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(71) Applicant(s)
E.F.P. Floor Products Fussboden GmbH

(72) Inventor(s)
Weber, Jurgen; Steinwender, Martin; Pletzer, Stefan

(74) Agent/Attorney
Collison & Co, 117 King William Street, Adelaide, SA, 5000

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(71) Anmelder *(für alle Bestimmungsstaaten mit Ausnahme von US)*: **E.F.P. FLOOR PRODUCTS FUSSBÖDEN GMBH** [AT/AT]; Weibemdorf 20, A-6380 St. Johann in Tirol (AT).

(72) Erfinder; und

(75) Erfinder/Anmelder *(nur für US)*: **PLETZER, Stefan** [AT/AT]; Rosenegg 32, A-6391 Fieberbrunn (AT). **STEINWENDER, Martin** [AT/AT]; B. Bärstrasse 2, A-2380 Perchtoldsdorf (AT). **WEBER, Jürgen** [AT/DE]; Am Brautmorgen 32, D-59469 Ense (DE).

(74) Anwalt: **COHAUSZ & FLORACK**; Kanzlerstrasse 8a, D-40472 Düsseldorf (DE).

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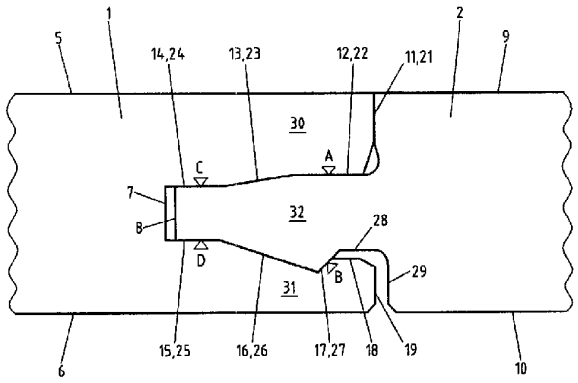
[Fortsetzung auf der nächsten Seite]

(54) Title: MECHANICAL CONNECTION OF PANELS

(54) Bezeichnung: MECHANISCHE VERBINDUNG VON PANEELEN



(57) Abstract: The invention relates to a connection of panels, especially for floor panels, comprising a groove (34) configured on one lateral edge (3), a tongue (32) configured in said groove (34) and provided with a recess (35) that has a locking surface (16), a locking element (33) configured on the tongue (32) that has a locking surface (27), and mating surfaces (12, 22) configured in the groove (34) and in the tongue (32) that serve as abutments for the locking surfaces (17, 27). The aim of the invention is to improve the locking and alignment stabilization properties of such a connection. To this end, the groove (34) is provided with mating surfaces (14, 15) in the zone of the groove base (7) that extend parallel to the upper side (5) and the tongue (42) is provided with mating surfaces (24, 25) in the zone of the end surface (8) that extend parallel to the upper side (9), said mating surfaces (14, 24; 15, 25) resting against one another in the locked state of the connection.

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Zur Erklärung der Zweibuchstaben-Codes, und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(57) Zusammenfassung: Die Erfindung betrifft eine Verbindung von Paneelen, insbesondere für Fußbodenpaneelen, mit einer an einer Seitenkante (3) ausgebildeten Nut (34), mit einer an einer Seitenkante (4) ausgebildeten Feder (32), mit einer in der Nut (34) ausgebildeten und eine Verriegelungsoberfläche (16) aufweisenden Vertiefung (35), mit einem an der Feder (32) ausgebildeten und eine Verriegelungsoberfläche (27) aufweisenden Verriegelungselement (33), mit in der Nut (34) und an der Feder (32) ausgebildeten Paßflächen (12, 22), die als Widerlager für die Verriegelungsobesflächen (17, 27) dienen, bei der die Verriegelungs- und Ausrichtungsstabilisierungseigenschaften dadurch verbessert werden, daß die Nut (34) im Bereich des Nutgrundes (7) parallel zur Oberseite (5) verlaufende Paßflächen (14, 15) aufweist und daß die Feder (32) im Bereich der Endfläche (8) parallel zur Oberseite (9) verlaufende Paßflächen (24, 25) aufweist, wobei die Paßflächen (14, 24; 15, 25) im verriegelten Zustand der Verbindung aneinander anliegen.

