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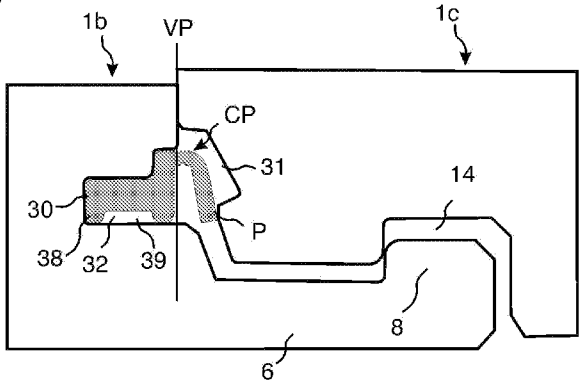
(54) **Title**: MECHANICAL LOCKING SYSTEM FOR FLOOR PANELS

Fig. 7b



(57) **Abstract**: Floor panels (1b, 1c) provided with a mechanical locking system made of a separate material in order to reduce snapping resistance during vertical displacement.

MECHANICAL LOCKING SYSTEM FOR FLOOR PANELS

Technical field

The invention generally relates to the field of mechanical locking systems for floor panels and building panels especially floor panels with mechanical locking systems, which are possible to lock with a vertical displacement.

Field of Application of the Invention

Embodiments of the present invention are particularly suitable for use in floating floors, which are formed of floor panels which are joined mechanically with a locking system integrated with the floor panel, i.e. mounted at the factory, that are made up of one or more upper layers of veneer, decorative laminate or decorative plastic material, an intermediate core of wood fibre based material or plastic material and preferably a lower balancing layer on the rear side of the core. The following description of known technique, problems of known systems and objects and features of the invention will therefore, as a non restrictive example, be aimed at this field of application and in particular at paper based or paper free laminate flooring formed as rectangular floor panels with long and shorts sides intended to be mechanically joined on both long and short sides. The long and short sides are mainly used to simplify the description of the invention. The panels can be squared and can have more than four sides, which are not parallel or perpendicular to each other.

It should be emphasized that embodiments of the invention can be applied to any floor panel and it could be combined with all types of known locking system, where the floor panels are intended to be joined using a mechanical locking system connecting the panels in the horizontal and vertical directions on at least two adjacent sides. The invention can thus also be applicable to, for instance, solid wooden floors, parquet floors with a core of wood or wood fibre based material and a surface of wood or wood veneer and the like, floors with a printed and preferably also varnished surface, floors with a surface layer of plastic or cork, linoleum, rubber or similar. Even floors with hard surfaces such as stone, tile and similar are included and floorings with soft wear layer, for instance needle felt glued to a board. Embodiments of the invention can also be used for

joining building panels which preferably contain a board material for instance wall panels, ceilings, furniture components and similar.

Background of the Invention

Laminate flooring usually comprising a core of 6-12 mm fibreboard, a 0.2-0.8 mm thick upper decorative surface layer of laminate and a 0.1-0.6 mm thick lower balancing layer of laminate, plastic, paper or like material. A laminate surface comprising a melamine impregnated paper. Recently printed surfaces and wood fibre based paper free laminate surfaces have been developed. The most common core material is a fibreboard with high density and good stability usually called HDF – High Density Fibreboard. Sometimes also MDF – Medium Density Fibreboard – is used as core.

Laminate floor panels are generally joined mechanically by means of so called mechanical locking systems. These systems comprise locking means, which lock the panels horizontally and vertically. The mechanical locking systems are usually formed by machining the core of the panel. Alternatively, parts of the locking system can be formed of separate materials, which are integrated with the floor panel, i.e. joined with the floor panel in connection with the manufacture thereof.

The main advantages of floating floors with mechanical locking systems are that they are easy to install. Preferably, they can also easily be taken up again and used once more at a different location.

Definition of Some Terms

In the following text, the visible surface of the installed floor panel is called "front side", while the opposite side of the floor panel, facing the sub floor, is called "rear side". The edge between the front and rear side is called “joint edge”. By "horizontal plane (HP) or principal plane" is meant a plane, which extends parallel to the outer part of the surface layer. Immediately juxtaposed upper parts of two adjacent joint edges of two joined floor panels together define a "vertical plane (VP)" perpendicular to the horizontal plane. By “horizontally” is meant parallel to the horizontal plane and by “vertically” parallel to the vertical plane. By “up or upwardly” is meant towards the front side and by ”down or downwardly” is

meant towards the rear side. By “inwardly” is meant essentially horizontally towards the inner part of the panel and by “outwardly is meant essentially horizontally and away from the inner part of the panel. By “strip panel” is meant a panel comprising a strip and a locking element. By “groove panel” is meant a panel with a locking groove intended to cooperate with a locking element for horizontal locking.

Known Technique and Problems thereof

The description of the known art below is in applicable parts also used in embodiments of the invention.

For mechanical joining of long sides as well as short sides in the vertical and horizontal direction several methods and locking systems could be used. One of the most used methods is the angle-snap method and one of the most used locking systems is a system made in one piece with the core. The long sides are installed by angling. The panel is then displaced in locked position along the long side. The short sides are locked by horizontal snapping.

An alternative method is the so-called angling-angling method whereby long and short sides are locked with angling.

Recently a new and simpler method has been developed where all floor panels can be joined with just an angling of the long edges. This installation method generally referred to as “fold down” installation method is described in figures 1-4. The locking of the short edges 1a, 1b takes place with a scissors like movement where a flexible tongue 31 is displaced inwardly gradually from one edge to the other edge when a long side of a panel 1c in one row is connected by angling to an adjacent panel 1a in a previously installed row. The flexible snap tab, which in most cases is made of a plastic section, is during folding bended horizontally along the joint. A part of the snap tab is during folding almost in a locked position, as shown in figure 1, and other parts are in contact with the adjacent edge, figure 2, or in an completely unlocked position, as shown in figure 4.

