elongated element 70 such that the tongue 30 is displaced along the displacement axis in an unlocking direction, to attain an unlocking state as shown in FIG.3B.

Upon insertion of the elongated element 70 in the unlocking groove 60, the tongue 30 is thus caused to displace or linearly translate inside the displacement groove 40 in response to the insertion, i.e. under the action of the elongated element 70 engaging the tongue 30 and urging the tongue 30 to displace along the displacement direction  $A_x$ .

The second portion 32 of the tongue 30 comprises a first engagement portion 34 for direct engaging or cooperating with the elongated element 70, such as with an outer circumference of the elongated element 70.

The second edge 22 of the second panel 2 may comprise a second engagement portion 25 (See FIG.4A) provided exterior the tongue groove 20, preferably below the tongue groove 20. The second engagement portion 25 may provide for direct engaging or contact with the elongated element 70, such as a circumference of the elongated element 70. The first edge 11 of the first panel 1 may comprise a first engagement portion 34. The first engagement portion 34 may provide for direct engaging or contact with the elongated element 70, such as a circumference of the elongated element 70.

The first engagement portion 34 and/or the second engagement portion 25 may be planar and/or may extend vertically. The first engagement portion 34 and

the second engagement portion 25 may extend side by side and/or in parallel. Preferably, the first engagement portion 34 and the second engagement portion 25 are planar and extends side by side in parallel.

During a vertical assembling of the panels, the second engagement portion  
5 25 may be configured to engage with the first portion 31 of the tongue 30 such as to push back the tongue 30 in an unlocking direction along the displacement axis Ax into the displacement groove 40.

The unlocking groove 60 may be configured such that the extension thereof in the direction Ny of the normal corresponds to at least the distance between the  
10 first engagement portion 34 and the second engagement portion 25 in the unlocking position as shown in FIG. 4B.

Typically, in the locking state, the unlocking groove 60 is configured such that the first engagement portion 34 and the second engagement portion 25 are provided to have an extension above the lower surface 43 of the displacement  
15 groove 40. For example, the first engagement portion 34 and the second engagement portion 25 are provided to have an extension at least at a distance above the lower surface 43 of the displacement groove 40 substantially corresponding to half the distance between the first and second engagement portions 34, 25 in the unlocking state or for example the first engagement portion  
20 34 and the second engagement portion 25 are provided to have an extension at least at a distance above the lower surface 43 of the displacement groove 40 substantially corresponding to half the distance between the plane Px and the first portion 31 of the tongue 30 in the Ny direction inside the unlocking groove 60. The second engagement portion 25 may have an extension below a first opening of  
25 the displacement groove 40 at the first edge 11.

The second portion 32 of the tongue 30 may be disposed exterior the tongue groove 20 in the locking state and/or unlocking state.

In particular, the first engagement portion 34 may be disposed exterior the tongue groove 20 in the locking state and/or in the unlocking state.

The unlocking groove 60 may be configured such that the tongue 30 is  
30 displaced in an unlocking direction to attain an unlocking state upon receiving the elongated element 70 which is preferably rotational symmetric, such as rotational symmetric under an angle of 120, 90, 72, 60, 45, 36, 30 degrees, preferably rotational symmetric under an angle of 120, more preferably under 90, most  
35 preferred being circular.

This arrangement brings about several advantageous effects, including that the elongated element 70 can be inserted in the unlocking groove 60 with reduced

frictional resistance which may otherwise cause bending of the elongated element 70.

Further, in the unlocking state when the respective first and second engagement portions 34, 25 are engaged with engagement element 70, the arrangement provides the function of a needle bearing and thus functions as a needle bearing as the second panel 2 is displaced in a direction opposite the engagement direction E, such as a vertical direction, causing the elongated element 70 to rotate or slide against the first engagement portion 34 and/or the second engagement portion 25.

It should be appreciated that as the angle of rotational symmetry decreases the effective contact surfaces, i.e. frictional surfaces, between the elongated element 70 and the respective engagement portions 34, 25 are reduced. Accordingly, in a preferred embodiment the elongated element 70 has a circular cross section in a transverse direction thereof, such as the shortest extension. In this embodiment, the circumference of the elongated element 70 may be tangent with the first and second engagement portions 34, 25 only along a respective incremental contact surface of the first and second engagement portions 34, 25. In other words, the circumference of the elongated element 70 and surfaces of the locking groove 60, i.a. the lower surface 43, the first and second unlocking surfaces 34', 25' of the locking system may substantially not be parallel in a transverse T plane of tongue 30, with exception for the contact surfaces.

Embodiments of the disclosed inventive concept enable a deactivating elongated element 70, such as a round stick, or substantially round stick to be used for unlocking the first and second edge 11, 22.

Thus, embodiments of the disclosed inventive concept may provide for synergistic effects; by providing the unlocking groove 60 exterior the tongue groove 20, the use of a deactivating element which substantially round or round, preferably circular, to be used for unlocking the first and second edge 11, 22 is facilitated. The round shape of the deactivating elongated element 70 may substantially reduce frictional forces associated with disassembling of the panels, such as the first and second panels 1, 2 and thus may facilitate easy vertical disassembling.

The longitudinal length of the elongated element 70, such as the longest extension thereof, may correspond to at least a short side of the panel 1 and/or the length of the first edge 11 and/or in some embodiments a length sufficient to cause the entire length of the tongue 30 to attain the unlocking state, such as if the first edge 11 corresponds to a long side of a panel configured to form part of a herringbone-pattern floating floor, as will be described herein. In such case, the

tongue 30 may optionally extend only in a portion of the displacement groove 40 of the long side of such panel (see FIGS 7A-7B and 8A-8C).

The first engagement portion 34 and second engagement portion 25 may abut or may be arranged flush with each other or may be spaced apart by a distance  $\Delta x$  in the locking state, as shown e.g. in FIG. 4A.

Referring to FIGS 4A-4B, the locking system of FIGS 3A-3B are shown more in detail. FIG. 4A illustrates the panels in locking state and FIG. 4B the unlocking state. As derivable from FIGS 4A-4B, the displacement groove 40 comprises a bottom surface 41, an upper surface 42 and a lower surface 43, the lower surface 43 being parallel a displacement axis  $Ax$  of the tongue 30. Thus, the tongue 30 may displace and/or linearly translate parallel the lower surface 43. The displacement axis  $Ax$  may be parallel the plane  $Px$  of the lower surface 43. As the tongue displaces in the locking direction and the unlocking direction respectively, the tongue 30 may be displaced along the displacement axis  $Ax$ . The tongue 30 may be displaced against or along the lower surface 43 and/or upper surface 42 of the displacement groove 40.

A normal  $Ny$  of the plane  $Px$  extends in a direction transverse the plane  $Px$  as shown in FIGS 4A-4B.

In the locking state, the first portion 31 may be wedged between the upper surface 42 of the displacement groove 40 and a lower surface of the tongue groove 20, as shown in FIG.4A.

An upper surface and/or lower surface of the tongue 30 may be substantially planar, or planar.

The first portion 31 of the tongue 30 may extend essentially along the displacement axis  $Ax$ , and may optionally have a substantially constant thickness in the direction of the normal  $Ny$ .

As schematically shown in FIG.4B, a dimension  $Dy$  in the direction of the normal  $Ny$  may be measured between the plane  $Px$  and the first portion 31, such as an underside of the protruding tongue nose.

$Dy$  may be measured in the unlocking groove 60 in unlocking state.

$Dy$  may correspond at least to a maximum diameter  $Dmax$  of the elongated element 70.

The dimension  $Dy$  in the direction of the normal  $Ny$  of the plane  $Px$ , between the lower surface 43 and the first portion 31, may correspond at least to a dimension  $Dx$  along the displacement axis  $Ax$  between the first engagement portion 34 and an outermost point 31a of the tongue 30.

As derivable from FIG. 4A illustrating the locking state, the dimension along the displacement axis  $Ax$  between the outermost tip point 31a of the tongue

30 and the outermost point of the second engagement portion 25, is denoted  $D_{ax}$ . By the outermost tip point 31a of the tongue 30 is meant in a direction away from the first edge 11 in a direction along the horizontal plane H. By outermost point of the second engagement portion 25 is meant in a direction away from the second edge 22 in a direction along the horizontal plane H. It follows that in order for the tongue 30 to obtain an unlocking state, i.e. such that the second engagement portion 25 and the tip point 31a do not overlap in a direction along the engagement direction E, the tongue 30 should to displace at least a distance  $D_{ax}$  in the unlocking direction along the displacement axis  $A_x$ . When the second engagement portion 25 and the tip point 31a do not overlap, the tongue is in the unlocking position and the second edge 22 of the second panel 2 may be disassembled from the first panel 1 by means of a displacement of the second edge in a direction being opposite the engagement direction E, i.e. a vertical displacement. This means the first edge 11 and the second edge 22 may essentially not displace horizontally relative each other during the vertical displacement, as shown in FIG.2B, in other words, the horizontal relationships between features of the first edge 11 and the second edge 22 may not change during the disassembling. Therefore, starting from the locking state shown in FIGS 3A and 4A, for unlocking the mechanical locking system it may suffice to displace the locking tongue 30 such that an outermost point of second engagement portion 25 and the outermost tip point 31a do not overlap in a direction along the engagement direction E when the first and second panel 1, 2 are adjacent as shown in FIGS 3A and 4A.

In some embodiments, there may be no play in the horizontal plane H, between the second engagement portion 25 and the tip point 31a. As derivable from FIG.4A, dimension  $D_{ax}$  is indicated as being measured from approximately half the extent of the second engagement portion 25 in order to provide play  $d_H$ , however if the tongue is to be displaced such that there is zero play,  $D_{ax}$  may be measured as the shortest distance between along the displacement axis  $A_x$  between the outermost tip point 31a of the tongue 30 and the second engagement portion 25, as illustrated in FIG.4C.

Consequently, a minimum cross-sectional diameter  $D_{min}$  of the elongated element 70 may displace the tongue 30 at least the distance  $D_{ax}$  along the displacement axis  $A_x$ , i.e. in the unlocking direction.

Accordingly, the unlocking groove 60 may be configured such that the tongue 30 is displaced in the unlocking direction a distance  $D_{ax}$  in response to receiving an elongated element 70 of diameter  $D_i$ , which may be a constant cross-sectional diameter, such that the tongue 30 assumes the unlocking state.