MECHANICAL PANEL CONNECTION

The invention relates to a panel, particularly flooring panel with the features of the preamble of claim 1, which can be mechanically connected to other panels. Such panels are typically used for a floor covering, such as parquet or laminate flooring, or for ceiling and wall tiling.

In all cases, the individual panels can be joined through a mechanical connection, i.e., interlocking, to form a flat surface, so the panels can be laid without adhesives or additional mechanical fastening elements, such as screws or nails. A particular advantage of this is that the panels can be laid without adhesive bonding, and can therefore be removed.

JP 3-169967 A, on which the present invention is based, describes a mechanical connection of flooring panels. Along one side edge, the panels are provided with a groove, which is formed by an upper lip and a lower lip and extends parallel to the side edge. Embodied on the opposite side edge of the same panel is a tongue, which extends parallel to this side edge. A depression having an interlocking surface that extends at an incline with respect to the top side of the panel is embodied in the groove. A corresponding interlocking element, which has an interlocking surface that extends at an incline with respect to the top side, is embodied at the tongue. Furthermore, fitting surfaces that extend parallel to the top side and serve as abutments for the interlocking surfaces of the groove depression and the interlocking element of the tongue are embodied in the groove and at the tongue, in the region of the respective side edge. In the direction parallel to the top side, the fitting surface of the groove covers the interlocking surface embodied opposite it in the groove. The same applies for the fitting surface and the interlocking surface of the tongue, because the profiles of the groove and the tongue correspond, at least in these sections. In the interlocked state of the connection, the fitting surfaces and the

interlocking surfaces fit closely together in pairs in order to keep the upper surfaces of side edges 3 and 4 in contact with one another. Through the cooperation of the fitting surfaces and the interlocking surfaces, the impacting side edges of two panels rest tightly against one another, forming a virtually gap-free connection.

Further a tongue and groove connection is known from the prior art of WO 96/27721 which is provided on both sides of a flooring panel which is provided with locking surfaces for a socalled click-connection. In the locked condition first fitting surfaces are related to the locking surfaces, wherein the fitting surface serve as abutments and keeping the locking surfaces in engagement with each other. Additionally there are second and third fitting surfaces provided on the tongue as well in the groove for further stabilizing the locked connection.

Further mechanical panel connections are known from the prior art disclosed in WO 94/26999, WO 97/47834 and WO 98/58142.

A common feature of the mechanical panel connections known from the prior art is that they permit a reliable mechanical interlocking in the direction parallel to the top side of the panels, yet they possess a low rigidity with respect to a rotation of the panels at the adjacent side edges. Hence, the panels can be pivoted relative to one another fairly easily, leading to a loosening of the mechanical connection. In the prior art, this is even desirable to a certain extent for simple panel laying. On the other hand, these known panels in the prior art possess a sufficient rigidity in terms of the aforementioned tilting and pivoting of the panels relative to one another, but the panel interlocking of the connection is inadequately rigid.

The technical problem facing the invention, therefore, is to provide a mechanical connection of panels that is distinguished by improved interlocking and stability properties.

In accordance with the invention, the outlined technical problem is solved by a panel possessing the features of the preamble to claim 1.

In accordance with the invention, it has been recognized that fitting surfaces that stabilize the connection to prevent tilting of the panels toward one another are additionally disposed inside the groove for interlocking the tongue. The interlocking is thus effected by the pair of interlocking surfaces and the pair of fitting surfaces disposed in the region of the side edges and acting as abutments. Therefore, the force generated by the interlocking surfaces effectively prevents the two panels from moving apart in a plane parallel to the top sides and perpendicular to the side edges. The two panels are stabilized to prevent tilting or pivoting along the side edges in the interlocked state by the additional fitting surfaces in the region of the groove bottom or the end surface of the tongue. Thus, different fitting-surface pairs assure the interlocking, on the one hand, and the stabilization of the orientation, on the other hand, of the two panels.