Some versions of flexible tongues which are generally made of an extruded plastic section have an inner part, which is connected in a holding groove 32 and

an outer flexible snap tab pointing downwards 33 that during folding snaps into a tongue groove 31 of an adjacent panel 1c. The flexible tongue is generally connected to an edge of the strip panel. It could also be connected to the groove panel. The snap tab is in such a version extending upwards.

The main problem with know flexible tongue 30 as shown in figure 2 is that it is difficult to lock due to limited flexibility. The contact point P between the groove panel and the flexible snap tab 33 is at an upper part when the groove panel is folded down along the vertical plane VP. The snap tab is also rather rigid due to the fact that the vertical extension T1 is less than 0.3 times the floor thickness T. The snap tab is also pushed inwardly and intersects the vertical plane VP. The holding groove must be made rather large in order to provide stability and this is a disadvantage.

Figures 5a and 5b show a snap tab with improved flexibility. It has an inner part 30a and an outer part 30b that are flexible. The snap tab must be displaced in the holding groove during locking and this requires tight tolerances. The snap is displaced into the holding groove 32, which must have a considerable horizontally extending depth.

Figures 6a and 6b show a locking system on the market where the contact point P is on the upper part of the flexible snap tab, which is displaced inwardly beyond the vertical plane in order to improve flexibility. The groove must be rather deep and this effect the stability of the edge in a negative way.

Figures 6c and 6d show another locking system on the market, which is made of three parts, two rather rigid parts 30a, 30b and one flexible rubber like part 30c.

Figures 6e, 6f show a locking system with a simple cross section, which is schematically shown in WO 2007/079845, figure 22, where the flexible snap tab 33 is made of a narrow rectangular cross-section that is bent or curved shaped. The snap tab is bended outside the vertical plane. The disadvantage is that the vertical extension of the holding groove is very small and difficult to produce with rotating tools. The flexible tongue 30 is difficult to fix into the groove and has a limited flexibility. The main disadvantage is however that the snap tab is bent around a centre point CP that is in contact with the lower part of the groove 32.

This will in most cases cause a breaker or a permanent bending in many materials especially an extruded plastic material. The embodiment combines three major disadvantages: a) a deep holding groove, b) limited flexibility of the snap tab and c) high snapping resistance.

All the shown known embodiments have snap tabs, which have a vertical extension T1 that is smaller than 0.3 times the floor thickness T, and this creates a considerable snapping resistance during folding especially if it is combined with contacts points P at the upper part of the snap tab.

The function of a locking system with a snap tab could be improved if flexibility of the snap tab could be increased and if the horizontal extension of the holding groove could be reduced.

Brief Description of the Invention and Objects thereof

An objective of certain embodiments of the present invention is to provide an improved mechanical locking system comprising a flexible tongue with an outer flexible snap tab, which could by locked by vertical folding.

More specifically the object is to provide a vertical snap locking system, which creates less snapping resistance and which has a more stable edge than the known systems.

The objective is to improve the stability of the edge mainly with holding grooves that allow a strong connection between a flexible tongue and the holding groove and that have a smaller horizontal extension inwardly into the core of the panel than present known systems.

The above objects of certain embodiments of the invention are achieved wholly or partly by a mechanical locking systems and floor panels, as described herein. Further embodiments of the invention are evident from the claims, description and drawings.

According to a first aspect of certain embodiments of the invention, a set of floor panels are provided which are mechanically connectable to each other along one pair of adjacent edges, so that upper joint edges of said floor panels in the connected state define a vertical plane. Each of said floor panels comprising a flexible tongue on a first edge of the panel and a tongue groove on a second

opposite edge of the panel for receiving the flexible tongue of an adjacent panel for mechanically locking together said adjacent edges vertically parallel to the vertical plane and at right angles to a horizontal plane of the panels.

The tongue groove is formed in a core of the panel and is open towards the vertical plane. A locking element is formed in one piece with the panel at the first edge and a locking groove at the opposite second edge. The locking groove being open towards a rear side of the panel that faces a subfloor.

The locking element and the locking groove form a horizontal mechanical connection perpendicular to the vertical plane, the locking element having a locking surface that is adapted to directly contact a locking surface of the locking groove for locking the panels to each other horizontally parallel to the horizontal plane and at right angles to the joined first and second edges.

The flexible tongue comprises resilient parts formed of a separate material than the core, and cooperates with a locking surface in the tongue groove.

Wherein two of the panels can be mechanically joined together by displacement of said two panels vertically towards each other, while at least an outer part of the flexible tongue, comprising a flexible snap tab extending downwards is resiliently displaced inwardly, substantially around a centre point located at an upper part of the flexible tongue and spaced from the lower part of the holding groove, to an inner position which is outside the vertical plane, until said adjacent edges of the two panels are brought into engagement with each other vertically and the flexible snap tab is displaced towards its initial position away from the vertical plane and against the tongue groove.

The flexible tongue has an inner part mounted in a sideward open holding groove in the first edge that is open towards the vertical plane. The inner part is fixed in the sideward open holding groove.

The outer flexible part, e.g., the flexible snap tab, has a cross section with a maximum thickness of the outer flexible part (e.g., the flexible snap tab), and the locking surface being offset in relation to the vertical plane by at least the maximum thickness of the flexible snap tab.

According to a second aspect of certain embodiments of the invention, a set of floor panels are provided which are mechanically connectable to each other along one pair of adjacent edges, so that upper joint edges of said floor panels in the connected state define a vertical plane. Each of said floor panels comprising a flexible tongue on a first edge of the panel and a tongue groove on a second opposite edge of the panel for receiving the flexible tongue of an adjacent panel for mechanically locking together said adjacent edges vertically parallel to the vertical plane and at right angles to a horizontal plane of the panels.