In particular, in the locking state, the distance  $\Delta x$  between the first engagement portion 34 and the second engagement portion 25 may be configured such that the tongue 30 is displaced in the unlocking direction along the displacement axis Ax a distance Dax in response to receiving an elongated element 70 of diameter Di, which may be constant cross-sectional diameter. The distance  $\Delta x$  may be measured along the plane H.

More in particular, the locking groove 60 may be configured such that when the distance between the first engagement portion 34 and the second engagement portion 25 essentially equals the diameter Di of the elongated element 70, the tongue has been caused displace the distance Dax along the displacement axis Ax in response to the unlocking groove 60 receiving of the elongated element 70.

In the locking state, a dimension along the displacement axis Ax between the first engagement portion 34 and an outermost point of the second engagement portion 25 may be greater than Dx.

The displacement groove 40 may be inclined by an angle  $\varphi$  relative the plane of the panels, such as the first panel 1 as shown in FIGS 4A-4B. Thus, the displacement axis Ax and the plane of the lower surface Px are inclined in respect of the plane H, such as a horizontal plane. An upper surface 55 of the panel 1 and/or a lower surface 56 of the panel 1 may be parallel the plane H. This entails that as the tongue 30 translates along the displacement axis Ax there may be a certain ratio between downwards movement and sideways movement of the tongue 30. For example, the tongue may be displaced the distance Dax in the displacement direction Ax; the sideways movement, typically horizontal, of the tongue 30 then corresponds to  $Dax \cdot \cos(\varphi)$ , and the downwards movement corresponds to the  $Dax \cdot \sin(\varphi)$ . It follows that Di is preferably equal to or greater than the sum of  $\Delta x$  and  $Dax \cdot \cos(\varphi)$ , optionally greater by a margin corresponding to the dimension of the play dH. In a non-limiting example,  $\varphi$  may be between  $5^\circ$  and  $45^\circ$ , such as between  $10^\circ$  and  $30^\circ$ , such as about  $10^\circ$ ,  $20^\circ$  or  $30^\circ$ .

In the locking state, the first portion 31 of the tongue 30 may be configured to protrude from the displacement groove 40 and/or from the first edge 11 a distance along a direction in the H plane equal to or less than the cross-sectional width Di of the elongated element 70.

In the locking state, the first portion 31 of the tongue 30, such as the outermost point 31a, may be configured to protrude from the displacement groove 40 and/or from the first edge 11 a distance along a direction in the H plane equal

to or less than the distance between a lower surface 43 of the displacement groove 40 and the first portion 31 in the direction of the normal  $N_y$ .

The unlocking groove 60 may be disposed at least partially between the tongue groove 20 and a lower surface 43 of the displacement groove 40.

5 The second engagement portion 25 may extend at least at a mid-point between the first portion 31 of the tongue 30 and the plane  $P_x$  of the lower surface 43 of the displacement groove 40, preferably the second engagement portion 25 extends at least to the plane  $P_x$  of the lower surface 43.

10 The extension of the second engagement portion 25 in the normal direction  $N_y$  may be greater than the corresponding extension of the first engagement portion 34.

The second engagement portion 25 may extend along or inside the vertical plane  $V$ .

15 The second engagement portion 25 may be stationary during displacement of the tongue 30 along the displacement axis  $A_x$  in the unlocking direction.

The unlocking groove 60 may be configured such that insertion of the elongated element 70 therein urges the unlocking groove 60 to expand by means applying force on the first engagement portion 34 in the unlocking direction.

20 The first portion 31 of the tongue 30 may comprise an outer and upper portion of the tongue 30 facing in a direction towards the upper surface 42 of the displacement groove 40. The second portion 32 of the tongue 30 may comprise an outer and preferably lower portion of the tongue 30 facing in a direction towards the lower surface 43 of displacement groove 40.

25 The elongated element 70 may have a longitudinal length corresponding to at least the length of the first 11 and/or second edge 22, such as a respective short edge of the first 1 and/or second panel 2. Alternatively, the elongated element 70 may have a longitudinal length corresponding to at least the length of the tongue 30 in the longitudinal direction  $L$  thereof, as indicated in FIG.5A.

30 The locking groove 60 may form a needle bearing with the elongated element 70 in the unlocking state and may thus act as a needle bearing during disassembling of the panels in a direction opposite the engagement direction, typically vertical and upwards movement of the second panel 2 as shown in FIGS 2A-B.

35 The diameter of the elongated element 70 may be in the range of 0.5 to 3 mm, such as 0.8 to 1.5 mm, preferably about 1.1 mm.

The thickness of the panels 10, 20 may be in the range of about 3 mm to about 10 mm, and preferably in the range of about 4 mm to about 8 mm.

The mechanical locking system comprises a first locking strip 6, at the first or the second edge 11, 22, provided with a first locking element 8 configured to cooperate for horizontal locking with a first locking groove 28 at the other of the first 11 or second edge 22.

5 FIG.3C shows a cross section of a third edge 13 of the first panel 1 and a fourth edge 304 of a third panel 3. The mechanical locking system at the third 13 and the fourth edge 304 comprises a second tongue 29 at the fourth edge 304 configured to cooperate for vertical locking with a second tongue groove 12 at the third edge 13. The third edge 13 is provided with a protruding second locking strip 10 16 with a second locking element 18 configured to cooperate for horizontal locking with a second locking groove 26 at the fourth edge 304. A second upper surface 19 of the second locking strip 16 is in contact with a lower surface of the second tongue 29 for locking in the vertical direction. The shown mechanical locking system at the third 13 and the fourth edge 304 is configured to be locked by an angling motion. The second upper surface 19 is positioned in a horizontal plane 15 49. The embodiment in FIG.3C is exemplary, other mechanical locking systems are conceivable at the third edge 13 and the fourth edge 304.

An upper surface 9 of the first locking strip 6 may be provided in a same plane 49 as an upper surface 19 of the second locking strip 16.

20 The mechanical locking system at the third 13 and the fourth edge 304 may be configured to be assembled by an angling motion, such as a pivoting displacement about the fourth edge 304.

The mechanical locking system at the first 11 and the second edge 22 may be configured to be assembled by a vertical motion.

25 The mechanical locking system at the first 11 and the second edge 22 may be configured to be assembled by a vertical motion, such as a vertical motion of the second edge 22 of the second panel 2 in the engagement direction E (see FIG.3A) relative the first panel 1.

30 The panels may be floorboards comprising a wood fibre-based core, such as HDF, or a core comprising thermoplastic, such as PVC.

35 The tongue 30 may comprise a chamfered end portion 36 as illustrated in FIGS 5A-5B. The end portion 36 may be a longitudinal L end portion. In particular, the second portion 32 of the tongue 30 may comprise a chamfered end portion 36 forming a guiding surface 37 extending in the longitudinal and transverse direction of the tongue 30. The second portion 32 of the tongue 30 may have a longitudinal L edge and a transverse edge as shown in FIG.5A. A transition between the longitudinal edge and the transverse edge of the second portion 32 and/or a corner of the second portion 32 between the longitudinal edge and the transverse edge

of the tongue 30 may comprise the chamfered end portion 36. Thereby forming the guiding surface 37 extending in the longitudinal and transverse direction of the tongue 30.

5 The guiding surface 37 may be configured to guide the elongated element 70 in the transverse T direction of the tongue 30 as the elongated element 70 is inserted in the unlocking groove 60 in a longitudinal direction of the tongue 30.

As also shown in FIG. 5A, the tongue 30 may comprise biasing means 38 configured to bias the tongue 30 to displace along the displacement axis Ax in the locking direction. The biasing means 38 may be in the form of resilient feathers  
10 which may be formed integrally with the tongue 30. The biasing means 38 may be configured to abut at least the bottom surface 41 of the displacement groove 40.

As shown in FIG.6, the second edge 22 may comprise a chamfered edge portion 36' for guiding the elongated element 70 in the longitudinal L direction of the panel 2 towards the unlocking groove 60.

15 The panel 1, 2 may have a longitudinal L edge and a transverse edge as shown in FIG.6. A transition between the second edge 12, 22 and the third edge 13, 23 and/or a corner between the second edge 12, 22 and the third edge 13, 23 may comprise the chamfered end portion 36. Thereby forming the guiding surface 36' extending in the longitudinal L and transverse T direction of the panel 1, 2.

20 In one embodiment shown in FIGS 7A-7B and 8A-8C, an embodiment of the inventive concept is configured to be applied in panels intended to be arranged in a herringbone pattern.

In a non-limiting example, such herringbone pattern may comprise two types of panels. An A-type panel and a B-type panel. The A-type panel and the B-type panel may mirror each other and/or be counter images of each other, as  
25 shown in FIG. 7 where FIG.7A shows an A-type panel and FIG.7B shows a B-type panel.

The A-type panel and the B-type panel may each comprise a short edge A11, A12, B11, B12 and a long edge A13, A14, B13, B14, wherein a long edge, such as A14, B14 may comprise a shape corresponding to the first edge 11 of the first panel 1 as explained above, for example in relation to FIGS 3A-3B. A short side edge, such as A12, B12 may be edges corresponding to the second edge 22 as explained in relation to FIGS 3A-3B. However, only a portion of the long edge, such as long edges A14, B14, comprises the displaceable tongue 30, as illustrated  
35 in FIGS 7A-7B and 8A-8C.

One of the respective short sides of panel A and B, such as A11 and B11 or A12 and B12 may comprise an edge corresponding to the third edge 13 as

explained with reference to FIG.3C and the other edge may correspond to that of the fourth edge 304 as explained with reference to FIG.3C.

A further long side, such as A13 and/or B13 may comprise a shape corresponding the fourth 304 edge as explained with reference to FIG.3C such that the tongue 29 of a panel, such as panel A' or B' is received in the displacement groove 40 of the adjacent panel, such as panel A or B, as shown in FIGS 8B-8C. It follows for example that panel B' may be assembled in locking position with panel A by means of vertical displacement of the second edge B12' i.e. the short side of panel B' relative the fourth edge A14, i.e. the long side of panel A.

It is thereby achieved that the herringbone pattern can be laid in part by means of vertical engagement to form a braid. It is further achieved that panels of the herringbone pattern may be disengaged by rotation and/or vertically instead of lateral sliding. This vastly facilitates ease of both assembling and disassembling of the floating floor.