A further advantage of the mechanical panel connection according to the invention is that the two functional groups for interlocking and stabilization of orientation are embodied along a tongue or a groove, so that a desired small panel thickness can be maintained in the region of laminate flooring.

In a preferred embodiment, the distance between the interlocking surface and the fitting surface in the region of the side edges is larger than the distance between the fitting surfaces in the region of the groove bottom or the end surface of the tongue. Consequently, the end of the tongue that first enters the groove at the start of the production of the mechanical connection can be easily received by the groove, because, provided that the two panels are disposed on the same surface, the tongue can penetrate the groove by a predetermined distance without encountering mechanical resistance, so as the panels are joined, the problems arising in the prior art, for example due to the joining and

pivoting of the panels relative to one another, do not occur. In addition, the groove tapers from its opening to the groove bottom, or the tongue tapers from the end facing the panel to the end surface, which improves the stability of the side-edge profiles of the two panels.

Additionally, a further surface can be embodied in the groove, the surface extending at an incline with respect to the top side and connecting the depressions of oppositely-located fitting surfaces. Likewise, a surface that extends at an incline with respect to the top side can be embodied on the other side of the groove; this surface connects the interlocking surface to the fitting surface disposed in the region of the groove bottom.

It is further preferable for the end surface of the upper lip and the end surface of the lower lip, which form the groove, to be arranged in essentially one plane. In other words, the two lips extend essentially by the same distance along the side edge, so when the mechanical panel connection is produced, the force required for latching is exerted by an impact block, which rests against the upper lip and the lower lip, and has the largest-possible contact surface. This effectively prevents damage to the side edges.

It is also preferable for the upper and lower lips to be embodied in one piece with the panel. This is possible through the process of milling the profile of the groove or the tongue out of the side edge of the panel, which is advantageous from a manufacturing standpoint. Of course, it is also possible to produce the tongue, the upper lip and/or the lower lip separately and connect them to the panels for attaining the same interlocking and orientation-stabilization properties.

The invention is described below by way of an exemplary embodiment of flooring panels, with reference to the following drawings:

FIG. 1 shows a side edge of a panel having a groove for a connection in accordance with the invention, in a cross section;

FIG. 2 shows a cross section of a side edge of a panel having a tongue for a connection in accordance with the invention, corresponding to the groove illustrated in FIG. 1; and

FIG. 3 shows a cross section of the profiles illustrated in FIGS. 1 and 2, in the engaged state.

All of the surfaces described below extend entirely, or at least in sections, along a longitudinal or transverse edge of panels 1 and 2, which will be generally referred to hereinafter as side edges.

FIG. 1 illustrates a panel 1, which has a groove 34 cut into its outside edge 3. Edge 3 has a plurality of surfaces that are inclined to various degrees relative to top side 5, and are described below.

A surface 11 is adjacent to top side 5 in the upper region of edge 3. A surface lla extends in the direction of groove bottom 7, at a flat angle relative to surface 11. A surface 12 extends essentially parallel to top side 5 in the direction of groove bottom 7, when seen from surface lla. Surfaces 13 and 14 adjoin surface 12, with surface 13 pointing downward at a flat angle, thereby connecting surfaces 12 and 14 to one another. Surface 14 is oriented parallel to top side 5 of panel 1, and ends at groove bottom 7. Thus, surfaces 12, 13 and 14 for*m the upper edge of groove 34 in panel 1.

Surfaces 15, 16, 17 and 18 form the lower surface o£ groove 34, and are oriented as follows: surface 15 extends parallel to surface 14, and is thus oriented essentially parallel to underside 6. Surface 16 adjoins surface 15, and extends downward at an incline, at a. flat angle relative to surface 15. Adjoining

surface 17, in contrast, is oriented upward, with the angle of ascent of surface 17 being larger than the angle of surface 16, which it forms with horizontal surface 15. Surface 18, which is oriented parallel to surface 12 and thus to top side 5 or underside 6 of panel 1, adjoins surface 17.