The tongue groove is formed in a core of the panel and is open towards the vertical plane. A locking element is formed in one piece with the panel at the first edge and a locking groove at the opposite second edge. The locking groove being open towards a rear side of the panel that faces a subfloor.

The locking element and the locking groove form a horizontal mechanical connection perpendicular to the vertical plane, the locking element having a locking surface that is adapted to directly contact a locking surface of the locking groove for locking the panels to each other horizontally parallel to the horizontal plane and at right angles to the joined first and second edges.

The flexible tongue comprises resilient parts formed of a separate material than the core, and cooperates with a locking surface in the tongue groove.

Wherein two of the panels can be mechanically joined together by displacement of said two panels vertically towards each other, while at least an outer part of the flexible tongue, comprising a flexible snap tab extending downwards is resiliently displaced inwardly until said adjacent edges of the two panels are brought into engagement with each other vertically and the flexible snap tab is displaced towards its initial position away from the vertical plane and against the tongue groove.

The flexible tongue has an inner part mounted in a sideward open holding groove in the first edge that is open towards the vertical plane. The inner part is fixed in the sideward open holding groove.

The outer flexible part, e.g., the flexible snap tab, has a cross section with a maximum thickness of the outer flexible part (e.g., the flexible snap tab), and the

locking surface being offset in relation to the vertical plane by at least the maximum thickness of the flexible snap tab.

The inner part comprises one or several vertical cross sections wherein one of said vertical cross sections may be larger than said thickness of the flexible snap tab and/or another vertical cross section of the inner part.

Brief Description of the Drawings

Figs 1-6 illustrate known systems.

Figs 7a-c illustrate a first embodiment of the invention.

Figs 8a-d illustrate a second embodiment of the invention.

Figs 9a-c illustrate a third embodiment of the invention.

Figs 10a-c illustrate a flexible tongue fixed to an edge of the fold panel.

Fig 10d illustrates a flexible tongue fixed in an inclined groove.

Description of Embodiments of the Invention

To facilitate understanding, several locking systems in the figures are shown schematically. It should be emphasized that improved or different functions can be achieved using combinations of the preferred embodiments.

Figures 7a – 7c show an embodiment of the invention. A strip panel 1b comprising a strip 6 and a locking element 8 which cooperates with a locking groove 14 in a groove panel 1c for horizontal locking of two adjacent edges of panels 1b, 1c is provided. The strip panel comprises a flexible tongue 30 in a holding groove 32, which is open towards the vertical plane VP and has an inner part IP connected to the holding groove. The flexible tongue has an outer part OP outside the vertical plane VP comprising a flexible snap tab 33 that cooperates with a locking surface 40 of a tongue groove 31 in an adjacent edge 1c of the groove panel 1c and locks the edges vertically parallel to the vertical plane VP.

The snap tab is during the whole locking motion positioned outside the vertical plane VP and is during locking displaced inwardly towards the vertical plane and outwardly away from the vertical plane as shown in figures 7b and 7c. The snap

tab is during the displacement bended around a centre point which is located at an upper part of the flexible tongue 30 and is preferably spaced vertically upwards from the lower part of the holding groove 32 and/or horizontally outwardly from the vertical plane VP. The snap tab is preferably spaced from the vertical plane in its inner position. The inner part of the snap tab could also preferably be aligned with the vertical pane.

Such an embodiment makes it possible to decrease the amount of material that has to be removed in order to form a holding groove. The horizontal extension of the holding groove 32 could be decreased and even the opening could be smaller. This improves the stability of the edge. The improved stability could be combined with a maintained or even improved flexibility of the snap tab.

The groove panel 1c comprises a lower part 36, which is preferably formed as a bevel, and preferably more vertically inclined than the outer part 37 of the flexible snap tab. The first contact point P between the groove panel 1c and the flexible tongue 30 is preferably located at the lower part of the flexible snap tab 33 when the groove panel 1c is displaced vertically along the vertical plane VP towards the strip panel 1b. Such an embodiment will decrease the snapping resistance considerably.

The lower part of the holding grove 32 is preferably located in a horizontal plane H1 which is vertically offset upwardly from a vertical plane H3 that intersects the upper part of the strip 6 and preferably also from a horizontal plane H2 that intersects the upper part of the locking element. This facilitates the fixing of the tongue into the holding groove. The holding grove could also be inclined upwardly from an inner to an outer position. This is an advantage, which could be used in all snap tab systems, such as the known art systems previously discussed, to facilitate the fixing of the flexible tongue. Embodiments of the known art systems previously discussed with an inclined holding groove are included within the scope of the invention.

The flexible tongue has preferably a thickness A-A at its outer part OP that is smaller than a vertical thickness B-B located in the inner part IP. The inner part IP of the flexible tongue 30 comprises preferably two vertical cross sections B-B, B'– B', with different vertical thicknesses and preferably a space 39 between a

lower and /or upper part of the flexible groove. Such an embodiment makes it possible to combine a stable connection of the flexible tongue, to save material and to improve flexibility.

The locking surface 40 is offset to the vertical plane by at least the maximum thickness A-A of the flexible snap tab 33.

The inner part of the flexible tongue 30 can substantially fill the volume of the sideward open holding groove or can comprise one or several friction connection 38 that extends downwards and /or upwards.

The described motion of a flexible snap tab outside the vertical plane and a first contact point at a lower part of the snap tab could be used separately to improve locking but preferably in combination. It is an advantage to use a low contact point even in embodiments where the snap tab is displaced inwardly beyond the vertical plane.