In a non-limiting example, a herringbone pattern, such as the one shown in FIGS.8A-8B, may be disassembled by means of a method comprising one or more of: providing the elongated element 70; inserting the elongated element 70 in a first unlocking groove, such as 60'', between a second edge, such as B12', of a first panel, such as B', and a fourth edge, such as A14, of an adjacent second panel, such as A, to thereby vertically unlock the second edge of the first panel and the fourth edge of the second panel; pivoting or angling the said first panel to thereby horizontally unlock a third edge, such as B13', of the first panel and a fourth edge, such as B14, of an adjacent third panel, such as B; removing the first panel;

inserting the elongated element 70 in a second unlocking groove, such as 60''', between a second edge, such as A12, of the second panel and a fourth edge, such as B14, of the third panel to thereby vertically unlock the second edge of the second panel and the fourth edge of the third panel; removing the second panel.

FIG. 9A shows a perspective view of a device 69 for disassembling assembled building panels, such as the building panels shown in FIGS 8A-8C. The device of FIG.9A may be particularly suitable for disassembling building panels assembled to form a herringbone pattern, such as by means of the mechanical locking system of the first panel 1 and the second panel 2 as explained in relation to FIGS 3A, 3B, 4A and 4B

FIG. 9B shows a side view of the positioning element 71 according to an embodiment of the inventive concept.

The positioning element 71 may comprise visual indication means 74, such as a text and/or sign indicating an intended orientation of the positioning

element in the displacement groove. The visual indication means may facilitate ease of use. The visual indication means may facilitate proper function of the device during use.

5 FIG. 9C shows another side view of the embodiment of FIG.9B. The positioning element may comprise a through-hole 73, extending from one side to an opposite side of the positioning element, preferably in a longitudinal direction of the positioning element.

FIG. 9D shows a perspective view of the embodiment of FIG.9B.

10 FIG. 10 shows a cross view of a positioning element arranged in a displacement groove of a building panel 1, which may be a Type-A or Type-B panel, according to an embodiment of the inventive concept. For ease or explaining the inventive concept, the elongated element 70 has been omitted in FIG.10, however, typically the elongated element may be arranged in the through-hole 73 of the positioning element 70. As derivable from FIG.10, the positioning  
15 element may facilitate a centre axis 70x of the elongated element is positioned at a predetermined position when the positioning device is arranged in the displacement groove 40. Preferably, when the positioning element is arranged in the displacement groove, an opening of the through-hole may be arranged adjacent an opening of the unlocking groove 60, 60'', 60'''.

20 Preferably, when the positioning element is arranged in the displacement groove, an opening of the through-hole may be arranged adjacent the second portion 32 of the locking tongue 30.

25 Preferably, when the positioning element is arranged in the displacement groove, at least a portion of the through-hole may be aligned with the unlocking groove.

Preferably, when the positioning element is arranged in the displacement groove, at least a portion of an opening of the through-hole may be arranged adjacent the guiding surface 37.

30 Preferably, when the positioning element is arranged in the displacement groove, at least a portion of the through-hole may be aligned with the guiding surface 37.

35 The positioning element may facilitate a centre axis 70x of the elongated element is positioned at a predetermined distance from the bottom surface 41 of the displacement groove, preferably also at a predetermined distance from the lower surface 43 of the displacement groove, optionally also at a predetermined distance from the upper surface 42 of the displacement groove 40, as illustrated in FIG.10.

FIGS.11A-11C schematically illustrate a method of disassembling assembled building panels, according to an embodiment of the inventive concept.

FIG. 11A shows two assembled building panels, such as the panel A, which may correspond to the second panel 2, and having second edge 22.

5 FIG.11A also shows the device of FIG.9A arranged in a displacement groove of one of panel B, which may correspond to the first panel 1 and having a first edge 11.

FIG. 11B shows at least a portion of the elongated element 70 of the device 69 of FIG.9A having been inserted in an unlocking groove 60, 60", 60''' shown in FIG.11A to thereby displace the locking tongue in the unlocking direction to obtain the unlocking position or state. Consequently, there may be provided horizontal play between the first portion 31 of the locking tongue 30 and the engagement portion 25 of the second edge 22 of the second panel, whereby the second panel 2 may be displaced vertically, hence whereby the second panel 2 is vertically unlocked from the first panel 1.

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FIG.11C shows a first and second building panel being disassembled by means of a vertical displacement of a second edge 22 of the second panel 2 relative a first edge 11 of a first panel 1.

When the word "about" or "essentially" or "substantially" is used in this specification in connection with a numerical value, it is intended that the associated numerical value include a tolerance of +/- 10% around the stated numerical value.

20

## ITEMS

25 ITEM 1. A set of essentially identical panels 1, 2, such as building panels, provided with a mechanical locking system comprising:

a displaceable tongue 30 arranged in a displacement groove 40 having a first opening at a first edge 11 of a first panel 1, said tongue 30 being configured to be displaced in said displacement groove 40 along a displacement axis Ax to attain a locking state wherein a first portion 31 of the tongue 30 cooperates with a first tongue groove 20 having a second opening at a second edge 22 of an adjacent second panel 2, for vertical locking of the first and the second edge 11, 22; and

30

wherein a second portion 32 of said tongue 30 is configured to cooperate with said second edge 22 of said adjacent second panel 2 via an elongated element 70 for vertical unlocking of the first and the second edge 11, 22.

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ITEM 2. Set of panels according to item 1, wherein a first engagement portion 34 of the second portion 32 is configured to engage with the elongated element 70 and delimits an unlocking groove 60 configured to receive the elongated element 70 such as to cause the tongue 30 to be displaced along the displacement axis Ax to attain an unlocking state for said vertical unlocking of the first 11 and the second edge 22.

ITEM 3. Set of panels according to item 1 or 2, wherein a second engagement portion 25 of the second edge 22 is configured to engage with the elongated element 70 and delimits the unlocking groove 60, preferably said second engagement portion 25 being provided externally of said first tongue groove 20, more preferably externally of and below said first tongue groove 20.

ITEM 4. Set of panels according to item 2 or 3, wherein said first engagement portion 34 and said second engagement portion 25 are planar and extend in parallel or substantially in parallel, preferably side by side and in parallel.

ITEM 5. Set of panels according to any one of items 2 to 4, wherein said unlocking groove 60 is configured to attain said unlocking state upon receiving an elongated element 70 having a constant cross-sectional width  $D_i$  in the longitudinal direction of said elongated element 70.

ITEM 6. Set of panels according to any one of the preceding items, wherein said displacement groove 40 comprises a bottom surface 41, an upper surface 42 and a lower surface 43, preferably said lower surface 43 being parallel to the upper surface 42 and/or parallel to the displacement axis Ax of the tongue 30.

ITEM 7. Set of panels according to item 6, wherein the second engagement portion 25 extends below a plane Px of the lower surface 43.

ITEM 8. Set of panels according to item 6 or 7, wherein a dimension  $D_y$  in the direction of a normal  $N_y$  of a plane Px of said lower surface 43, between the lower surface 43 and the first portion (31), corresponds at least to a maximum diameter  $D_i$  of the elongated element 70.

ITEM 9. Set of panels according to any one of items 6 to 8, wherein a dimension  $D_y$  in the direction of the normal  $N_y$  of a plane Px of said lower surface

43, between the lower surface 43 and the first portion 31, corresponds at least to a dimension  $D_x$  along the displacement axis  $A_x$  between the first engagement portion 34 and an outermost point 31a of the tongue 30.

5           ITEM 10. Set of panels according to any one of items 6 to 8, wherein a dimension  $D_y$  in the direction of the normal  $N_y$  of a plane  $P_x$  of said lower surface 43, between the plane  $P_x$  and the first portion 31 corresponds at least to a largest distance  $D_{ax}$  along the displacement axis  $A_x$  between the second engagement portion 25 and an outermost point 31a of the tongue 30 in the locking state,  
10 preferably the largest distance of dimension  $D_{ax}$  is measured between an outermost point of the second engagement portion 25 and an outermost point 31a of the tongue 30.

          ITEM 10a. Set of panels according to any one of the preceding claims 9  
15 to 10, wherein the dimension  $D_y$  is measured from a point on a lower surface of the first portion 31, said point being aligned, in the direction of the normal  $N_y$ , with an uppermost point of the elongated element 70.

          ITEM 11. Set of panels according to any one of the preceding items 3  
20 to 10, wherein the second portion 32 and the diameter  $D_i$  of the elongated element 70 are configured to cooperate such that the tongue 30 is displaced along the displacement axis  $A_x$  at least to the extent that an outermost point of the second engagement portion 25 and an outermost point 31a of the first portion 31 do not overlap, preferably to the extent that there is provided a play  $d_H$  in a horizontal  
25 plane  $H$  between the outermost point of the second engagement portion 25 and the outermost point 31a of the first portion 31.

          ITEM 12. Set of panels according to any one of the preceding items, wherein said second portion 32 comprises a chamfered edge portion 36, said edge  
30 portion being an outer end portion in the longitudinal direction of the tongue, the chamfered edge portion 36 forming a guiding surface 37 configured to guide said elongated element 70 in the transverse direction  $T$  of said tongue 30, preferably a chamfered longitudinal edge portion 36.

35           ITEM 13. Set of panels according to any one of the preceding items, wherein said second edge 22 comprises a chamfered edge portion 36' for guiding said elongated element 70 towards said tongue 30.

ITEM 14. Set of panels according to any one of the preceding items, wherein said elongated element 70 has a rotationally symmetric cross-section in a transverse plane thereof, by an angle of less than 120 degrees, preferably less than 90 degrees, more preferably being circular.

5

ITEM 15. Set of panels according to any one of the preceding items, the elongated element 70 preferably configured to abut the second portion 32 and the second edge 22 simultaneously.

10 ITEM 16. A method for vertical unlocking a set of essentially identical panels 10, 20, such as building panels, provided with a mechanical locking system comprising:

15 a displaceable tongue 30 arranged in a displacement groove 40 having a first opening at a first edge 11 of a first panel 10, said tongue 30 configured to be displaced in said displacement groove 40 along a displacement axis Ax to attain a locking state wherein a first portion 31 of the tongue 30 is configured to cooperate with a first tongue groove 20 with a second opening at a second edge 22 of an adjacent second panel 2, for vertical locking of the first and the second edge 11, 22; and

20 wherein the method comprises: inserting an elongated element 70 in an unlocking groove 60 delimited by a first engagement portion 34 of said second portion of said tongue 30 and further delimited by a second engagement portion 25 of the second edge 22 of the second panel 2 disposed externally said tongue groove 20, to thereby cause said tongue 30 to be displaced along the displacement axis Ax to attain an unlocking state for vertical unlocking of the first 25 11 and the second edge 22.

