US 20120124932A1

(19) **United States**

(12) **Patent Application Publication**

Schulte et al.

(10) **Pub. No.: US 2012/0124932 A1**

(43) **Pub. Date: May 24, 2012**

(54) **COVERING MADE FROM MECHANICALLY INTERCONNECTABLE PANELS**

(76) Inventors: **Guido Schulte**, Ruthen-Meiste (DE); **Franz Eschlbeck**, Prien am Chiemsee (DE)

(21) Appl. No.: **13/387,562**

(22) PCT Filed: **Jul. 10, 2010**

(86) PCT No.: **PCT/DE2010/000803**

§ 371 (c)(1),
(2), (4) Date: **Jan. 27, 2012**

(30) **Foreign Application Priority Data**

Jul. 27, 2009 (DE) 10 2009 034 902.2

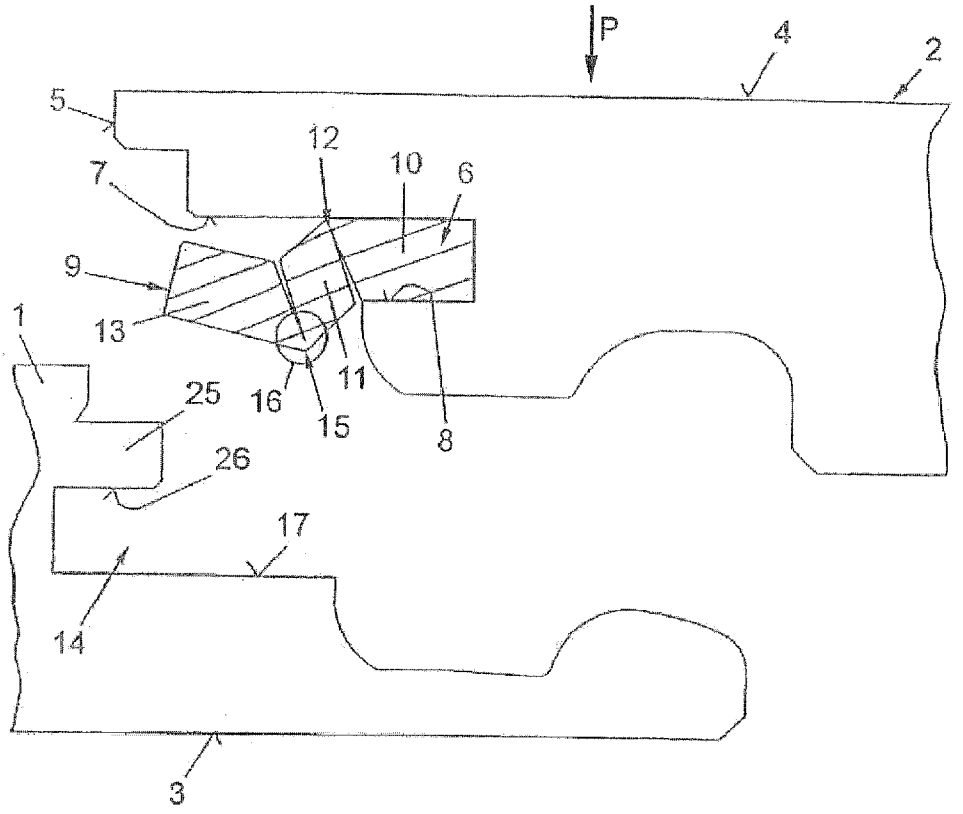
Publication Classification

(51) **Int. Cl.**
E04C 2/38 (2006.01)
E04B 5/00 (2006.01)

(52) **U.S. Cl.** **52/588.1**

(57) **ABSTRACT**

The invention relates to a covering comprising panels that can be connected to each other mechanically, and having the following characteristics:—adjacent first and second panels (**1**, **2**) each having a groove (**6**, **14**) on the sides (**5**, **21**) thereof that are complementary to each other,—the grooves (**6**, **14**) each have upper and lower groove sides (**7**, **8**; **17**, **26**) having different lengths,—in one of the grooves (**6**, **14**) a tongue (**9**, **9***a*, **9***b*, **9***c*, **9***d*) is arranged that can be moved relative to the panel (**1**, **2**) at least in parts, said tongue is suitable for engaging in the corresponding groove (**6**, **14**) of the adjacent panel (**1**, **2**) when the adjacent panels (**1**, **2**) are connected,—the tongue (**9**, **9***a*, **9***b*, **9***c*, **9***d*) has at least one projection (**16**, **33**, **42**, **43**), which points in the direction of the area of the longer groove sides (**7**, **17**) of the other groove (**6**, **14**) that protrudes relative to the shorter groove sides (**8**, **26**),—the projection (**16**, **33**, **42**, **43**) is intended to be moved transversely to the laying plane ( ) of the panels (**1**, **2**) in the event of contact with said area of the groove side (**7**, **17**), wherein the projection (**16**, **33**, **42**, **43**) is operatively connected to a locking section (**13**, **29**, **32**, **35**, **41**, **47**) of the tongue (**9**, **9***a*, **9***b*, **9***c*, **9***d*), said locking section can be moved in the direction of the groove (**6**, **14**) of the adjacent panel (**1**, **2**) as a result of the motion of the projection (**16**, **33**, **42**, **43**),