Figures 8a – 8c show that the snap tab 33 could preferably be formed with a vertical extension T1 that is equal or larger than 0.3 times the floor thickness T. It is even more preferred to increase this vertical extension to 0.35 or even to more than 0.40 times the floor thickness T. This is especially preferable in wood floors where a high locking strength could be combined with an easy locking.

Such an embodiment could be used to decrease the locking resistance further especially if it is combined with one or both of the two other desired features described above.

Figure 8d shows an embodiment where the upper part 34 of the flexible tongue 30 can be bended horizontally inwardly, preferably to a position inside the vertical plane VP. When the upper part of the snap tab is in locked position, a space 35 exists between the flexible tongue and the holding groove 32. The upper part of the flexible tongue is displaced in the space 35 during locking. This can be used to reduce snapping resistance and to increase the flexibility of the flexible tongue.

Figures 9a-9c show a preferred embodiment of a flexible tongue 30, which is connected in a fixed manner in a holding groove 32 of the strip panel 1b and comprises a flexible part 33 that is displaceable in a displacement groove 32a.

Such an embodiment allows increased flexibility since the vertical distance between the lower part of the tongue that is connected in the holding groove 32 and the upper part 33 that locks against the locking surface 40 of the tongue groove 31, could be increased.

The flexible snap tab 33 is during folding displaced horizontally inwards and outwards in the displacement groove 32a and bending occurs preferably and essentially around a centre point C located in a lower part of the flexible tongue 30.

The holding groove 32 is located vertically below the displacement groove 32a. The locking surface 40 of the tongue groove 31 is preferably spaced vertically upwards in relation to the holding groove 32 and these two grooves are preferably located in different horizontal planes one over the other. The holding grove 32 is preferably located vertically below the upper part of the locking element 8 and is preferably inclined upwards in relation to a horizontal plane in order to facilitate the insertion of the flexible tongue 31 into the holding groove 32.

Such a flexible tongue could also be connected to an edge of the groove panel 1c. The holding groove 32 is in such an embodiment preferably located in the upper part of the panel edge and the displacement groove 32a below the holding groove 32.

Figures 10a – 10c show that a flexible tongue could be connected to a holding groove 32 in the groove panel 1c and that the holding groove 32 is spaced inwardly from the locking groove 14. The holding groove 32 could even in this embodiment preferably be inclined against the horizontal plane.

Figures 10b and 10c show that the flexible snap tab 33 during locking slides against the upper and outer part 8a of the locking element 8. This part 8a is in this embodiment inclined. It could for example also be rounded. The outer part 33 of the snap tab locks against a locking surface 6a formed on the outer part of the strip 6. This locking surface 6a could be inclined downwards or upward, essentially horizontal or rounded.

Figure 10d shows that all embodiments shown in figures 7 and 8 could be connected to a holding grove 32 that is inclined in order to facilitate the fixing of the flexible tongue 30 when a holding groove 32 is formed in the strip panel 1b.

CLAIMS

1. A set of floor panels (1b, 1c) which are mechanically connectable to each other along one pair of adjacent edges, so that upper joint edges of said floor panels in the connected state define a vertical plane (VP), each of said floor panels comprising:

a flexible tongue (30) on a first edge of the panel (1b);

a tongue groove (31) on a second opposite edge (1c) of the panel for receiving the flexible tongue of an adjacent panel for mechanically locking together said adjacent edges vertically parallel to the vertical plane (VP) and at right angles to a horizontal plane (HP) of the panels;

the tongue groove (31) is formed in a core of the panel and is open towards the vertical plane;

a locking element (8) formed in one piece with the panel at the first edge and a locking groove (14) at the opposite second edge, the locking groove being open towards a rear side of the panel that faces a subfloor;

the locking element and the locking groove form a horizontal mechanical connection perpendicular to the vertical plane, the locking element having a locking surface that is adapted to directly contact a locking surface of the locking groove for locking the panels to each other horizontally parallel to the horizontal plane and at right angles to the joined first and second edges;

the flexible tongue (30) comprising resilient parts formed of a separate material than the core, and cooperates with a locking surface (40) in the tongue groove (31);

wherein two of the panels can be mechanically joined together by displacement of said two panels vertically towards each other, while at least an outer part (OP) of the flexible tongue, comprising a flexible snap tab (33) extending downwards is resiliently displaced inwardly, substantially around a centre point (CP) located at an upper part of the flexible tongue (30) and spaced from the lower part of the holding groove (32), to an inner position which is outside the vertical plane (VP) until said adjacent edges of the two panels are brought into engagement with each

other vertically and the flexible snap tab (33) is displaced towards its initial position away from the vertical plane (VP) and against the tongue groove (31), and

wherein the flexible tongue has an inner part (IP) mounted in a sideward open holding groove (32) in the first edge that is open towards the vertical plane (VP), the inner part (IP) is fixed in the sideward open holding groove (32),

wherein the outer flexible part (OP) comprises a cross section (A-A) which is the maximum thickness and the locking surface (40) being offset in relation to the vertical plane (VP) by at least the maximum thickness (A-A) of the flexible snap tab (33).

2. The set of floor panels as claimed in claim 1, wherein the inner part (IP) comprises one or several vertical cross sections (B-B, B'-B') and wherein one of said vertical cross sections (B-B, B'-B') is larger than said thickness (A-A) of the flexible snap tab (33) and/or another vertical cross section (B-B, B'-B') of the inner part (IP).

3. The set of floor panels as claimed in claim 1 or 2, wherein the snap tab (33) during locking is bended horizontally along the joint edge.

4. The set of floor panels as claimed in any one of the claims 1-3, wherein a lower part of the second edge (36) and the flexible snap tab (33) are configured such that the first contact point (P) between the second edge and the flexible snap tab (33) is located at the lower part of said flexible snap tab (33) when the second edge (1c) is displaced along the vertical plane (VP) towards the first edge.