30 ITEM 17. The method according to item 16, wherein the second portion 32 and the diameter Di of the elongated element 70 are configured to cooperate such that the tongue 30 is displaced along the displacement axis Ax at least to the extent that an outermost point of the second engagement portion 25 and an outermost point 31a of the first portion 31 do not overlap.

35 ITEM 18. The method according to item 16 or 17, wherein the second portion 32 and the diameter Di of the elongated element 70 are configured to cooperate such that the tongue 30 is displaced along the displacement axis Ax at least to the extent that there is provided horizontal H play between an outermost

point of the second engagement portion 25 and an outermost point 31a of the first portion 31.

5 ITEM 19. The method according to any one of items 16 to 18, further comprising:

- providing a positioning element 71 to said elongated element 70;
- arranging said positioning element in said displacement groove 40.

10 ITEM 20. A device 69 for unlocking a mechanical locking system of building panels 1, 2, such as a set of building panels, assembled by means of said mechanical locking system, said mechanical locking system configured for horizontal and vertical locking of adjacent building panels,

15 said locking system comprising at a first edge 11 of a first building 1, a displaceable locking tongue 30 configured to displace in a displacement groove 40 provided in said first edge of said first building panel, said locking tongue configured to displace between a locking position and an unlocking position,

20 wherein the locking position, the locking tongue 30 is configured in a protruding position wherein protruding from said displacement groove for cooperating with a tongue groove 20 provided in an adjacent edge 22 of a second adjacent building panel 2;

25 wherein the unlocking position, the locking tongue is configured in a retracted position,

wherein said unlocking device comprises an elongated element 70 and a positioning element 71,

30 wherein said positioning element is configured to be received in said displacement groove.

35 ITEM 21. Device according to item 20, wherein said positioning element is configured to be received in said displacement groove to thereby position a centre axis 70x of said elongated element at a predetermined distance from a bottom surface 41 of the displacement groove.

ITEM 22. Device according to item 20, wherein said positioning element is configured to position a centre axis 70x of the elongated element 70 in parallel with said first edge 11, preferably parallel an upper surface 55 of the first panel.

5           ITEM 23. Device according to any one of items 20 to 22, wherein said positioning element is configured to be received in said displacement groove to thereby position a centre axis of said elongated element at a predetermined distance from a lower surface 43 of the displacement groove.

10           ITEM 24. Device according to any one of items 20 to 23, wherein the locking position, a first portion 31 of the locking tongue cooperates with the tongue groove 20 provided in the adjacent edge 22 of a second adjacent building panel 2.

15           ITEM 25. Device according to any one of the preceding items 20 to 24, wherein the unlocking position, the first portion 31 of the locking tongue is configured such that there is provided horizontal H paly between an outermost point 31a of the first portion 31 and a lower portion 25, such as vertically below said outer portion of said locking tongue, of the second edge 22 of the second  
20 adjacent panel 2.

ITEM 26. Device according to any one of items 20 to 25, wherein said locking tongue comprises a second lower portion configured to cooperate with said elongated element for displacing the locking to said unlocking position.

25

ITEM 27. Device according to any one of items 20 to 26, wherein said second portion is configured to form an unlocking groove 60, 60", 60'" with an edge portion of said second edge of said second panel, when said first and second panel are configured in assembled position, said edge portion provided below and  
30 external said tongue groove.

ITEM 28. Device according to any of the preceding claims 20 to 27, wherein said elongated element is rotational symmetric.

35           ITEM 29. Device according to any one of the preceding claims 20 to 28, wherein said centre axis of said elongated element is positioned at least partially below said tongue groove / below said outer portion of said locking tongue.

ITEM 30. Device according to any one of the preceding items 20 to 29, wherein said device comprises a handle 72.

ITEM 31. Device according to any one of the preceding items 20 to 30,  
5 wherein said positioning element is arranged on the elongated element, and preferably configured to be displaced along the elongated element.

ITEM 32. A device 69 for unlocking a mechanical locking system of building panels 1, 2 assembled by means of said mechanical locking system, said  
10 mechanical locking system being configured for horizontal and vertical locking of adjacent building panels,

said locking system comprising at a first edge 11 of a first building 1, a displaceable locking tongue 30 configured to displace in a displacement groove 40 provided in said first edge of said first building panel, said locking tongue  
15 configured to displace between a locking position and an unlocking position,

wherein the locking position, the locking tongue 30 is configured in a protruding position wherein protruding from said displacement groove for cooperating with a tongue groove 20 provided in an adjacent edge 22 of a second  
20 adjacent building panel 2;

wherein the unlocking position, the locking tongue is configured in a retracted position;

25 wherein said unlocking device comprises an elongated element 70 and a positioning element 71,

wherein said positioning element is configured to be received in said displacement groove to thereby align a centre axis 70x of said elongated element  
30 with an unlocking groove 60, 60'', 60''' configured to receive said elongated element for configuring said locking tongue in said unlocking position in response to insertion of said elongated element in said unlocking groove.

ITEM 33. Device according to item 32, wherein said locking tongue  
35 comprises a second lower portion 32 configured to cooperate with said elongated element for displacing the locking to said unlocking position, and

wherein said second edge portion 25 of said second panel comprises provided below and external said tongue groove, and

wherein said unlocking groove 60, 60", 60'" is formed by said second portion 32 of said locking tongue and said edge portion 25 of said second edge 22, when said first and second panel are configured in assembled position.

5           ITEM 34. Device according to any one of the preceding items 20 to 33, wherein said building panels comprises a set of building panels.

          ITEM 35. A kit comprising the building panels according to any one of items 1 to 14 and a device according to any one of claims 20 to 34.

10

**CLAIMS**

1. A set of essentially identical panels (1, 2), such as building panels, provided with a mechanical locking system comprising:
  - a displaceable tongue (30) arranged in a displacement groove (40) having  
5 a first opening at a first edge (11) of a first panel (1), said tongue (30) being configured to be displaced in said displacement groove (40) along a displacement axis (Ax) to attain a locking state wherein a first portion (31) of the tongue (30) cooperates with a first tongue groove (20) having a second opening at a second edge (22) of an adjacent second panel (2), for vertical locking of the first and the  
10 second edge (11, 22); and  
wherein a second portion (32) of said tongue (30) is configured to cooperate with said second edge (22) of said adjacent second panel (2) via an elongated element (70) for vertical unlocking of the first and the second edge (11, 22).
- 15 2. Set of panels according to claim 1, wherein a first engagement portion (34) of the second portion (32) is configured to engage with the elongated element (70) and delimits an unlocking groove (60) configured to receive the elongated element (70) such as to cause the tongue (30) to be displaced along the displacement axis (Ax) to attain an unlocking state for said vertical unlocking of the first (11) and the  
20 second edge (22).
3. Set of panels according to claim 1 or 2, wherein a second engagement portion (25) of the second edge (22) is configured to engage with the elongated element (70) and delimits the unlocking groove (60, 60'', 60'''), preferably said  
25 second engagement portion (25) being provided externally of said first tongue groove (20), more preferably externally of and below said first tongue groove (20).
4. Set of panels according to claim 2 or 3, wherein said first engagement portion (34) and said second engagement portion (25) are planar and extend side  
30 by side and/or in parallel or substantially in parallel, preferably side by side and in parallel.
5. Set of panels according to any one of claims 2 to 4, wherein said unlocking groove (60) is configured to attain said unlocking state upon receiving an  
35 elongated element (70) having a constant cross-sectional width (Di) in the longitudinal direction of said elongated element (70).

6. Set of panels according to any one of the preceding claims, wherein said displacement groove (40) comprises a bottom surface (41), an upper surface (42) and a lower surface (43), preferably said lower surface (43) being parallel to the upper surface (42) and/or parallel to the displacement axis (Ax) of the tongue (30).
- 5
7. Set of panels according to claim 6, wherein the second engagement portion (25) extends below a plane (Px) of the lower surface (43).
8. Set of panels according to claim 6 or 7, wherein a dimension (Dy) in the direction of a normal (Ny) of a plane (Px) of said lower surface (43), between the lower surface (43) and the first portion (31), corresponds at least to a maximum diameter (Di) of the elongated element (70).
- 10
9. Set of panels according to any one of claims 6 to 8, wherein a dimension (Dy) in the direction of the normal (Ny) of a plane (Px) of said lower surface (43), between the lower surface (43) and the first portion (31), corresponds at least to a dimension (Dx) along the displacement axis (Ax) between the first engagement portion (34) and an outermost point (31a) of the tongue (30).
- 15
10. Set of panels according to any one of claims 6 to 8, wherein a dimension (Dy) in the direction of the normal (Ny) of a plane (Px) of said lower surface (43), between the plane (Px) and the first portion (31) corresponds at least to a largest distance of a dimension (Dax) along the displacement axis (Ax) between the second engagement portion (25) and an outermost point (31a) of the tongue (30) in the locking state, preferably the largest distance of dimension (Dax) is measured between an outermost point of the second engagement portion (25) and an outermost point (31a) of the tongue (30).
- 20
- 25
11. Set of panels according to any one of the preceding claims 9 to 10, wherein the dimension (Dy) is measured from a point on a lower surface of the first portion (31), said point being aligned, in the direction of the normal (Ny), with an uppermost point of the elongated element (70).
- 30
12. Set of panels according to any one of the preceding claims 3 to 11, wherein the second portion (32) and the elongated element (70) are configured to cooperate such that the tongue (30) is displaced along the displacement axis (Ax) at least to the extent that an outermost point of the second engagement portion (25) and an outermost point (31a) of the first portion (31) do not overlap, preferably
- 35

to the extent that there is provided a play (dH) in a horizontal plane (H) between the outermost point of the second engagement portion (25) and the outermost point (31a) of the first portion (31).

5 13. Set of panels according to any one of the preceding claims, wherein said second portion (32) comprises a chamfered edge portion (36), said edge portion being an outer end portion in the longitudinal direction of the tongue, the chamfered edge portion (36) forming a guiding surface (37) configured to guide  
10 said elongated element (70) in the transverse direction (T) of said tongue (30), preferably a chamfered longitudinal edge portion (36).

14. Set of panels according to any one of the preceding claims, wherein said second edge (22) comprises a chamfered edge portion (36') for guiding said elongated element (70) towards said tongue (30).

15

15. Set of panels according to any one of the preceding claims, wherein said elongated element (70) has a rotationally symmetric cross-section in a transverse plane thereof, by an angle of less than 120 degrees, preferably less than 90 degrees, more preferably being circular.