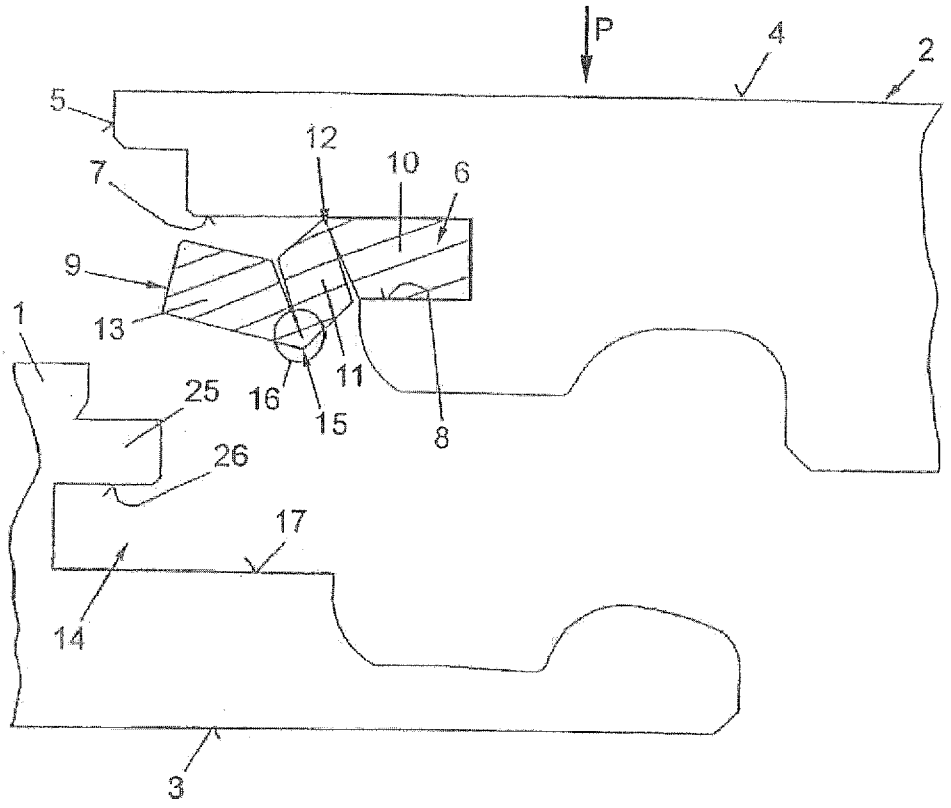

P
4
2
5
12
10
6
7
9
13
1
11
16
15
8
25
26
17
14
3

Fig. 1a

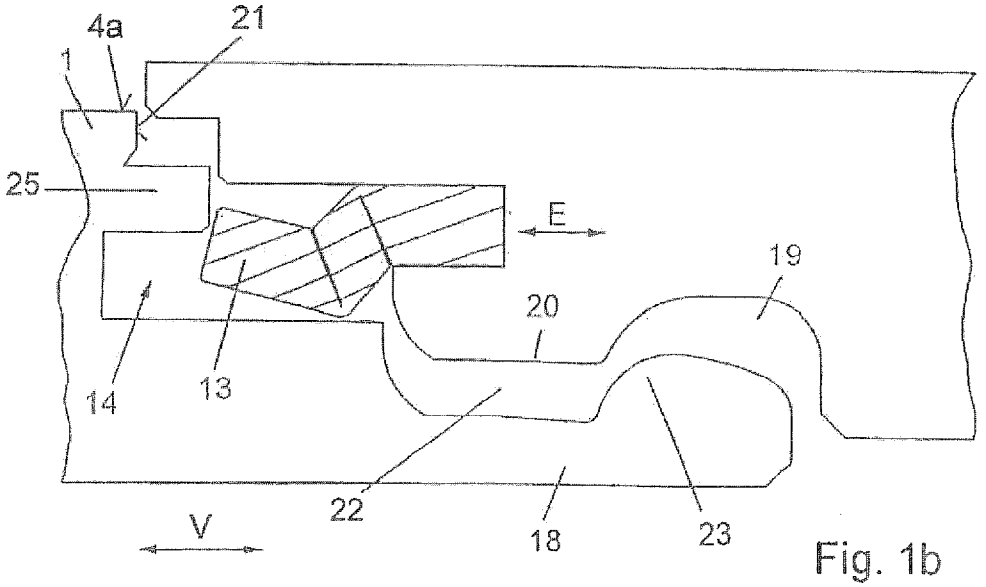

4a
21
1
25
E
19
20
14
13
22
18
23
V

Fig. 1b

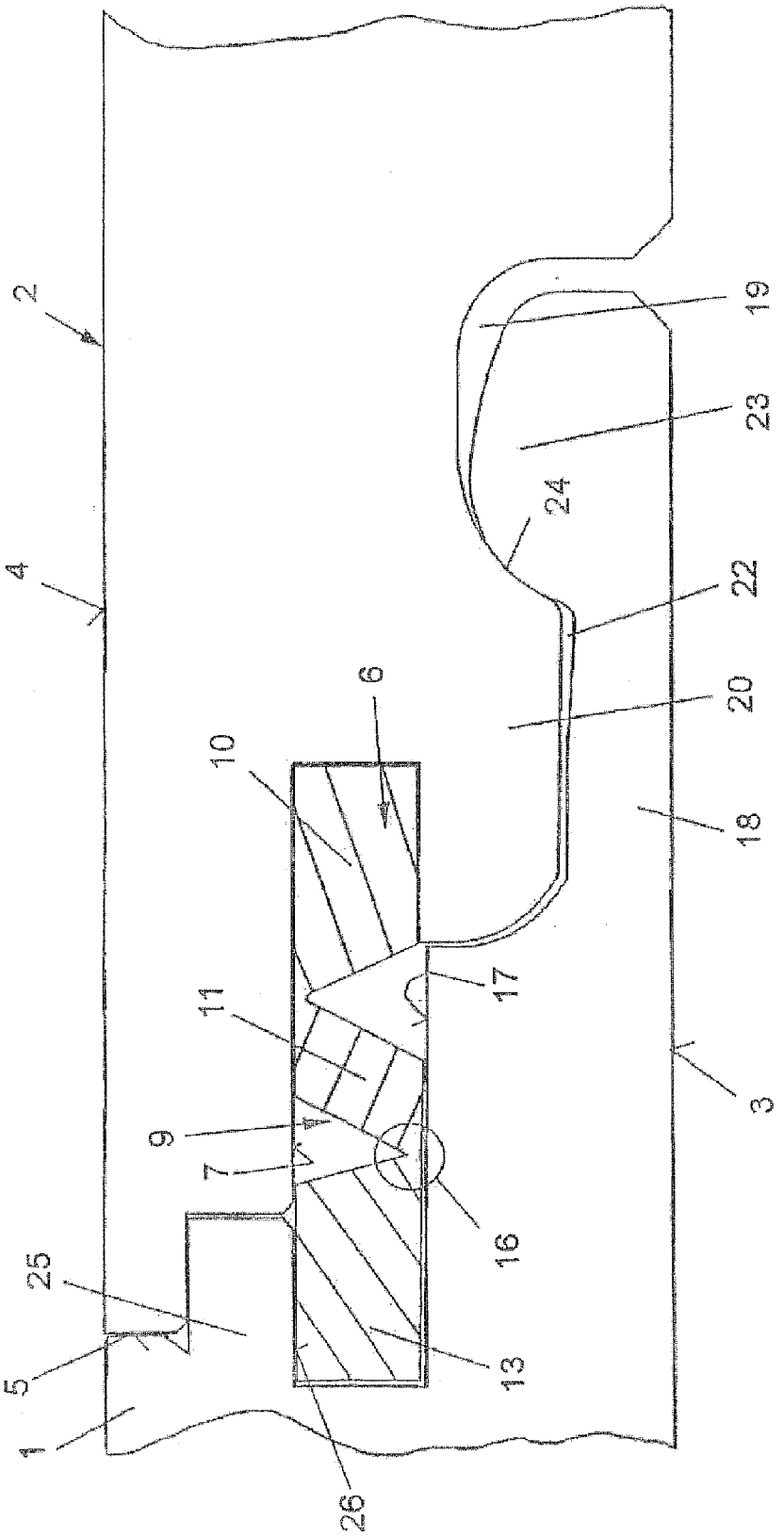


Fig. 1C

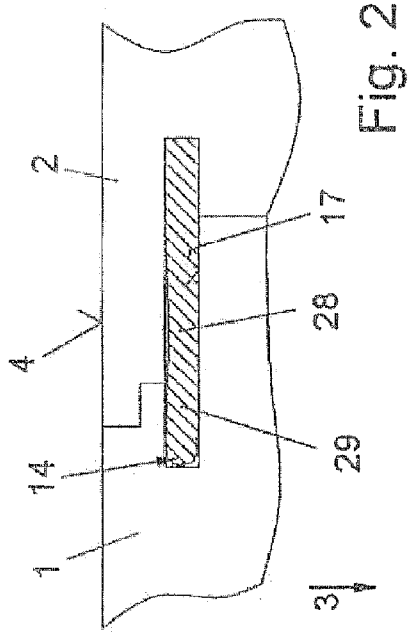


Fig. 2b

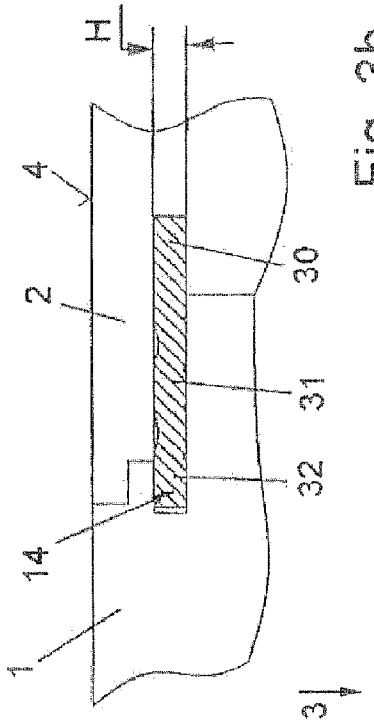


Fig. 3b

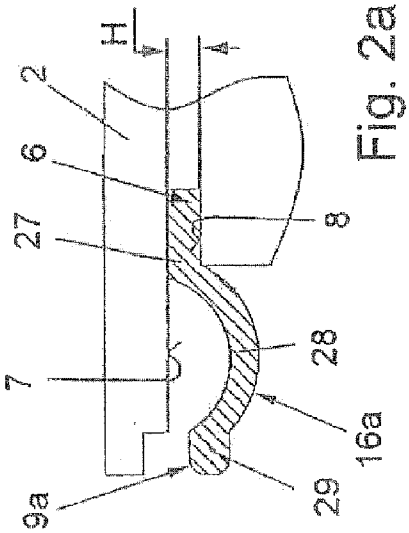


Fig. 2a

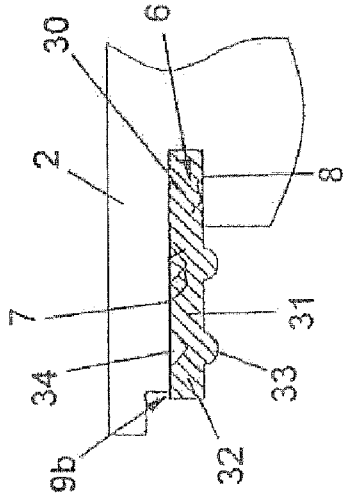


Fig. 3a

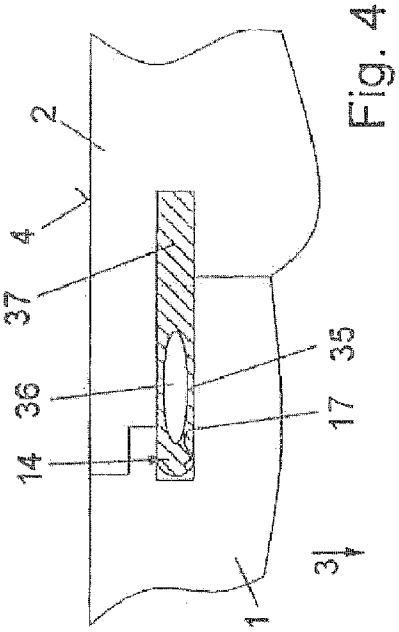


Fig. 4b

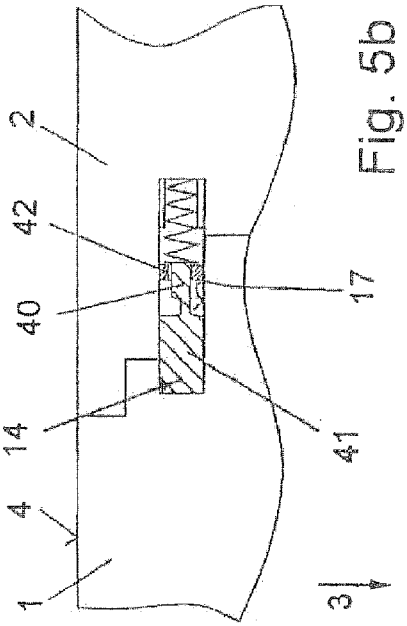


Fig. 5b

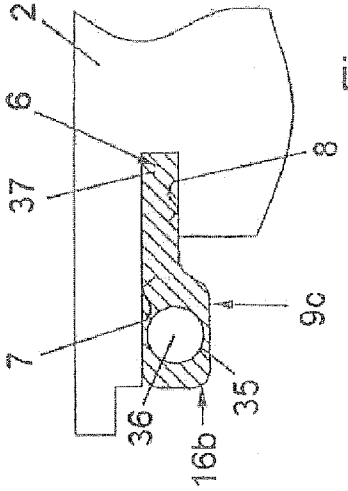


Fig. 4a

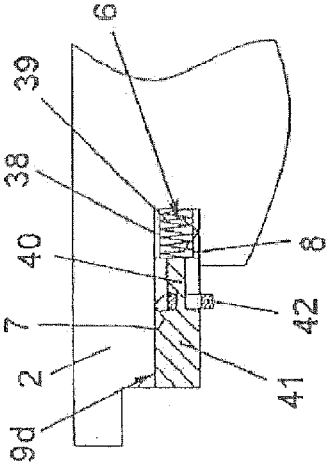


Fig. 5a

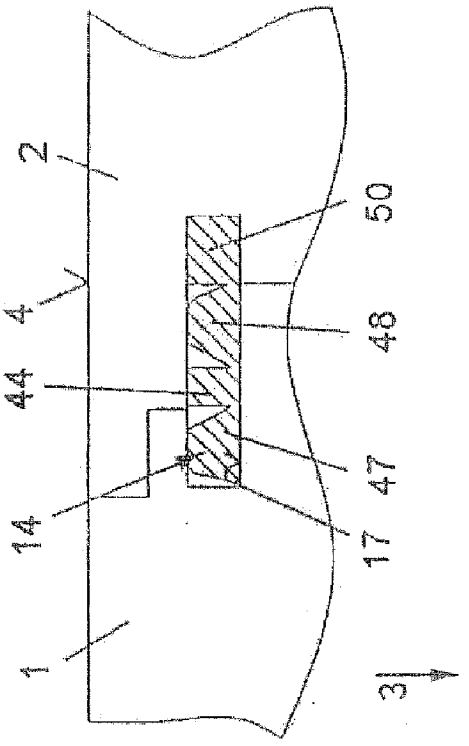


Fig. 6b

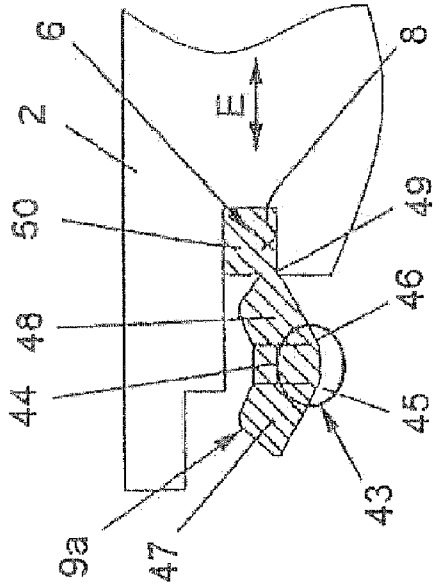


Fig. 6a

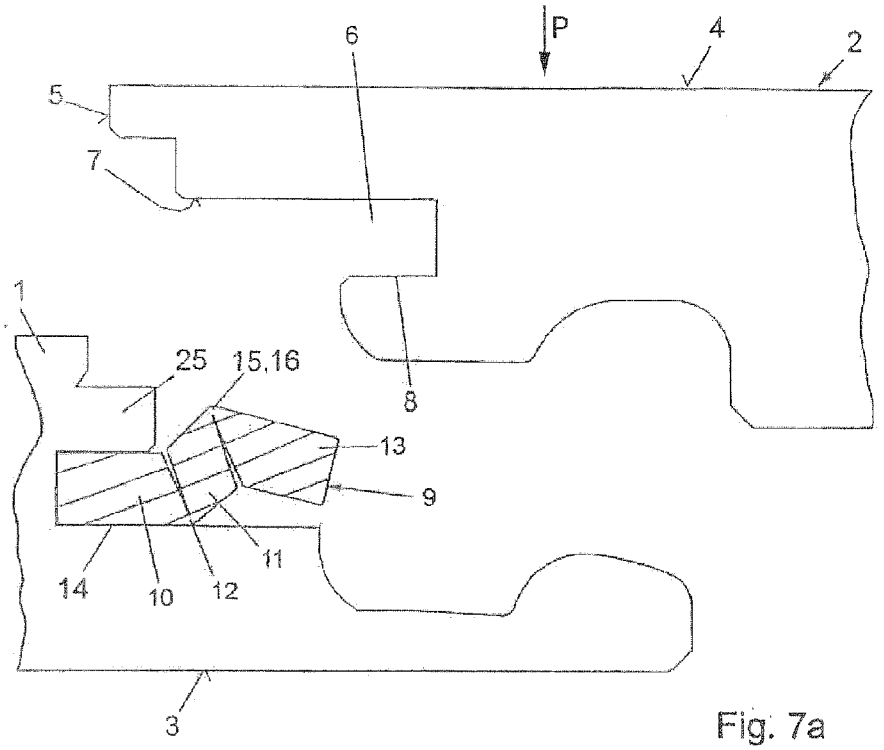


Fig. 7a

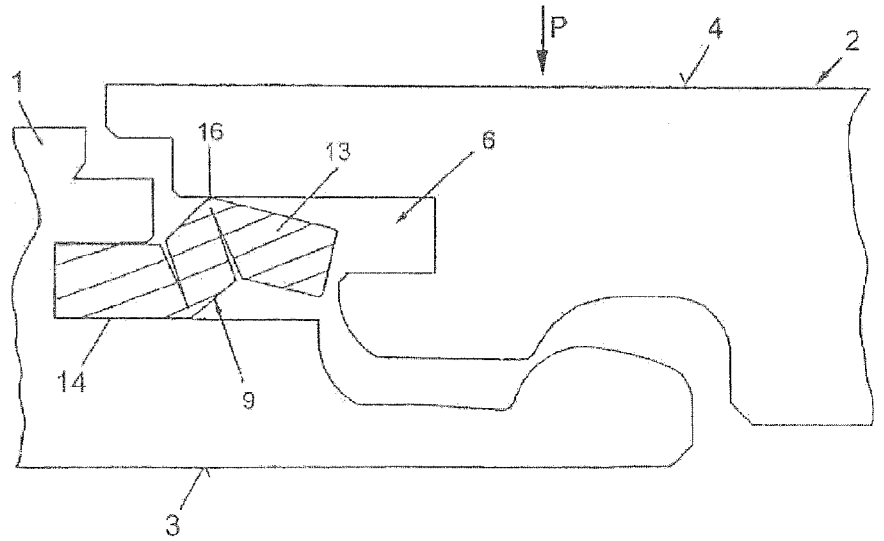


Fig. 7b

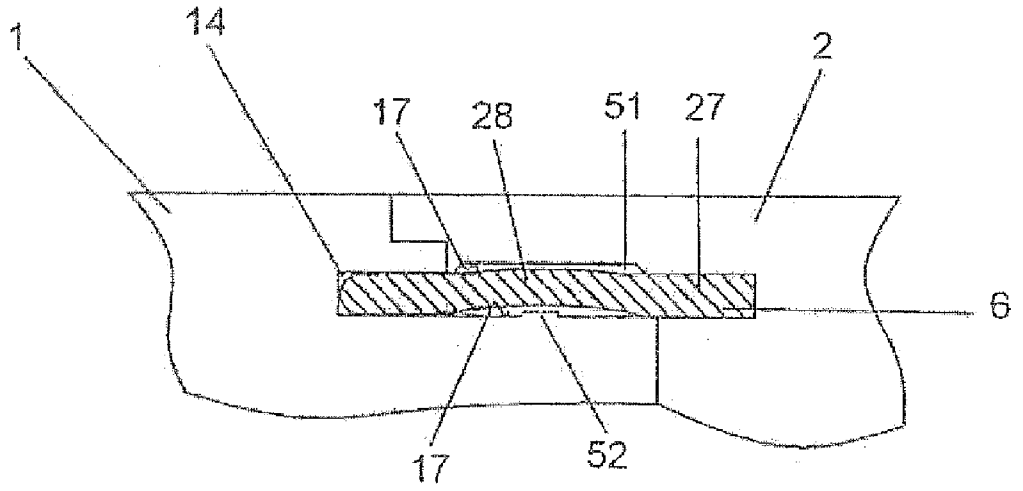


Fig. 8

COVERING MADE FROM MECHANICALLY INTERCONNECTABLE PANELS

[0001] The invention relates to a covering made from mechanically interconnectable panels.

[0002] Wall, ceiling, and floor coverings, such as for example prefabricated parquet, real wood floors or laminate floorings, consist of several rows of predominantly rectangular panels. Conventionally, the panels have continuous grooves on a longitudinal side and a head side, and, on the respective opposing longitudinal side or head side, respectively, continuous tongues which formfittingly match the grooves. The panels are installed by joining the groove and tongue, wherein the panels of two neighboring rows are arranged offset to each other.