5. The set of floor panels as claimed in any one of the claims 1-4 wherein the vertical extension (T1) of the snap tab is equal or larger than 0.3 times the floor panel thickness (T).

6. The set of floor panels as claimed in any one of the preceding claims, wherein the flexible tongue (30) is made of extruded polymer material.

7. The set of floor panels as claimed in any one of the preceding claims, wherein the second edge comprises a lower part (36) formed as a bevel.

8. The set of floor panels as claimed in claim 7, wherein the lower part (36) is more vertically inclined than an initial position of the snap tab (33).

9. The set of floor panels as claimed in any one of the preceding claims, wherein there is a space (35) between an upper part (34) of the flexible tongue and the holding groove and wherein the upper part (34) of the flexible tongue is displaced in said space during locking.

10. A set of floor panels (1b, 1c) which are mechanically connectable to each other along one pair of adjacent edges, so that upper joint edges of said floor panels in the connected state define a vertical plane (VP), each of said floor panels comprising:

a flexible tongue (30) on a first edge of the panel (1b);

a tongue groove (31) on a second opposite edge (1c) of the panel for receiving the flexible tongue of an adjacent panel for mechanically locking together said adjacent edges vertically parallel to the vertical plane (VP) and at right angles to a horizontal plane (HP) of the panels;

the tongue groove (31) is formed in a core of the panel and is open towards the vertical plane;

a locking element (8) formed in one piece with the panel at the first edge and a locking groove (14) at the opposite second edge, the locking groove being open towards a rear side of the panel that faces a subfloor;

the locking element and the locking groove form a horizontal mechanical connection perpendicular to the vertical plane, the locking element having a locking surface that is adapted to directly contact a locking surface of the locking groove for locking the panels to each other horizontally parallel to the horizontal plane and at right angles to the joined first and second edges;

the flexible tongue (30) comprising resilient parts formed of a separate material than the core, and cooperates with a locking surface (40) in the tongue groove (31);

wherein two of the panels can be mechanically joined together by displacement of said two panels vertically towards each other, while at least an outer part (OP) of the flexible tongue, comprising a flexible snap tab (33) extending downwards is resiliently displaced inwardly to an inner position which is outside the vertical plane (VP) until said adjacent edges of the two panels are brought into engagement with each other vertically and the flexible snap tab (33) is displaced

towards its initial position away from the vertical plane (VP) and against the tongue groove (31), and

wherein the flexible tongue has an inner part (IP) mounted in a sideward open holding groove (32) in the first edge that is open towards the vertical plane (VP), the inner part (IP) is fixed in the sideward open holding groove (32),

wherein the flexible snap tab has a cross section with a maximum thickness of the flexible snap tab and the locking surface (40) being offset in relation to the vertical plane (VP) by at least the maximum thickness (A-A) of the flexible snap tab (33) and,

wherein the inner part (IP)) comprises one or several vertical cross sections (B-B, B'-B') and wherein at least one of said vertical cross sections (B-B, B'-B') is larger than said thickness (A-A) of the flexible snap tab (33) and/or another vertical cross section (B-B, B'-B') in the inner part (IP).

11. The set of floor panels as claimed in claim 10, wherein the flexible snap tab (33) is resiliently displaced inwardly substantially around a centre point (CP) located at an upper part of the flexible tongue (30) and spaced from the lower part of the holding groove (32).

12. The set of floor panels as claimed in claim 11, wherein there is a space (39) between the inner part (IP) of the flexible tongue (30) and the lower part of the holding groove (32).