Surface 19 forms the lower end surface of edge 3, and is oriented essentially parallel to surface 11. Surfaces 11 and 19 are preferably disposed in one plane. Surface 19a forms the transition between surfaces 18 and 19, and is oriented inward at an incline.

Groove 34 of panel 1 is therefore formed by an upper lip 30 and a lower lip 31. Upper lip 30 is surrounded by surfaces 5, 11, lla, 12, 13 and 14, with surface 11 forming the end surface of upper lip 30. Lower lip 31 is limited by surfaces 6, 15, 16, 17, 18, 19 and 19a, with surface 19 forming the end surface of lower lip 31.

FIG. 2 illustrates a panel 2, which has at an edge 4 a tongue 32, which is preferably an integral component of panel 2. Edge 4 has an upper surface 21, which adjoins top side 9 of panel 2. Surface 21 extends essentially vertically downward. Tongue 32 is surrounded by surfaces 22, 23, 24, 8, 25, 26, 27 and 28. Surface 22 extends essentially horizontally, and thus parallel to surface 9 of panel 2. Surface 23 is inclined downward at a flat angle, and connects surfaces 22 and 24 to one another. Surface 24 is, again, oriented parallel to top side 9 of panel 2, and thus extends essentially horizontally. Surface 24 ends at end surface 8 of tongue 32.

The lower surfaces of tongue 32 have the following orientations: surface 25 borders end surface 8, and extends parallel to surface 24, or essentially parallel to underside 10 of panel 2. Surface 26 extends downward and away from end surface 8 of tongue 32, while surface 27 is, again, oriented upward at an incline. The angle of inclination of surface 27 is larger than the angle of surface 26, which it forms with the horizontal. Surface 28 adjoins surface 27, and changes

over into surface 29 of edge 4. Surface 29 extends essentially vertically, that is, perpendicular to underside 10 of panel 2.

Surfaces 21 and 29 are therefore oriented essentially parallel to one another, but do not lie in one plane/surface 29 is offset slightly to the rear, in the direction of the body of panel 2, relative to surface 21.

FIG. 3 depicts panels 1 and 2, which are mechanically connected to one another. Tongue 32 of panel 2 engages upper lip 30 and lower lip 31 of groove 34 of panel 1.

In the latched or interlocked state, the above-described surfaces of groove 34, on the one hand, and of the tongue, on the other hand, rest against one another, at least partly in pairs, to form a flat surface. This forms at least the fitting-surface pairs 12, 22; 14, 24; 15, 25; and 17, 27 represented by the open triangles and capital letters A, B, C and D.

The two upper fitting-surface pairs 12, 22 and 14, 24 effect a height offset of the two coupled parts, namely tongue 32, on the one hand, and groove 34 formed by lips 30 and 31, on the other hand. This prevents panel 2 from tilting relative to panel 1, particularly during the joining process.

The two pairs of surfaces 12, 22 and 14, 24 have oppositely-located pairs of surfaces 15, 25 and 17, 27 as abutments. This snug fit secures the position of tongue 32 at the front end facing end surface 8, as well as at the rear end facing edge 4. Surface pairs 14, 24 and 15, 25 are spaced as far as possible from surface pairs 12, 22 and 17, 27. This attains a high stability and, particularly, a high flexural strength against a stress acting vertically on surfaces 5 and 9 of coupled panels 1 and 2.

Furthermore, the above-described effects can also be enhanced and improved

if surface pairs 13, 23 and 16, 26 fit snugly together, thereby improving the flexural strength.

To this point, the cooperation of the surfaces has been described in terms of flexural strength. Surfaces 17 and 27 ensure that tongue 32 is held securely in groove 34 formed by lips 30 and 31, because surfaces 26 and 27 form a downward-projecting interlocking element 33 of tongue 32, which extends into depression 35 formed by surfaces 16 and 17 in groove 34 at lower lip 31. As indicated by triangle B, surfaces 17 and 27 are inclined such that tongue 32 is effectively prevented from sliding out of groove 34.

Furthermore, groove 34 and tongue 32 are oriented so precisely to one another that, with a snug fit of tongue 32 in groove 34, surfaces 11 and 21 of edges 3 and 4 of panels 1 and 2 rest closely together. Thus, surfaces 9 and 5 rest against one another without gaps, and form a throughgoing surface.