[0003] It is known to provide the grooves and tongues with mechanical locking means which, in neighboring panels in a floor covering, form an interlocking engagement with one another. This is intended to prevent the formation of gaps in the installed floor through stretching or shrinking processes. The groove and tongue are provided with locking elements in the form of indentations, recesses or projections, which are matched to each other to retain connected floor panels in the joined position without the use of adhesives. Normally, the panels are turned or clicked into each other along their longitudinal sides and subsequently shifted sideways, such that locking rails on the head sides engage. To facilitate this, hammer strikes can be used in connection with a tapping block. This poses the risk of damage to the panels, even when working most carefully.

[0004] Solutions also exist, in which the abutting head sides are connected by a tongue which is displaceable in its longitudinal direction. This obviates the manual tapping-in with a hammer. The tongues are pre-assembled, which obviates the subsequent inserting. Such a floor covering is the subject matter of WO 2008/017301. In this case a projecting end of a tongue is displaced into a head side groove, to partially displace the tongue from one groove to the corresponding groove of the neighboring panel. In this way the panels are interlocked.

[0005] To enable the displacement of the tongue in the first place, it has to be supported with a certain play, and inserted into the exactly oriented corresponding opposing groove of the complementary panel. Preferably, this play is as small as possible, to prevent a height offset in the region of a gap clearance of two panels. However, because of this design, a certain play cannot be avoided.

[0006] The invention is based on the object to provide a covering from mechanically interconnectable panels, in particular a floor covering, in which the height offset in the region of the gap clearance is minimal.