Fig. 1

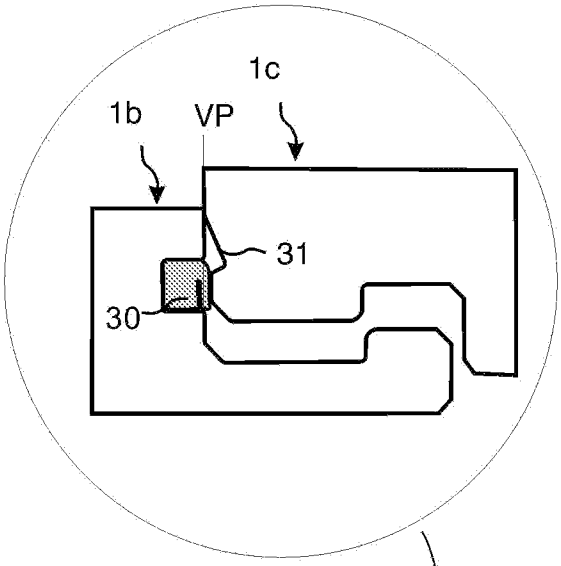


Fig. 2

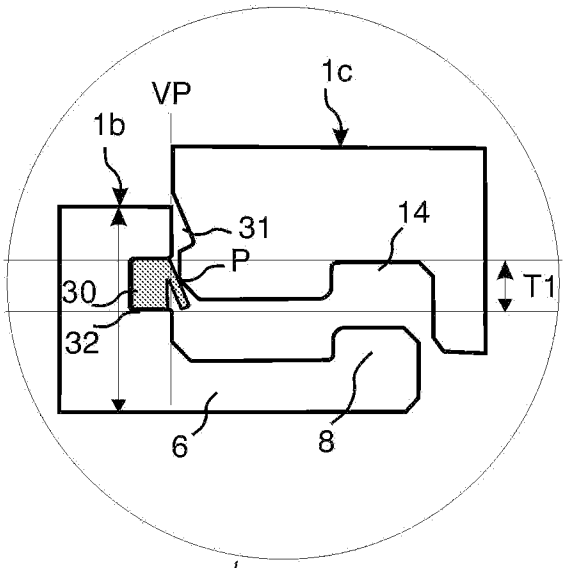


Fig. 3

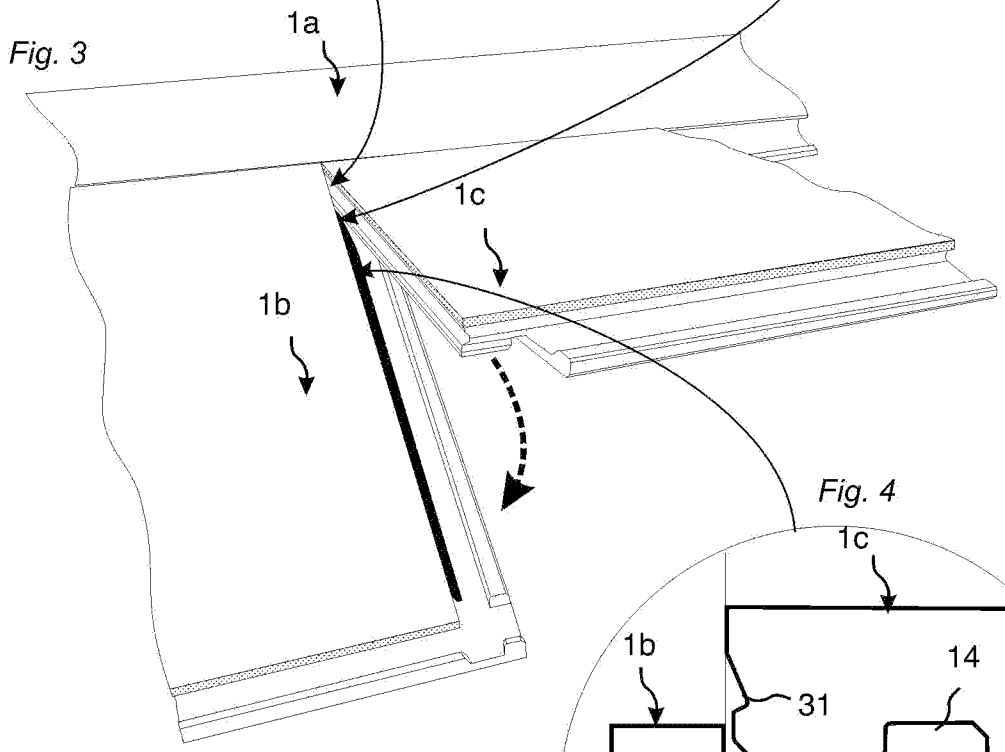


Fig. 4

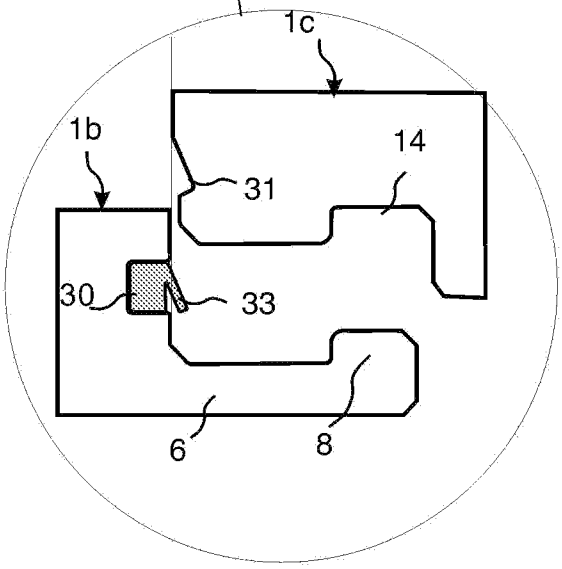


Fig. 5a

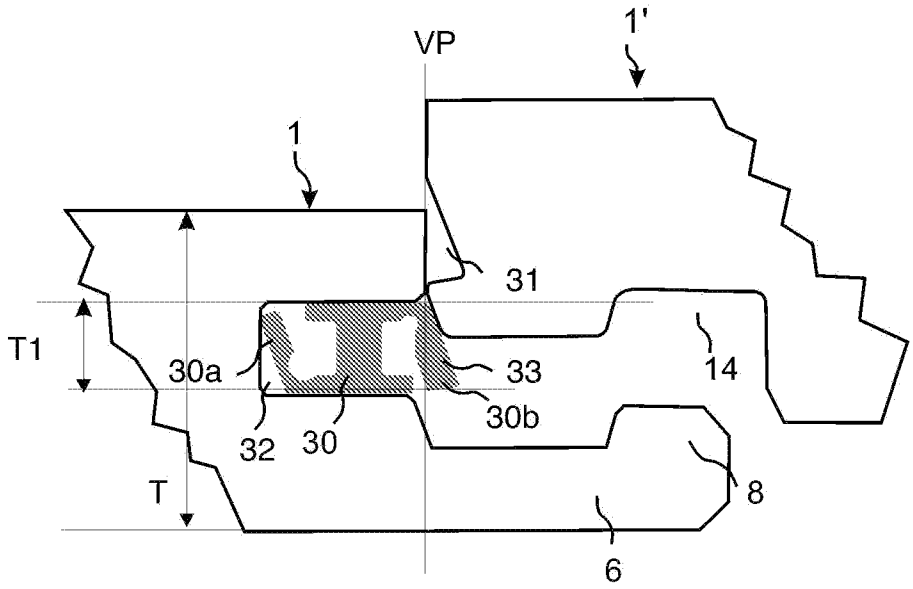


Fig. 5b