For a joining process, panels 1 and 2 are moved toward one another horizontally, that is, essentially parallel to undersides 6 and 10. Due to a corresponding mechanical pressure, tongue 32 presses lower lip 31 downward until tongue 32 has been pushed so far into groove 34 that it latches with lower lip 31. FIG. 3 illustrates the latched state. It is emphasized here that only surfaces 11 and 21, which extend perpendicular to top sides 5 and 9, rest against one another, thereby defining the relative position of panels 1 and 2. The further vertical surface pairs 7 and 8, and 19 and 29, in contrast, have no direct mechanical contact with one another.

FIG. 3 further shows that, in the interlocked state, the two profiles form hollow spaces in the region of surfaces 11 and 21, and 7 and 8. These spaces serve to receive possible impurities, so the fit between the fitting surfaces is not impeded. The hollow spaces can also receive an adhesive, should it be necessary for fixing the assumed position. It is emphasized here, however, that

no adhesive is required for the mechanical interlocking.

Panel 1 and panel 2 can be provided on all sides with either the profile shown in FIG. 1 or the profile shown in FIG. 2, so a plurality of panels 1 and 2 can be joined to create a flat arrangement. To this end, the panels have a profile in accordance with FIG. 1 on a respective longitudinal side and a respective transverse side, and a profile in accordance with FIG. 2 on the other sides.

The embodiment illustrated in FIGS. 1-3 has one piece embodiments of groove 34 in panel 1, on the one hand, and tongue 32 in or on panel 2, on the other hand. Of course, it is also possible to embody tongue 32, lower lip 31, orboth in multiple pieces, for example, through the use of plastic profiles in combination with the wood materials of the panel. The invention is therefore not limited to a one-piece embodiment.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A panel connection, particularly for flooring panels,
having a groove (34), which is formed by an upper lip (30) and a lower lip (31) at a side edge (3) of a first panel (1) and extends parallel to the side edge (3) ,
having a tongue (32) , which is embodied at a side edge (4) of a second panel (2) and extends parallel to the side edge (4),
having a depression (35), which is embodied in the groove (34) and has an interlocking surface (16) that extends at an incline with respect to the top side (5),
having an interlocking element (33), which is embodied at the tongue (32) and has an interlocking surface (27) that extends at an incline with respect to the top side (9) of the panel (2),
having a fitting surface (12), which is embodied in the groove (34), in the region of the side edge (3), and extends parallel to the top side (5), and
having a fitting surface (22), which is embodied at the tongue (32), in the region of the side edge (4), and extends parallel to the top side (9),
with the fitting surfaces (12, 22) serving as abutments for the interlocking surfaces (17, 27), with the fitting surface (12) completely covering the interlocking surface (17) in the direction parallel to the top side (5),
and with the fitting surfaces (12, 22) and the interlocking surfaces (17, 27) resting against one another in pairs in the interlocked state of the connection in order to keep the upper surfaces (11, 21) of the side edges (3, 4) in contact with one another,
characterized in that
the groove (34) has fitting surfaces (14, 24), which extend parallel to the top side (5) in the region of the groove bottom (7), and
the tongue (32) has fitting surfaces (24, 25), which extend parallel to the top side (9) in the region of the end surface (8),

wherein the fitting surfaces (14, 24; 15, 25) rest against one another in the interlocked state of the connection.

2. The connection according to claim 1, characterized in that

the distance between the interlocking surface (17) and the fitting surface (12) is larger than the spacing between the fitting surface (14) and the fitting surface (15) .

3. The connection according to claim 1 or 2, characterized in that

a surface (13) that is embodied in the groove (34) and extends at an incline relative to the top side (5) connects the fitting surfaces (12, 14).

4. The connection according to any of claims 1 to 3, characterized in that a surface (16) that is embodied in the groove (34) and extends at an incline relative to the top side (5) connects the interlocking surface (17) to the fitting surface (15).