20

16. A method for vertical unlocking a set of essentially identical panels (10, 20), such as building panels, provided with a mechanical locking system comprising:

a displaceable tongue (30) arranged in a displacement groove (40) having a first opening at a first edge (11) of a first panel (10), said tongue (30) configured  
25 to be displaced in said displacement groove (40) along a displacement axis (Ax) to attain a locking state wherein a first portion (31) of the tongue (30) is configured to cooperate with a first tongue groove (20) with a second opening at a second edge (22) of an adjacent second panel (2), for vertical locking of the first and the second edge (11, 22); and

30 wherein the method comprises: inserting an elongated element (70) in an unlocking groove (60, 60'', 60''') delimited by a first engagement portion (34) of said second portion of said tongue (30) and further delimited by a second engagement portion (25) of the second edge (22) of the second panel (2) disposed externally said tongue groove (20), to thereby cause said tongue (30) to be  
35 displaced along the displacement axis (Ax) to attain an unlocking state for vertical unlocking of the first (11) and the second edge (22).

17. The method according to claim 16, wherein the second portion (32) and a diameter ( $D_i$ ) of the elongated element (70) are configured to cooperate such that the tongue (30) is displaced along the displacement axis ( $A_x$ ) at least to the extent that an outermost point of the second engagement portion (25) and an outermost point (31a) of the first portion (31) do not overlap.

18. The method according to claim 16 or 17, further comprising:  
providing a positioning element (71) to said elongated element (70);  
arranging said positioning element in said displacement groove (40).

19. A device (69) for unlocking a mechanical locking system of building panels (1, 2) assembled by means of said mechanical locking system, said mechanical locking system configured for horizontal and vertical locking of adjacent building panels,

said locking system comprising at a first edge (11) of a first building (1), a displaceable locking tongue (30) configured to displace in a displacement groove (40) provided in said first edge of said first building panel, said locking tongue configured to displace between a locking position and an unlocking position,

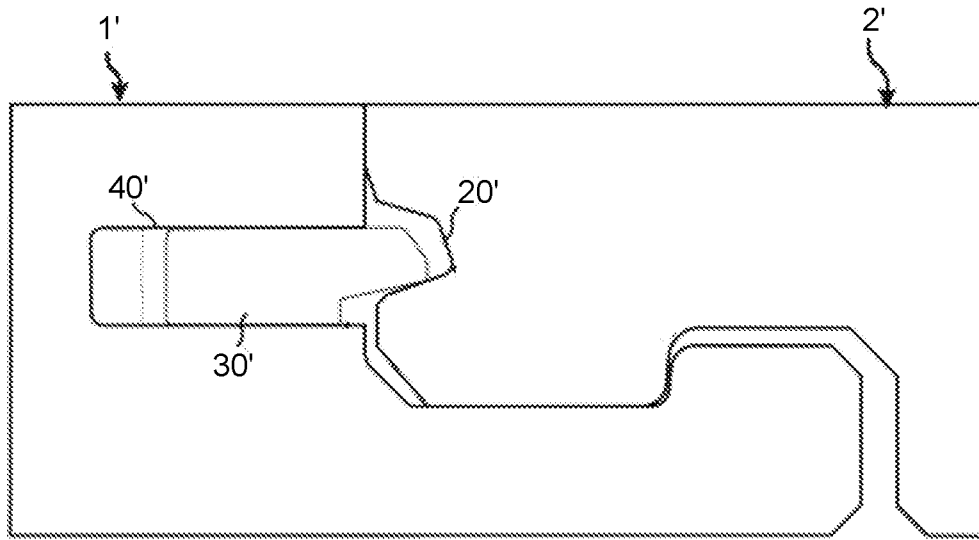
wherein the locking position, the locking tongue (30) is configured in a protruding position wherein protruding from said displacement groove for cooperating with a tongue groove (20) provided in an adjacent edge (22) of a second adjacent building panel (2);

wherein the unlocking position, the locking tongue is configured in a retracted position;

wherein said unlocking device comprises an elongated element (70) and a positioning element (71),

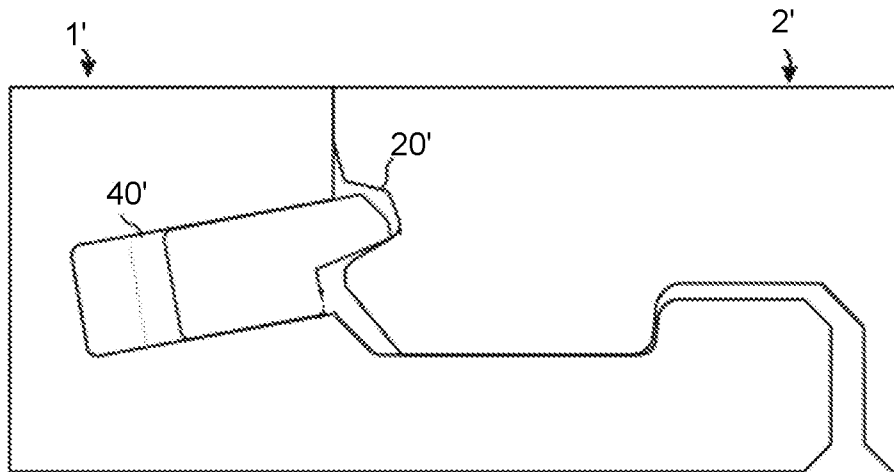
wherein said positioning element is configured to be received in said displacement groove.

20. Device according to claim 19, wherein said positioning element is configured to be received in said displacement groove to thereby position a centre axis ( $70_x$ ) of said elongated element at a predetermined distance from a bottom surface (41) of the displacement groove.



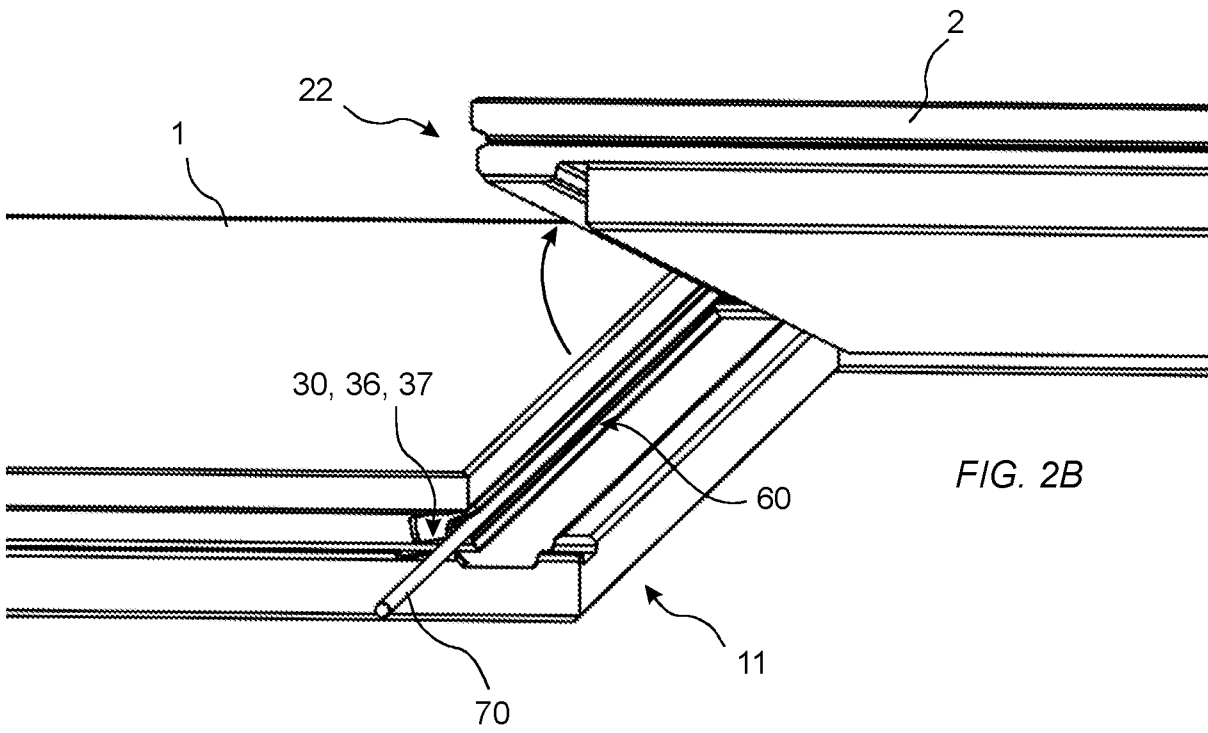
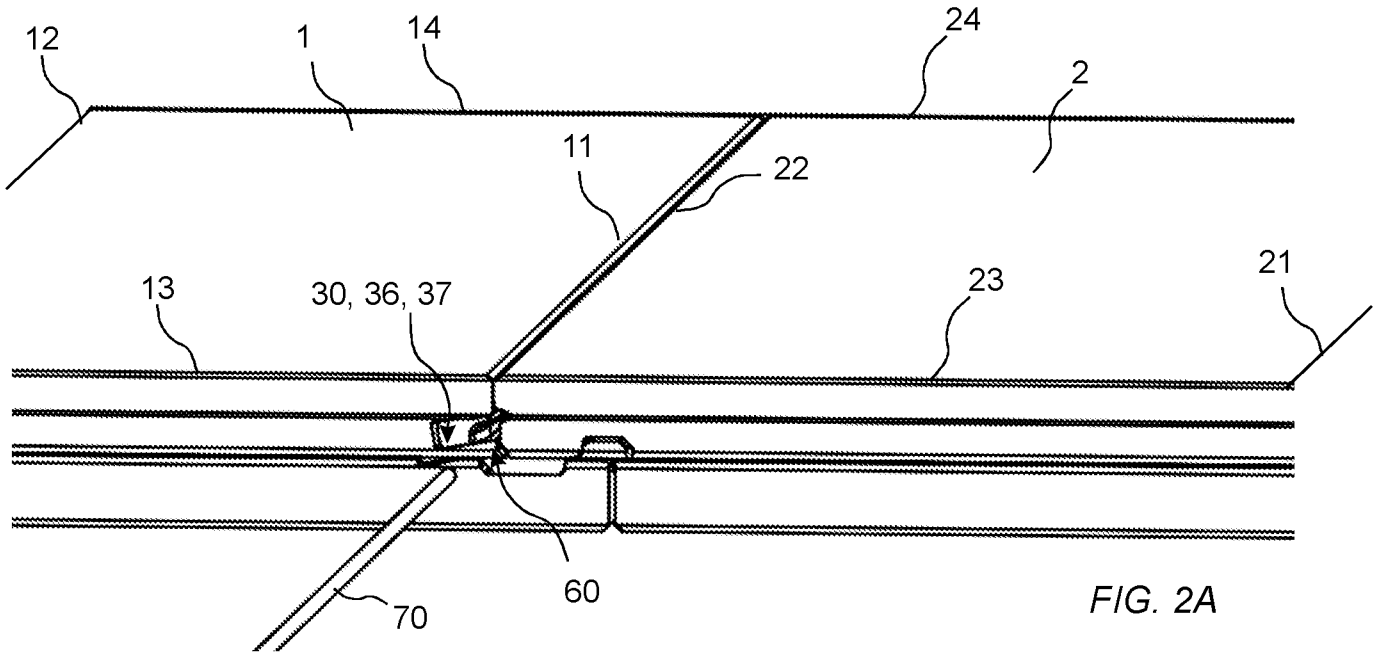
Prior art