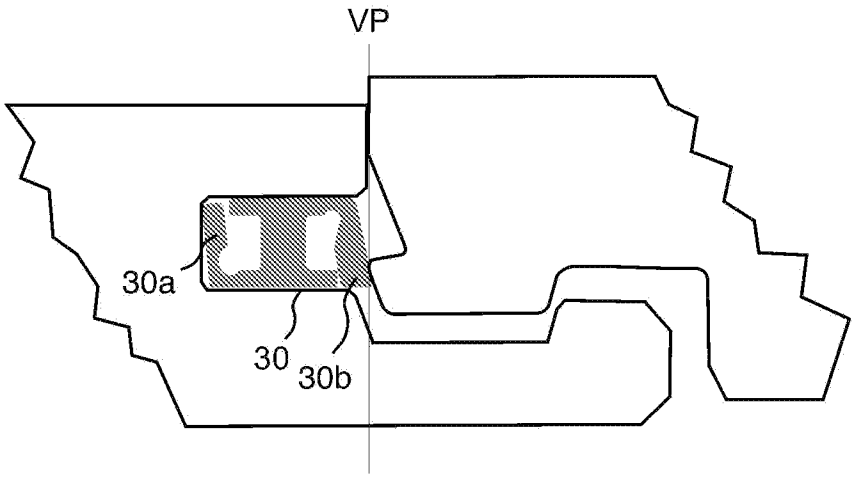


Fig. 6a

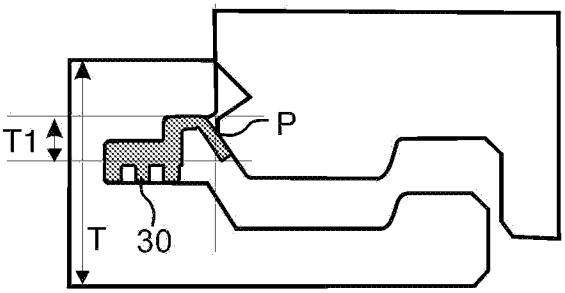


Fig. 6c

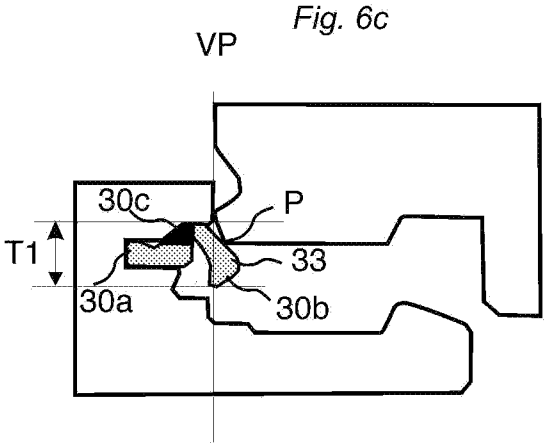


Fig. 6b

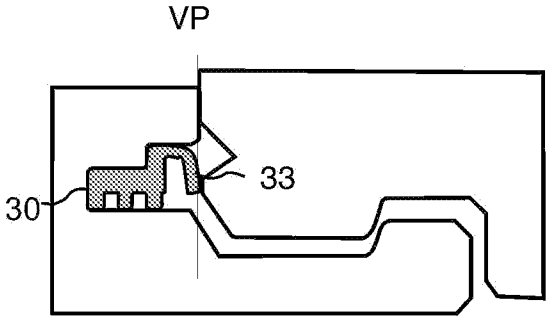


Fig. 6d

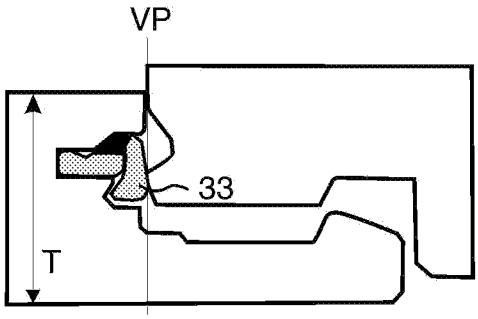


Fig. 6e

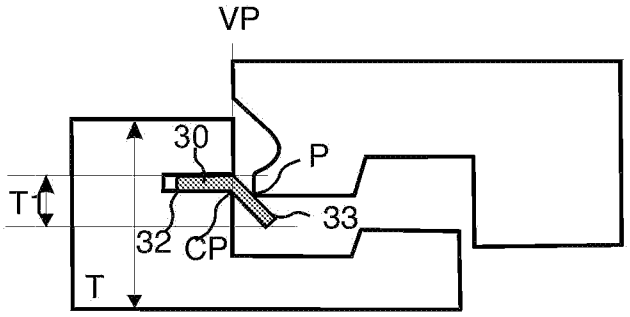