5. The connection according to any of claims 1 to 4, characterized in that

the end surface (11) of the upper lip (30) and the end surface (19) of the lower lip (31) are essentially disposed in one plane.

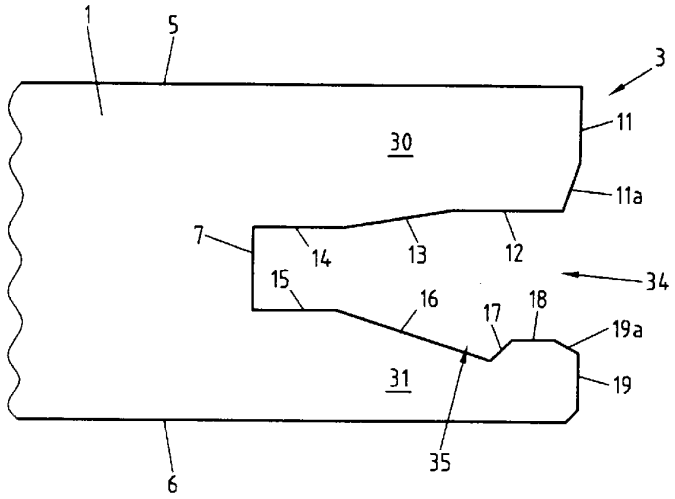
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Fig.1

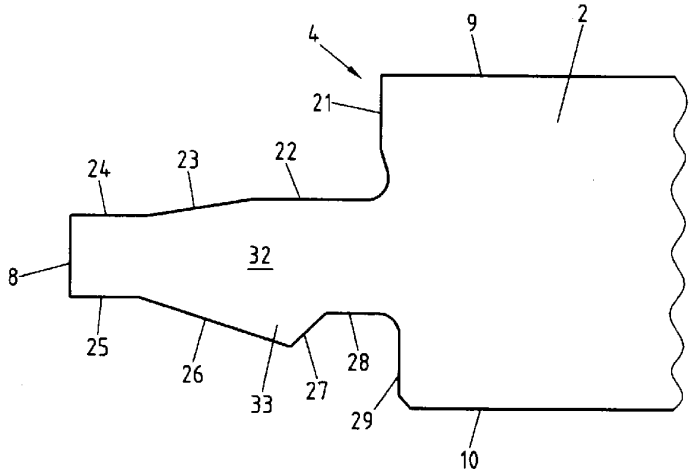
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Fig.2

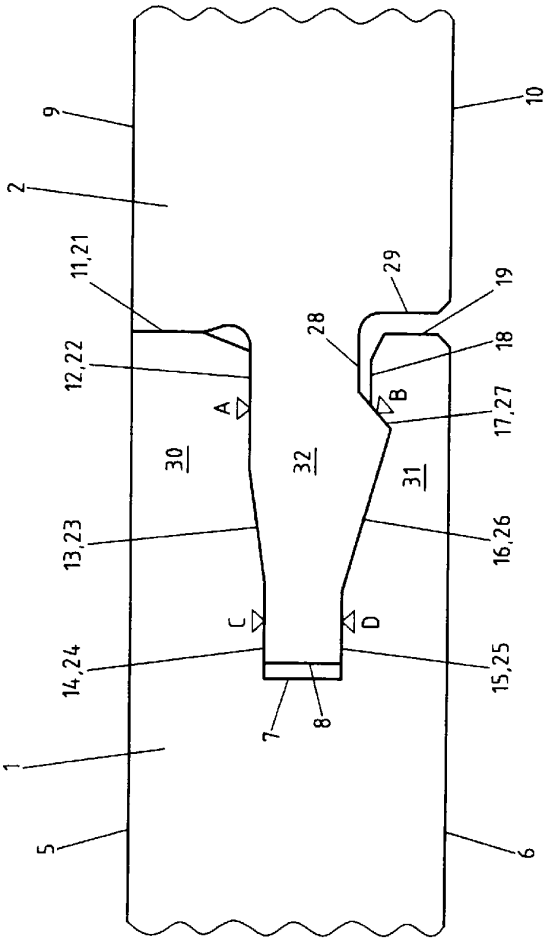
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Fig.3