[0007] This object is solved by a covering with the features of patent claim **1**.

[0008] The sub-claims are directed to advantageous refinements of the invention.

[0009] The panels of the covering according to the invention are intended and suited to be mechanically connected with other similar panels. The connection takes place via connecting elements in form of groove and tongue connections, disposed on the complementary sides of the panels. The neighboring panels each have a horizontal groove on their mutually complementary sides. In one of the grooves, a tongue is disposed which is at least partially displaceable relative to the panel. When connecting the neighboring panels, the tongue engages into a groove of the neighboring panel and blocks the neighboring panels from becoming vertically displaced relative to each other. The tongue has a retaining section, which is arranged in the groove of the panel holding the tongue.

[0010] The tongue has at least one projection. The projection projects transverse to the plane of installation, which means in the direction of the top side or to the bottom side of the panel. A projecting is given, if in the locking position, the projecting region of the tongue is broader than the groove width measured transverse to the plane of installation in the region of the projection. Therefore, the projection projects in particular over the retaining section of the tongue.

[0011] It is noted that, for orientation of the grooves, and with that the tongues arranged in the grooves, the grooves are preferably oriented horizontally, which means oriented in the plane of installation. It is also possible however, that the grooves and with that the tongues are inclined, which means form an acute angle with the plane of installation.