FIG. 1A



Prior art

FIG. 1B



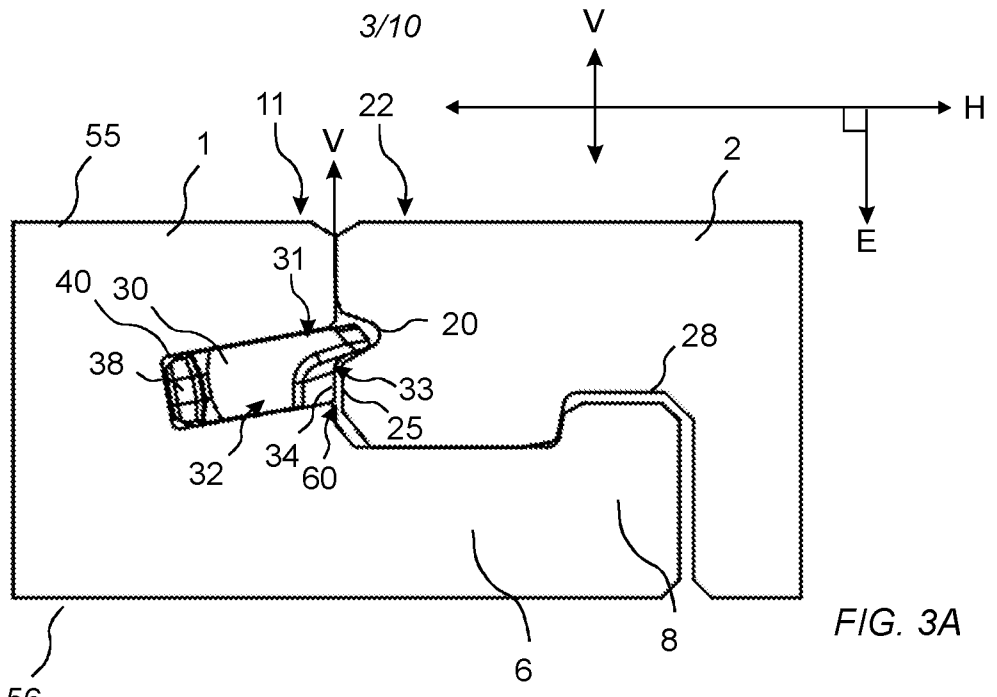


FIG. 3A

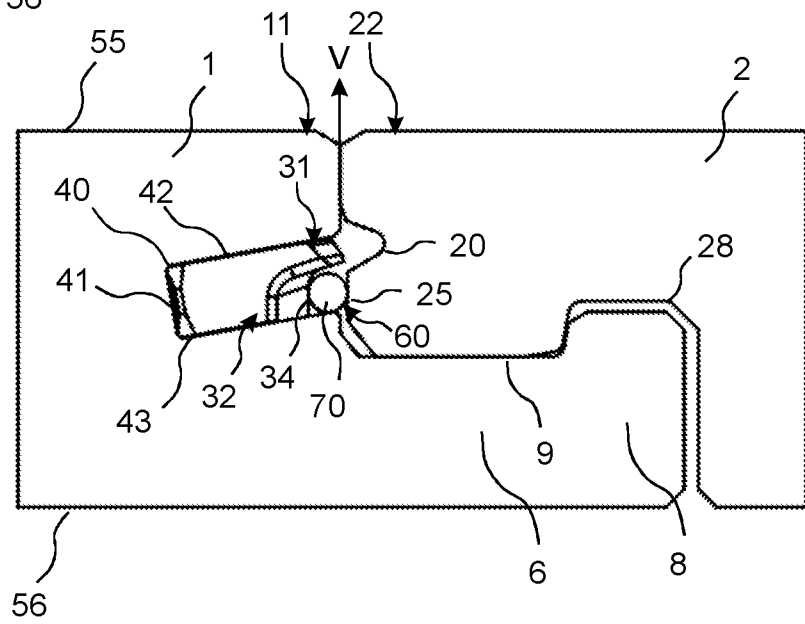


FIG. 3B

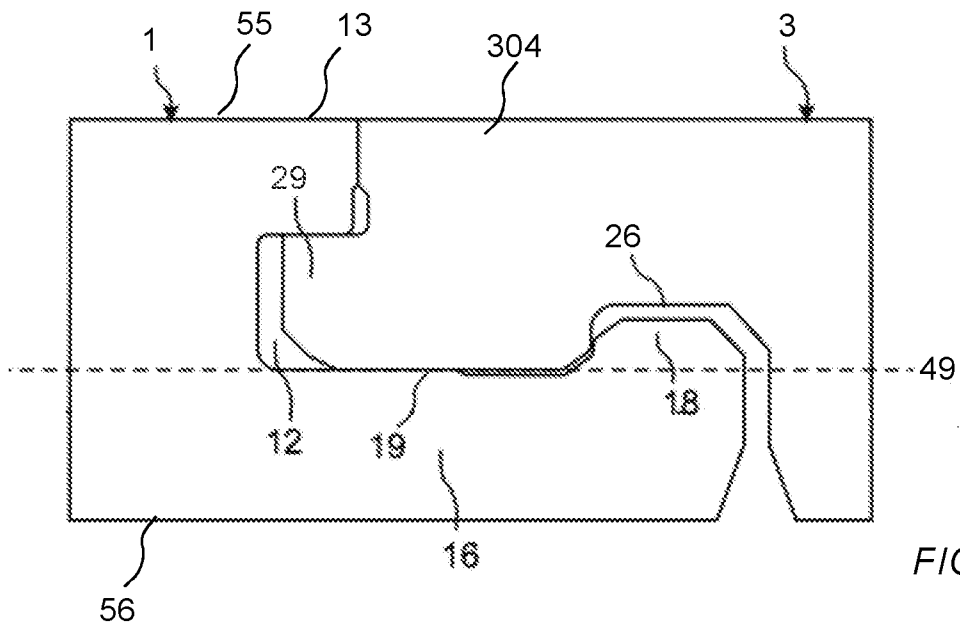
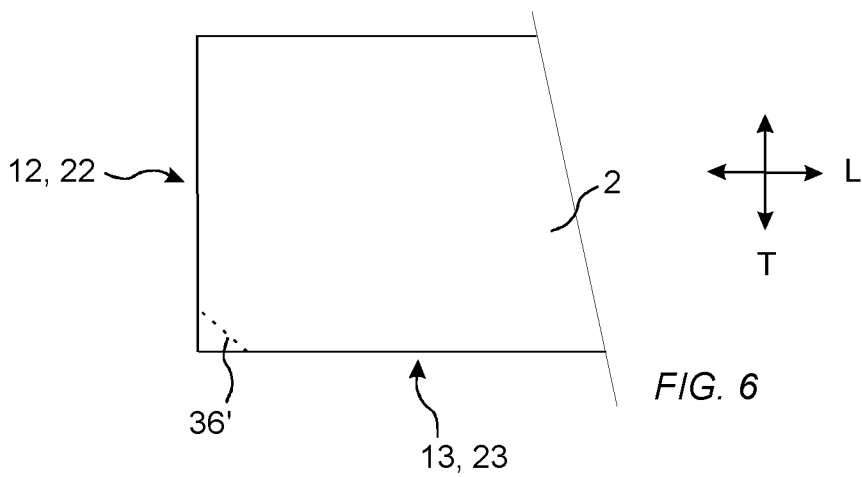
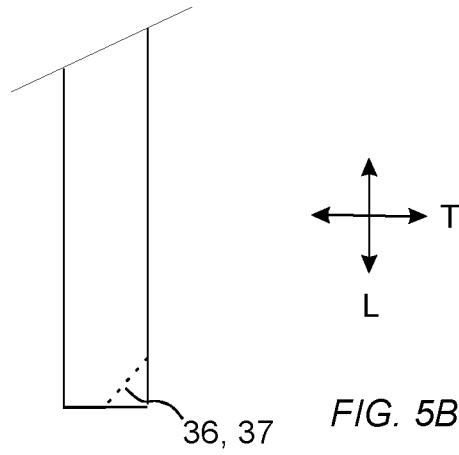
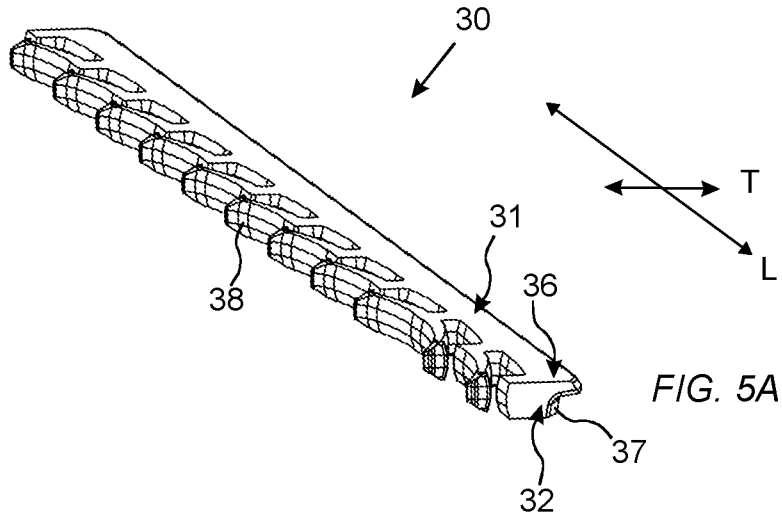