[0012] The grooves have each upper and lower groove flanks with different lengths, such that the regions of the longer groove flanks protruding with respect to the shorter groove flanks are located opposite one another. These protruding regions of the groove flanks serve as support surfaces for the projection. The projection is provided so as to be displaced, during contact with this protruding region of the groove flank, perpendicular to the plane of installation, i.e. typically perpendicular to the plane of installation of the panels. In other words, the projection and/or the protruding region of the tongue is not only urged backward in the vertical direction and reduced to the width of the groove between the opposing projecting regions of the longer flanks, but are simultaneously also displaced in the plane of installation i.e. horizontally. The horizontal displacement results because the projection is a fixed component of the tongue which is supported with one end already in the groove, i.e. is configured so that the other end of the tongue is displaced along the plane of installation. The projection is therefore operatively connected to the locking section of the tongue which can be displaced by moving the projection towards the groove of the adjacent panel.

[0013] Groove within the context of the invention does not only refer to the region extending between the directly opposing groove flanks. It includes also the region opposite the long groove flank, because this space is taken up by the tongue. The groove flanks, in particular the longer groove flanks may vary in their distance viewed across the groove depth. In particular, the regions of the longer groove flanks which protrude over the shorter groove flanks may be dropped or offset with respect to shorter groove flanks, thereby increasing the distance to the opposing flank. The dropped regions nevertheless are part of the groove. The retaining section may be connected to the locking section via a connecting section. Depending on the installation position, the connecting section is preferably connected to the retaining section by way of a joint arranged on an edge oriented towards its top side or bottom side of the panel. The locking section is coupled with the connecting section by way of a joint arranged on its diagonally opposing edge. The position of the hinge significantly determines the position of the far protruding point of the projection.

[0014] Before two panels are connected the tongue is at least partially folded in its initial position, wherein retaining

section, connecting section and locking section are pivoted about the joints with respect to each other in the vertical direction from the plane of the retaining section. To enable such folding, opposing side faces of retaining section connecting section and locking section are each beveled in a complementary fashion towards the top side and bottom side of the panels.

[0015] For connecting two adjacent panels, the projection is displaced by moving the longer groove flanks of the panels closer. Depending on the installation position, the projection can also face upward or downward. Preferably, the projection is displaced through contact with a lower groove flank of the first panel receiving the locking section. The vertical movement causes a horizontal movement during which the projection slides along the lower groove flank of the groove receiving the locking section. This causes the connecting section to pivot about both joints in the horizontal plane of the retaining section. The locking section is also pivoted about the joint of the projection into the horizontal plane of the retaining section. The tongue is expanded from its folded state as soon as the longer groove flanks have approached as closely as possible. This is the case when the height offset between adjacent panels is minimal. The locking section is pushed by the expansion motion of the tongue into the groove of the first panel. To facilitate insertion of the connecting section into the groove, a face of the connecting section facing the groove can be beveled or rounded.

[0016] After displacement of the locking section of the tongue into the groove of the adjacent panel, the joint between the locking section and connecting section is located at the height of the lower groove flank of the groove receiving the locking section. Retaining section, connecting section and locking section are preferably oriented horizontally after two adjacent panels are connected. Because the lower groove flank of the groove retaining the tongue extends only across a width of the retaining section, the surfaces of connecting section and locking section are oriented towards the bottom side of the panels rest on a lower groove flank of the groove receiving the locking section of the tongue.

[0017] Beside the embodiments described above, it is also conceivable to connect individual sections of the tongue at the center. In this case the projection is formed by the edges of the connecting section and the locking section which are oriented towards the bottom sides of the panels. Beside the retaining section, the connecting section and the locking section, the tongue can also have further sections.

[0018] Further, embodiments of tongues are conceivable, in which a projection is coupled to a certain mechanism. This mechanism has the effect that a locking section of the tongue is pushed in horizontal direction into the groove of the neighboring panel. The mechanism is triggered, as soon as the projection comes into contact with a corresponding groove flank and is displaced in the direction of the other groove flank.

[0019] The concrete configuration of the tongue also depends on the mode of installation in particular, when the panel is not to be placed in a parallel, linear movement, but is to be quasi angled by a pivoting movement. During the pivoting movement, the projecting regions of the longer groove flanks, viewed over the length of the groove at a given time point, approach each other to a different degree. Example: In a 45°—position, the groove flanks are located at one end of the groove almost in the end position, while the groove flanks at the other end are several centimeters apart. Especially in this case it is useful to either provide multiple tongues arranged at a distance from each other, which do not interfere with each other in their kinematics. However, it is also possible to provide a tongue which is divided into tongue sections by slots arranged transverse to the groove, which sections can be operated independent of each other.

[0020] Preferably, the tongue segments have a common retaining section. This configuration can be referred to as comb-like. This embodiment has proven to be especially advantageous, when the second panel, starting at one end of the groove, is lowered in longitudinal direction of the groove, such that the tongue sections engage in the groove of the first panel one after another. Panel segments which can be operated independent of each other can also be used in all other installation modes, which means also in the case in which the panels are not pivoted relative to each other, but are placed in a parallel movement.

[0021] The locking section can have a profiling on its side surface pointing towards the top and/or lower groove flank. The connecting section, like the locking section, has a profiling on one or both side surfaces. This profiling can, for example, be wave-like, can have individual prongs or a sawtooth profile.

[0022] The groove flanks of the panel can have a profiling which is complementary to the profiling. Likewise, it is possible to provide latching elements on one or both side surfaces of the locking section, which engage into corresponding recesses of the upper or lower groove flank of the neighboring groove when inserting the locking section into the groove of the neighboring panel.

[0023] It is important that the locking section bridges the gap formed between the shorter groove flank and the bordering longer groove flank of the other groove, to minimize the height offset in the region of the butt joint of the panel. The locking section thus has to project partly from the groove by which it is received, which means it has to project over the shorter groove flank of this groove.

[0024] In general, the tongue can extend over the entire length of the groove. Additionally, multiple tongues can be provided spaced apart in longitudinal direction of the groove. These can have locking sections which can be operated independent of each other. In this way the panels can also be arranged in longitudinal direction of the groove, offset to each other. Here, it is conceivable to connect the retaining sections to each other in the region of the groove, wherein the connection can at the same time be used as spacer between the tongues.

[0025] A locking rail is provided on one of the panels for protecting the neighboring panels from tensile loading in a plane of installation. The locking rail thus has the purpose to couple the panels in the plane of installation, whereas the tongues prevent the panels from shifting vertically relative to each other. Additionally, since the locking rail, which engages underneath the neighboring panel, is arranged at a relatively large distance to the top side of the panel, the panel which is engaged underneath by the locking rail is primarily supported on a support rail which is arranged at a greater distance to the locking rail than the groove. In other words, the groove is located between the support rail and the locking rail. The support rail has the function to reduce the distance between the point of support and the top side of the panel, which is advantageous especially in the case of thin-flanked and softer materials. Because of the proximity of the support rail to the top side of the panel, vertical forces, which apply at points

close to a butt joint and act on the panel which is engaged underneath, can be transferred to the bordering panel which engages underneath, via a shorter distance, than would be possible via the lower positioned locking rail. Because of the support immediately next to the point of applied force, the height offset between two panels is significantly smaller.

[0026] The tongue as a whole can be made of a uniform material. Regions which are configured appropriately thin can serve as film joints. The thicker regions then serve to absorb forces which apply transverse to the plane of installation.

[0027] The material for the tongues can be a wood material, which means it can be wood or a material that contains wood fibers, or a material, which is constructed from wood as a base material, such as for example liquid wood. Metal and metal alloys, such as for example spring steels, as well as composite materials, can be used for the tongues. It is also possible to use bimetals or mixed plastics, as well as materials that are based on thermoplastic or thermosetting materials. The tongue can also be made from fiber reinforced plastic. Preferably, the tongue is configured elastic.

[0028] The tongue can be configured such that it is pre-tensioned before connection. Through the pre-tension the locking section is pushed into the groove of the neighboring panel and the connection of two panels is additionally secured.

[0029] Tongues with return forces which result from elasticity or from using a spring metal, are able to cause the tongue to retract or jump back to the starting position when the connection is released.

[0030] The joints, which connect sections of the tongue, are preferably constructed from the same material as the tongue. Of course it is also possible to choose a different material here, for example a type of hotmelt. Hotmelt relates to hotmelt adhesives which for example are based on polymers, resins, or waxes and are still flexible after setting. The fundamental idea is based on a functional separation of elastic and non-elastic regions. While the flexible regions require malleable materials, a deformation of the locking section is not desired. Therefore, a material with less elasticity should be used for the locking section than in the region of the joints, or the connecting section, respectively.

[0031] A particularity are tongues, which can assume two states. The tongue can assume a stable position as well as a meta-stable position from which the tongue can return to the stable position when the applied force is removed. Also, a bistable tongue can be provided which is characterized in that two stable positions exist and each change from one position to the other requires the application of force.

[0032] The tongue with a meta-stable position is transitioned from a stable position to a meta-stable position by the process of warping, wherein the return force from the meta-stable position into the stable position is much smaller than vice versa. This favorable force-displacement characteristic can also be taken advantage of in the present invention. The warping is equivalent to a projection on the tongue which is to be displaced. The projection is displaced until the tongue abruptly jumps into the meta-stable position. This is the locking position. The locking position can also be noticed acoustically by a popping sound as it occurs in the case of tongues made from metal or at least in the case of warpings made from metal. Additionally, however a slight jolt occurs, when the locking position is reached. The haptic information and also the acoustic information of the so called clicker-effect are a useful feedback during installation and also during removing of the panels. With regard to the materials the clicker-effect primarily occurs in metallic materials. However, the principle can also be realized with other warpable materials, as for example plastics.

[0033] There is no limitation with regard to the material of the panel, so long as it can be machined to the required shaped, in particular by material removing machining. These can be panels based on wood materials or plastics, as well as mineral materials and composite materials. Also, the size of the panels plays a lesser role. The panel can be large-format, for example as component plates of 600 mm×1500 mm.

[0034] The inventive idea is applicable in particular to all floor systems, in which a finish is disposed on a carrier, as for example real wood finishes, laminate, carriers with lacquered surfaces as finish, linoleum, cork on carrier panels etc. The cover layer can in particular comprise a décor paper with overlay, which determines the appearance of the panel. A floor covering can thus be a parquet floor, a finished parquet floor, a real wood floor or a laminate floor.

[0035] The floor covering can in particular be a double floor or wood floor, with a hollow space underneath the covering, which means underneath the panels, which is used for installing wiring. Especially in the case of these double floors it is advantageous, when individual panels can be removed again, which can be accomplished easily with the invention. Because the afore mentioned tongues can be present not only on the head sides but also on the longitudinal sides of a panel, it is possible to lift individual panels again, for example with a vacuum lifting tool, and subsequently set down again.

[0036] In the following, the invention is explained by way of the embodiments shown in the schematic drawings. It shows:

[0037] FIGS. **1***a* to **1***c* a section of the connection region of two neighboring panels, in different mounting positions in a cross section, respectively, and

[0038] FIGS. **2***a* to **7***b* and **8** different embodiments of the tongue, respectively.

[0039] FIG. **1***a* shows a cross section through the connection region of two panels **1**, **2**. The panels **1**, **2** are configured such that the panels **1**, **2** can be connected to form a floor covering. The panels **1**, **2** have a bottom side **3** pointing towards the installation surface and a top side **4** pointing away from the installation surface. The diagram shows a left first panel **1** and on the right side a second panel **2**, before the connection of the two panels **1**, **2**. On its head side, which in the following is referred to as side **5**, and which in installation position faces towards the first panel **1**, the second panel **2** has a groove **6** extending in horizontal direction. Here, an upper groove flank **7** is broader than a lower groove flank **8**. A tongue **9** is arranged in the groove **6**.

[0040] The tongue **9** is arranged in the groove **6** with its retaining section **10**. The retaining section **10** is coupled to a connecting section **11** via its edge which projects over the lower groove flank **8** and points towards the top side **4** of the panel **2**. The retaining section **10** and connecting section **11** are coupled by a joint **12**. In this embodiment this joint **12** is configured as film joint. It is made from the same material as the tongue **9** and can be manufactured together with the tongue **9** in a single manufacturing step. Following the connecting section **11** is a locking section **13**, which is provided to engage with a groove **14** which is complementary to the groove **6** of the second panel **2**. The locking section **13** is connected to the connecting section **11** via a joint **15**, which is

here also configured as film joint. The joint **15** is arranged between two edges of the locking section **13** and the connecting section **11**, which face towards each other and towards the bottom side **3** of the panels **1**, **2**. The connecting region between locking section **13** and connecting section **11**, together with the joint **15**, forms a projection **16**, which projects over the groove **6** of the second panel **2** in the direction of the bottom sides of the panels **1**,**2**. The side surfaces of the retaining section **10** and connecting section **11** which face towards each other are configured such that the tongue **9** is quasi folded in a starting position, in which the connecting section **11** is pivoted relative to the retaining section **10** and the locking section **13** is pivoted relative to the connecting section **11**, out of the horizontal plane E of the retaining section **10**.

[0041] When connecting the first panel **1** with the second panel **2**, the projection **16** comes into contact with a lower groove flank **17** of the groove **14** which receives the locking section **13** (FIG. **1***b*). When the second panel is further displaced in the direction of the arrow P, the projection **16** is pushed by the lower groove flank **17** into the direction of the top side **4** of the panel **2**. At the same time the connecting section **11** and the locking section **13** are pivoted relative to each other from the folded position into a horizontal plane E of the retaining section **10**. The locking section **13** projects over the length of the upper groove flank **7** and engages in the groove **14** of the neighboring first panel **1**.

[0042] The first panel **1** engages underneath the second panel **2** with a locking rail **18**. For this purpose, the second panel **2** has a coupling channel **19** which is open to the bottom, and adjoining the coupling channel **19**, an end-side coupling bulge **20** which is oriented downwards. The locking rail **18** of the first panel **1** projects horizontally over a head side referred to as side **21** such that the coupling bulge **20** engages in the coupling channel **22** of the locking rail **18**, which coupling channel **22** is open to the top. Adjoining the coupling channel **22** at the end side of the locking rail **18** is an upwards oriented coupling bulge **23** which is open to the top, and which, in mounted position, engages in the associated coupling channel **19** of the second panel **2**. The indentation of the coupling bulges **20**, **23** secures the two panels **1**, **2** against displacement in the plane of installation, which means in horizontal direction of the installed floor covering. Because the coupling bulges **20**, **23** abut each other in their region of contact such that they are slanted relative to the plane of installation V, the second panel **2** when pivoted downward in the direction of the arrow P onto the already installed first panel **1**, is pulled toward the first panel **1** with its site **5**, which is complementary to the side **21** of the first panel **1**, such that the sides **5**, **21** of the panels **1**, **2** abut each other.