FIG. 3C







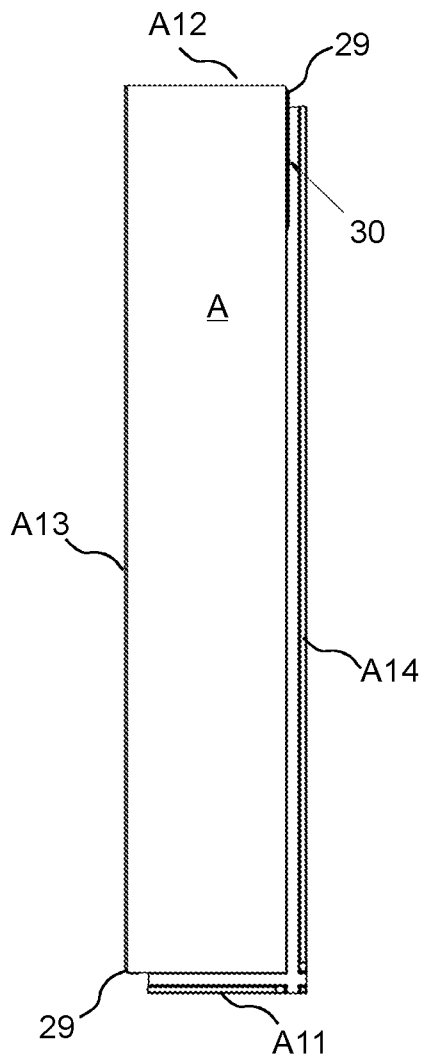


FIG. 7A

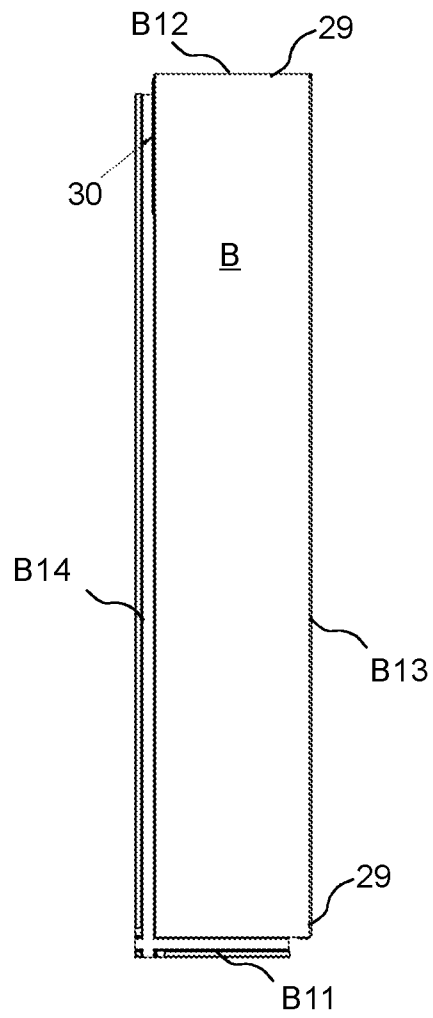


FIG. 7B

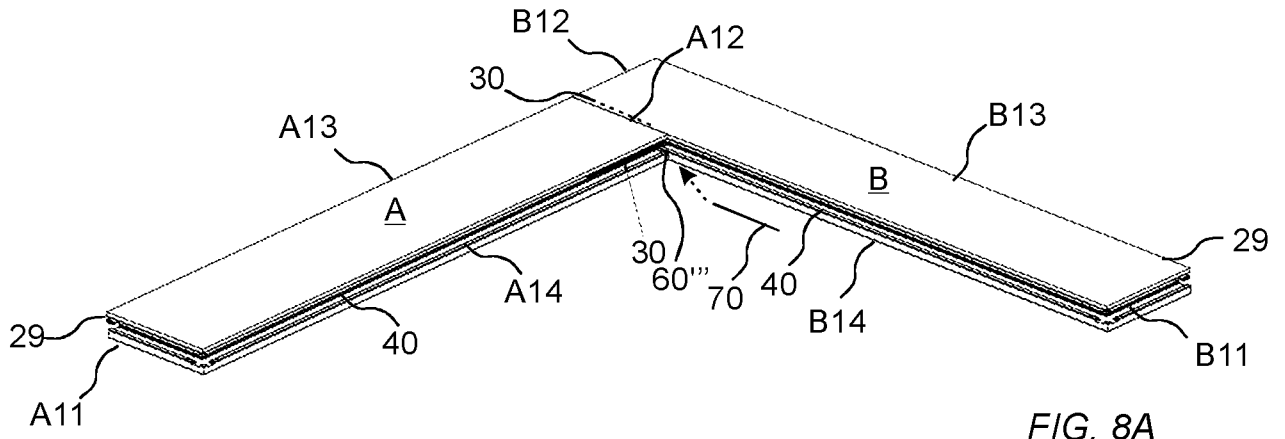


FIG. 8A

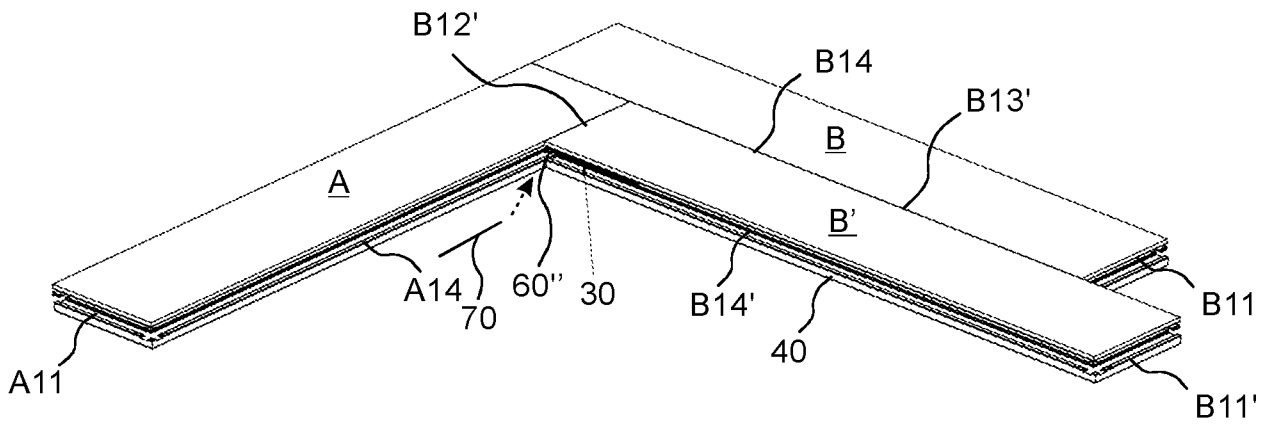


FIG. 8B

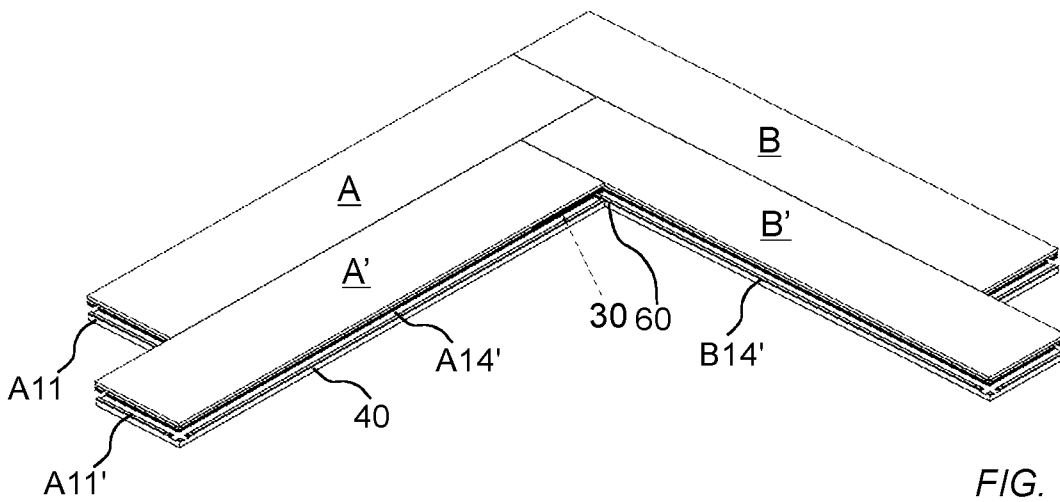
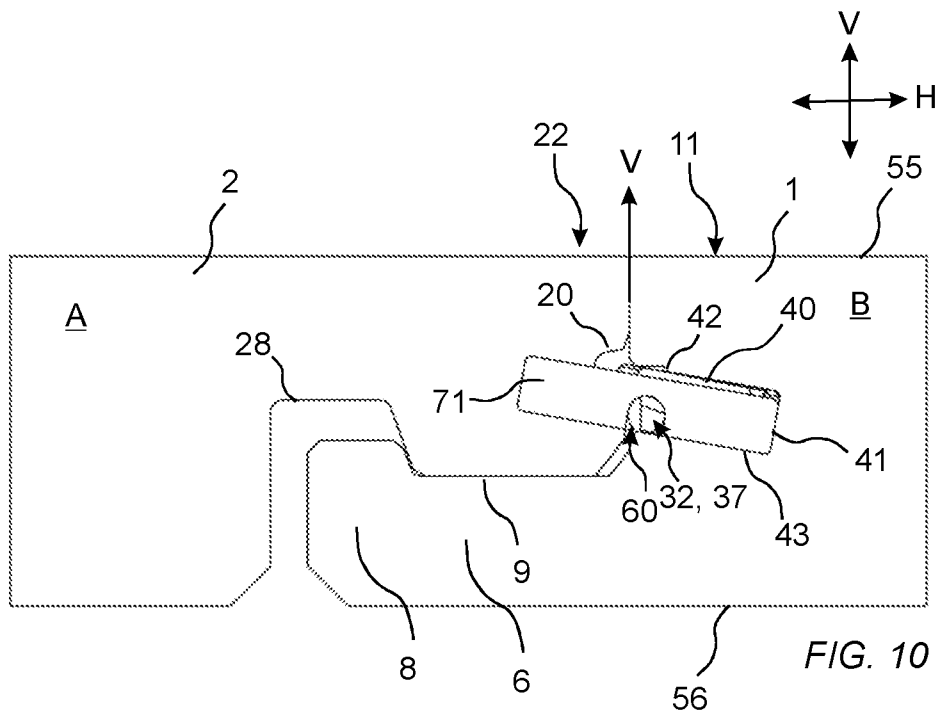