[0043] In addition to the contact between the coupling bulges **20**, **23** the second panel **2** rests on a support rail **25** above the groove **14**. The support rail **25** is thus located at a smaller distance from the top side **4** of the left panel **2** than the locking rail **18**, which normally supports the panel **2** in vertical direction. Because of the small distance of the support rail **25** to the top side **4**, narrower tolerances can be maintained, such that a possible height offset between the panels **1**, **2** can be minimized with this solution. The support rail **25** borders immediately at the groove **14**, such that its bottom edge is part of an upper groove flank **14**. The support rail **25** thus co-extends with the groove **14** which receives the locking section **13** of the tongue **9**.

[0044] The panels **1**, **2** contact each other preferably at defined support and holding points. The locking rail **18** and the coupling bulge **20** contact each other in this embodiment only in the previously described region of contact **24**. However, the spaces that remain between the locking rail **18** and the coupling bulge **20** are gaps which are so small that a contact cannot be ruled out in the case of extreme vertical load, which is due to the limited elasticity of the materials. In addition, the spaces allow compensation of manufacturing tolerances.

[0045] In the locking position shown in FIG. **1***c*, the locking section **13** extends out of the left groove **14** and thus bridges the gap between the neighboring upper groove flanks of the left and the right groove **14**, **6**.

[0046] For the sake of clarity the reference signs for panels **1**, **2** have been adopted in the FIGS. **2***a* and **5***b*, described in the following, which does not exclude however, that, in the concrete embodiments, the panels **1**, **2** can differ slightly from each other because of the adjustment to the different tongues.

[0047] Further, only details of the panels **1**, **2** are shown below. However, all have the locking rail described in FIGS. **1***a* to **1***c*.

[0048] FIG. **2***a* shows a further embodiment of a tongue **9***a* arranged in a second panel **2**. The tongue **9***a* is fixed in the groove **6** of the second panel **2** with a retaining section **27**. The connecting section **28** which adjoins the retaining section **28** is arched. The arched connecting section **28** forms a projection **16***a*, which projects in the direction of the bottom side **3** over the lower groove flank **8** of the groove **6**, which holds the tongue **9***a*. The locking section **29**, which adjoins the connecting section **28** is oriented approximately transverse to the longitudinal direction of the groove **6**. Of course, embodiments are also conceivable in which the locking section is formed by an end section of the connecting section which points towards the neighboring panel.

[0049] When connecting two neighboring panels **1**, **2** the arched connecting section **28** is displaced by a lower groove flank **17** of the groove **14** of the first panel in the direction of the upper groove flank **7**of the groove **6** of the second panel **2**. By that, the arched connecting section **11** **28** of the tongue **9***a*, is flattened and the locking section **29** is shifted transverse to the longitudinal direction of the groove **6** into the groove **14** of the first panel **1**. The tongue **9***a* is quasi stretched. The arched connecting section **28** is upset between the lower groove flank **17** of the groove **14** of the first panel **1** and the upper groove flank **8** of the groove **6** of the second panel **2**. By that, the tongue **9***a* becomes longer and because of its elasticity is preloaded when connecting the neighboring panels **1**, **2**. The tongue **9***a* is thus pre-tensioned and engages force-fittingly in the opposing grooves **6**, **14** of the panels **1**, **2** (FIG. **2***b*).

[0050] FIG. **3***a* shows a further embodiment of a tongue **9***b* made from an elastic material. The tongue **9***b* is divided into three sections. Thereby, a projection is provided between the retaining section **30** and the connecting section **31**, as well as between the connecting section **31** and the locking section **32**, respectively. The projections **33** project over the lower groove flank **8** of the groove **6** of the second panel **2** in the direction

of the bottom **3** of the panel **2**. Opposite both projections **33**, i.e. on the side of the tongue **9***a* which points towards the top **4** of the panel **2**, a recess **34** is arranged. As shown here, the recess **34** can have a triangular cross section. Semicircular or rectangular cross sections are also conceivable.

[0051] When connecting two neighboring panels **1**, **2** the lower groove flank **17** of the groove **14** of the first panel **1** pushes the projections **33** in the direction of the upper groove flank **7** of the groove **6** of the second panel **2**. Because of the elastic material used here, the material of the projections which are pushed towards the top **4** enters the respective opposing recess **34** and the tongue **9***b* expands transverse to the longitudinal direction of the groove **6**. The expansion causes the locking section **32** to enter the groove **14** of the first panel **1**. Because the height H of the grooves **6**, **14** of the first panel **1** and the second panel **2** remains constant after connection, the pressure exerted by the lower groove flank **17** on the projections **33** remains, the tongue **9***b* remains stretched and force fittingly engages in the grooves **6**, **14** of the panels **1**, **2**. (FIG. **3***b*).

[0052] In a further embodiment (FIG. **4***a*) connecting and locking section **35** of the tongue **9***c* are configured in one piece. Here, a space **36** is provided in the connecting and locking section **35**, which extends in longitudinal direction of the groove **6**. Of course multiple spaces are also conceivable in alternative embodiments. The retaining section **37** which is connected to the connecting and locking section **35** is arranged in the groove **6** of the second panel **2**.

[0053] On the side of the tongue **9***c* which points towards the bottom side of the panels **1**, **2** a projection **16***b* is arranged in the region of the space **36**, which projects over the lower groove flank **7** of the second panel **2** in the direction of the bottom side **3** of the panels **1**, **2**. The projection **16***b* is formed by a region of the connecting and locking section **35**, which is broadened relative to the height H of the groove **6**. The tongue **9***c* is manufactured from elastic material such that when connecting two panels **1**, **2** the projection is pushed upwards by the lower groove flank **17** of the groove **14** of the first panel **1**, in the direction of the upper groove flank **8** of the groove **6** of the second panel **2**. Because of the elasticity of the tongue **9***c*, the broadened region of the connecting and locking section **35** is reduced in its width to the height H of the groove **6** of the second panel **2**, or the groove **4** of the first panel **1**, respectively. The circular cross section of the space **36** is transformed into an ellipsis, which causes a stretching of the locking and connecting section **35** in longitudinal direction of the groove **6**. The stretching causes the locking and connecting section **35** to enter the groove **14** of the neighboring first panel **1** and is held there in a force fitting manner. (FIG. **4***b*)

[0054] FIG. **5***a* shows an exemplary and schematic representation of a tongue **9***d* with a locking mechanism. Here, the tongue **9***d* has a retaining section **38** with which it is held in the groove **6** of the second panel **2**. The retaining section **38** has a spring element **39** which is preloaded in starting position. The retaining section **38** is connected to the locking section **41** via a connecting section **40**. The connecting section **40** has a projection **42** which projects over the lower groove flank **8** of the groove **6** of the second panel **2** in the direction of the bottom side **3** of the panels **1**, **2** via which it is held at the same time in the starting position by the preloaded spring element **39** of the retaining section **38**.

[0055] When connecting two panels **1**, **2** the projection **42** is displaced by the lower groove flank **14** of the first panel **1** in the direction of the top side **4** of the second panel **2**. This causes the retention of the connecting section **41** to be released and the spring force F of the spring element **39** acts on the connecting section **41** which in turn acts on the locking section **42** and displaces it into the groove **14** of the first panel **1**. The force F of the spring element **39** which acts transverse to the longitudinal direction of the groove **14** causes a force fitting engagement of the locking section **42** in the groove **14** of the first panel **1** (FIG. **5***b*).

[0056] The tongue **9***e* shown in the exemplary embodiment of the FIGS. **6***a* and **6***b* has an alternative configuration to the tongue **9** shown in the FIGS. **1***a* to **1***c*. Here, a projection **43** which projects over the lower groove flank **8** of the groove **6** of the second panel **2** is formed by a first section **44** of the two-part connecting section. The first section **44** is connected to the locking section **47** and to the second section **48** of the connecting section via a respective joint **45**, **46**. The second section **48** of the connecting section is connected to the retaining section **50** of the tongue **9***e* via a further joint **49**. All joints **45**, **46**, **49** are arranged at a side surface of the tongue **9***e*, which points towards the bottom side of the second panel **2**. The first section **44** is arranged in a plane which is parallel to the plane E of the retaining section **50**. The locking section **47** as well as the second section **48** are slanted relative to the plane E of the retaining section **50**.

[0057] When connecting two neighboring panels **1**, **2** the projection contacts the lower groove flank **17** of the groove **14** of the opposing first panel **1** and, by further lowering of the second panel **2**, is displaced in the direction of the arrow P towards the top side **4** of the panels **1**, **2**. This displacement causes the first section **44** to be moved into the plane of the retaining section **50**. During this, the locking section **47** is displaced into the groove **14** of the neighboring first panel **1**. If the tongue **9***e* is pre-tensioned, the panels **1**, **2** are additionally braced against each other by the internal stress of the tongue **9***e*.

[0058] FIGS. **7***a* and **7***b* show an embodiment, in which the tongue **9**, as shown in FIG. **1** is rotated by 180° and instead of being arranged in the right panel **2**, is now arranged in the left panel **1**. The retaining section **10** is now located in the left groove **14**. The locking section **13** has to be inserted into the right groove **6**. The projection **16** points upwards and no longer downwards.

[0059] With regard to further functions, reference is made to the descriptions of the FIGS. **1***a* to **1***c*, since in FIG. **7** merely the orientation and assignment of the tongue is changed.

[0060] The example of FIG. **7** is representative of the possibility to modify all further shown embodiments with regard to the mounting location of the tongue. Thus, in all embodiments, the tongue can be rotated by 180° and mounted in the corresponding groove of the other panel.

[0061] The embodiment of FIG. **8** is a modification of the embodiment of FIG. **2***b*. The tongue in this embodiment can be transformed into the meta-stable position. The stable position corresponds essentially to the representation in FIG. **2***a* with the difference that the arched connecting section is configured as a warp. This warp is pushed back beyond a tipping point until the connecting section **28** extends in the other direction. For this, a corresponding recess **51** is provided on the upper groove flank **7** and a pusher **52** on the lower groove flank **17**.

[0062] In all embodiments, the geometry of the tongue is shown and described as being rectangular. The invention

however, does not exclude tongues with other geometries, such that the shown and described shape is representative for other geometries.

REFERENCE SIGNS

[0063] **1**—panel
[0064] **2**—panel
[0065] **3**—bottom side
[0066] **4**—top side
[0067] **5**—side
[0068] **6**—groove
[0069] **7**—upper groove flank
[0070] **8**—lower groove flank
[0071] **9**—tongue
[0072] **9***a*—tongue
[0073] **9***b*—tongue
[0074] **9***c*—tongue
[0075] **9***d*—tongue
[0076] **9***e*—tongue
[0077] **10**—retaining section
[0078] **11**—connecting section
[0079] **12**—joint
[0080] **13**—locking section
[0081] **14**—groove
[0082] **15**—joint
[0083] **16**—projection
[0084] **16***a*—projection
[0085] **16***b*—projection
[0086] **17**—lower groove flank
[0087] **18**—locking rail
[0088] **19**—coupling channel
[0089] **20**—coupling bulge
[0090] **21**—side
[0091] **22**—coupling channel
[0092] **23**—coupling bulge
[0093] **24**—region of contact
[0094] **25**—support rail
[0095] **26**—groove flank
[0096] **27**—retaining section
[0097] **28**—connecting section
[0098] **29**—locking section
[0099] **30**—retaining section
[0100] **31**—connecting section
[0101] **32**—locking section
[0102] **33**—projection
[0103] **34**—recess
[0104] **35**—locking and connecting section
[0105] **36**—space
[0106] **37**—retaining section
[0107] **38**—retaining section
[0108] **39**—spring element
[0109] **40**—connecting section
[0110] **41**—locking section
[0111] **42**—projection
[0112] **43**—projection
[0113] **44**—first section
[0114] **45**—joint
[0115] **46**—joint
[0116] **47**—locking section
[0117] **48**—second section
[0118] **49**—joint
[0119] **50**—retaining section
[0120] **51**—recess
[0121] **52**—pusher
[0122] E—plane
[0123] V—plane of installation
[0124] P—arrow
[0125] H—height
[0126] F—spring force

1.-**18**. (canceled)

19. A covering, comprising:

first and second panels disposed adjacent to one another and having confronting sides which complement one another, each said side having a groove, wherein the groove of one of the confronting sides and the groove of the other one of the confronting sides have upper and lower groove flanks of different lengths to define a short groove flank and a long groove flank which projects beyond the short groove flank by a protruding region; and

a tongue having a locking section, a retaining section, and a connecting section which is displaceable relative to the retaining section and the locking section, said tongue being movably received in one of the grooves of one of the first and second panels for engagement in the groove of the other one of the first and second panels when the first and second panels are connected, said tongue having at least one projection which is oriented in a direction of the protruding region of the long groove flank of the other one of the grooves, said projection being configured to move transversely to a plane of installation when contacting the protruding region to thereby displace the locking section of the tongue in the direction of the groove of the other one of the first and second panels.

20. The covering of claim **19**, wherein the locking section bridges in a locking position a gap between the short groove flank of the one of the grooves and the long groove flank of the other one of the grooves.

21. The covering of claim **19**, wherein the connecting section is flexibly connected to at least one member selected from the group consisting of locking section and retaining section.

22. The covering of claim **21**, further comprising a joint between the connecting section and the member, said joint defining a pivot axis in parallel relationship to the one of the grooves.

23. The covering of claim **22**, wherein the joint is a film joint.

24. The covering of claim **22**, wherein the joint is arranged between opposing edges of the connecting section and the member.

25. The covering of claim **22**, wherein the joint is made from a same material as the locking section, retaining section and connecting section of the tongue.

26. The covering of claim **22**, wherein the joint is made from a different material as the locking section, retaining section and connecting section of the tongue.

27. The covering of claim **26**, wherein the joint is made from hotmelt.

28. The covering of claim **19**, wherein the tongue is made from an elastic material.

29. The covering of claim **19**, wherein the locking section is made from a material defined by a lower elasticity than other parts of the tongue.

30. The covering of claim **19**, wherein the tongue comprises a plurality of said locking section, said locking sections

being arranged in spaced-apart relationship in longitudinal direction of the one of the grooves and actuatable independently of one another.

31. The covering of claim **19**, further comprising a plurality of said tongue in the one of the grooves, wherein the retaining sections of the tongues are connected to one another in a region of the one of the grooves.

32. The covering of claim **19**, wherein the locking section of the tongue has a profiling on at least one side selected from the group consisting of a side oriented towards an upper side of the one of the first and second panels and a side oriented towards a lower side of the one of the first and second panels.

33. The covering of claim **19**, wherein the one of the grooves has a profiling on at least one of the upper and lower groove flanks for receiving the locking section of the tongue.

34. The covering of claim **33**, wherein the locking section of the tongue has a profiling on at least one side selected from the group consisting of a side oriented towards an upper side of the one of the first and second panels and a side oriented towards a lower side of the one of the first and second panels, said profiling of the locking section engaging in the profiling of the one of the grooves.

35. The covering of claim **19**, wherein parts of the tongue are constructed to be able to assume a first state and a second state, wherein the first state is a stable state and the second state is a stable or metastable state.

* * * * *