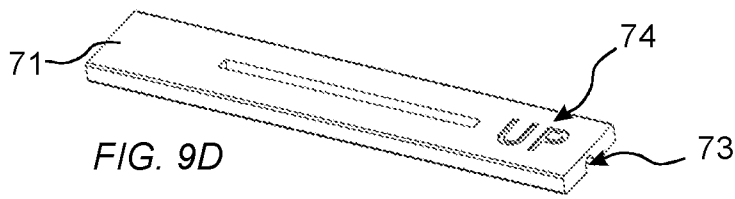
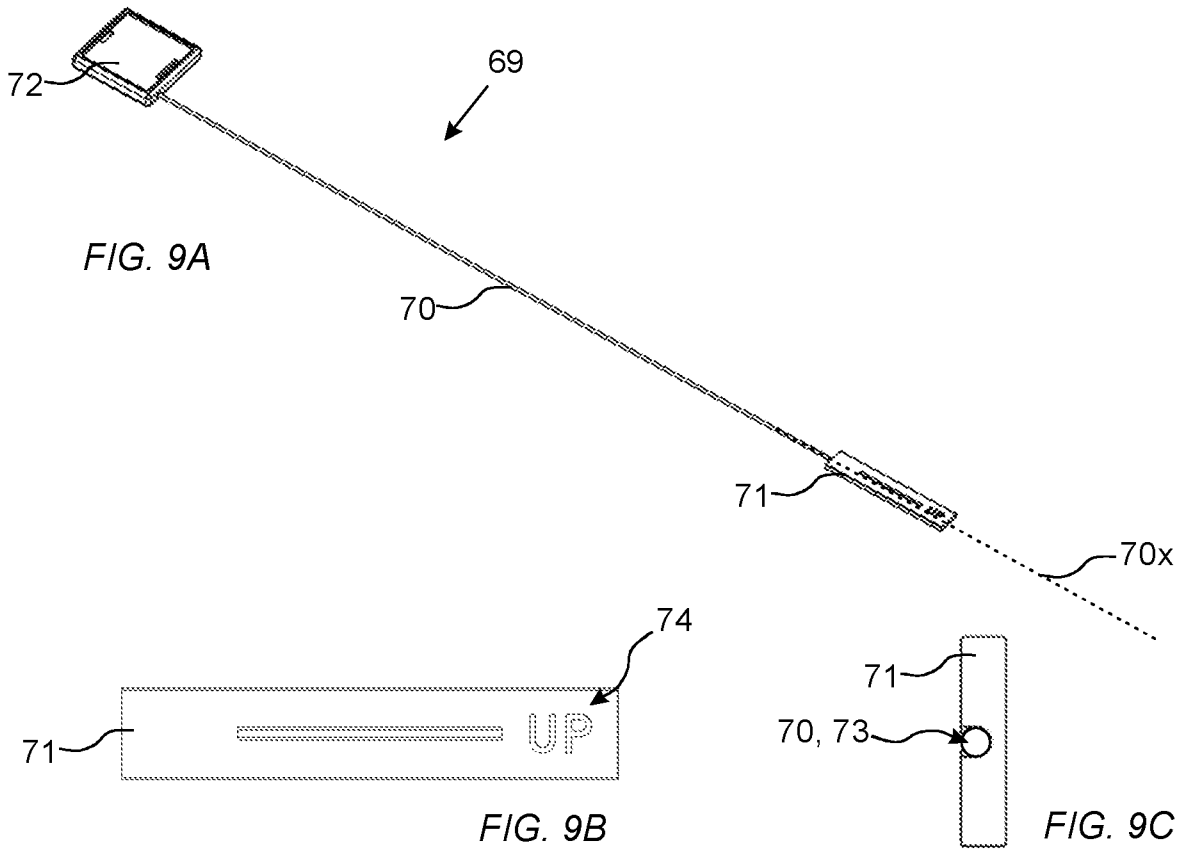
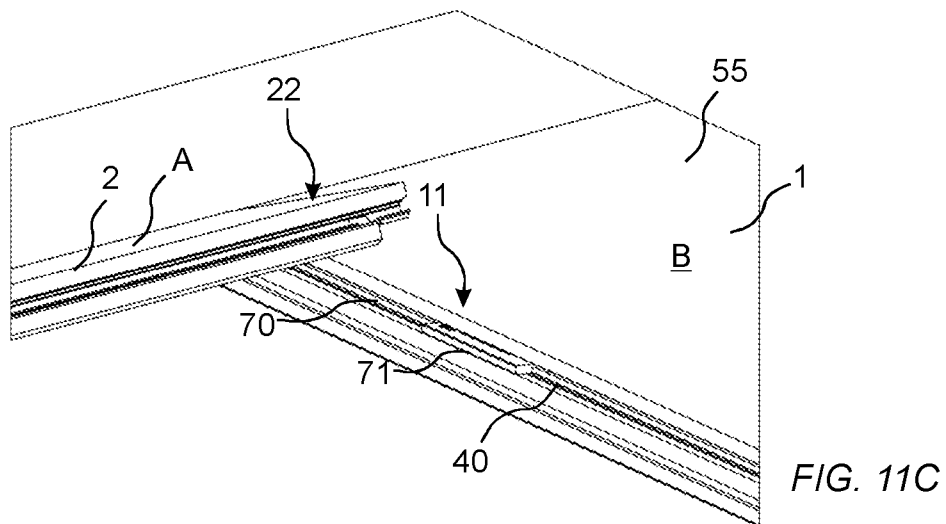
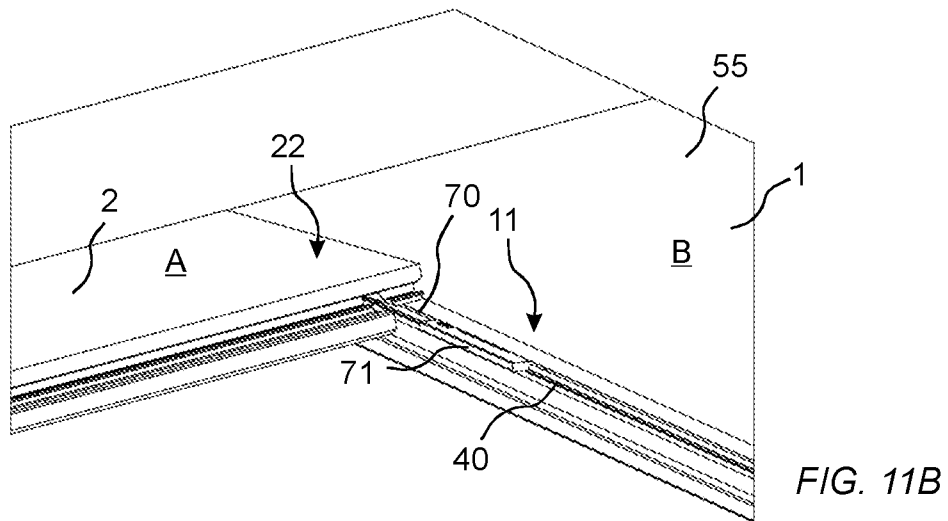
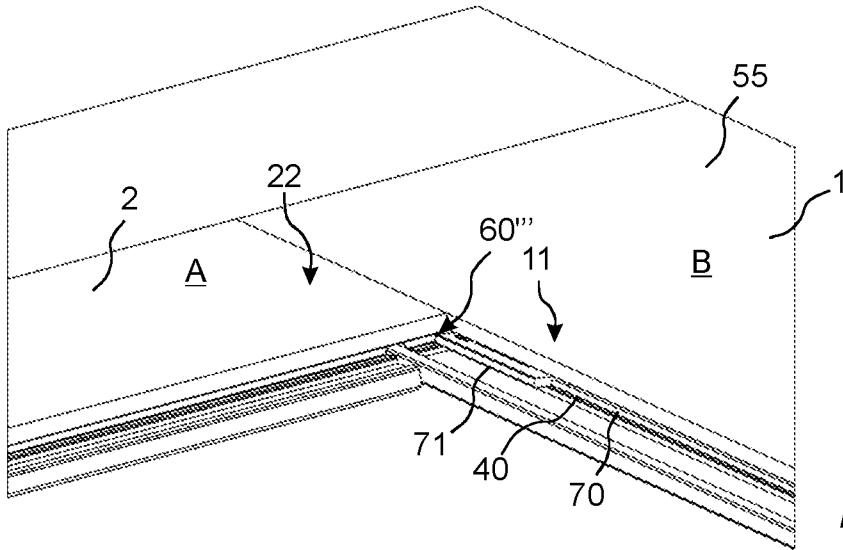


FIG. 8C





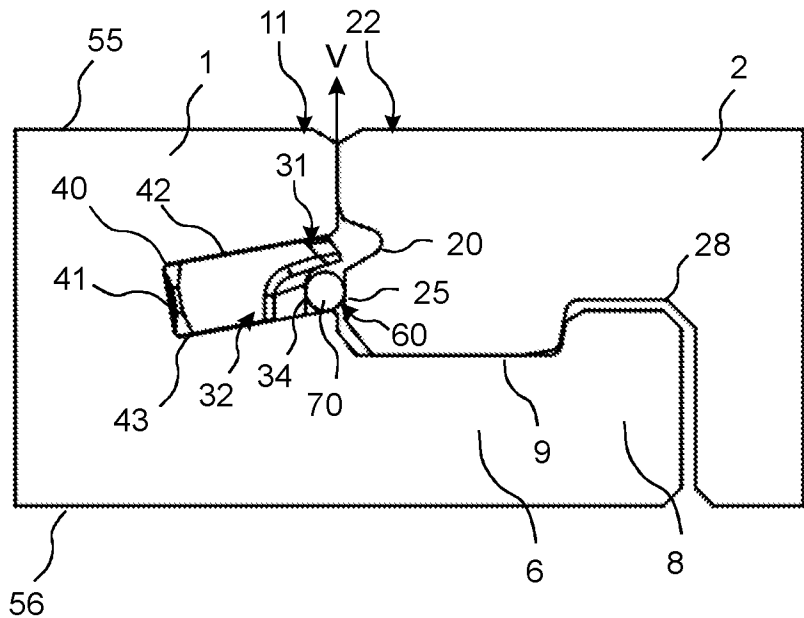


FIG. 3B