Fig. 6f

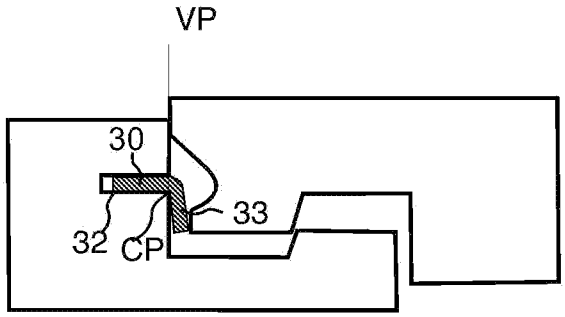


Fig. 7a

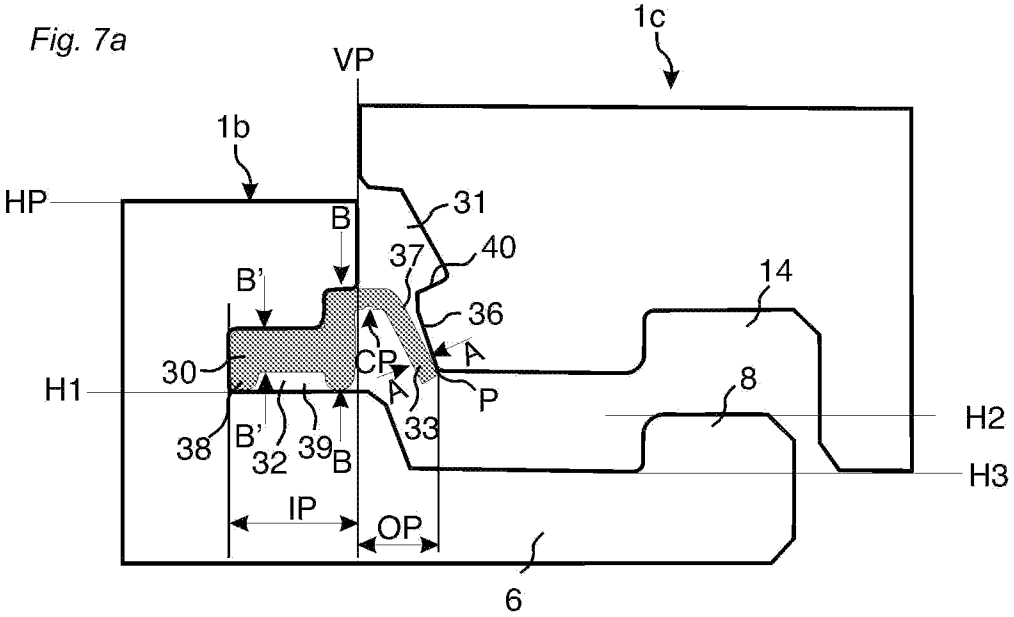


Fig. 7b

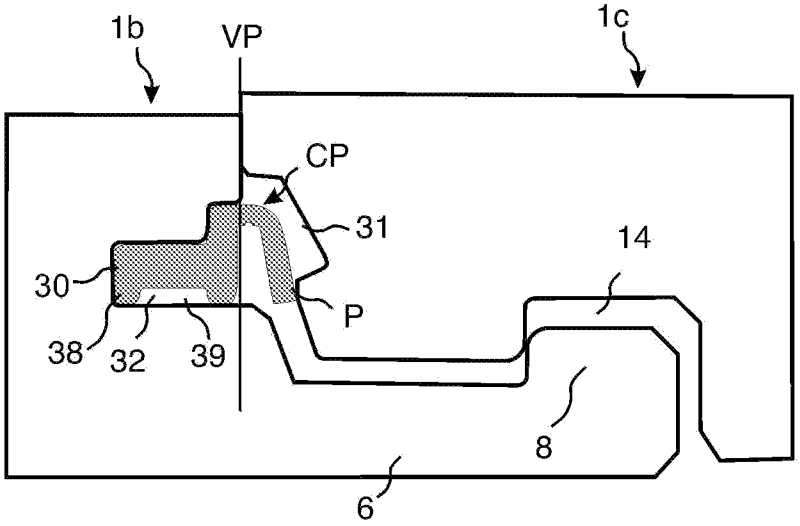


Fig. 7c

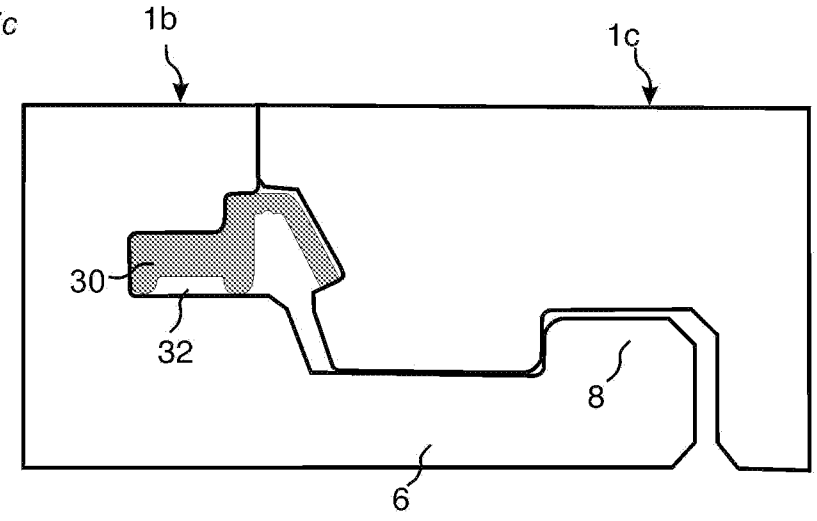


Fig. 8a

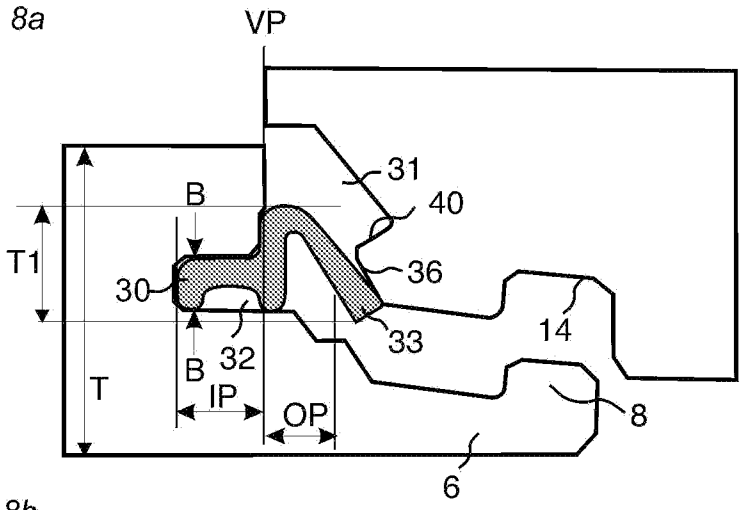


Fig. 8b

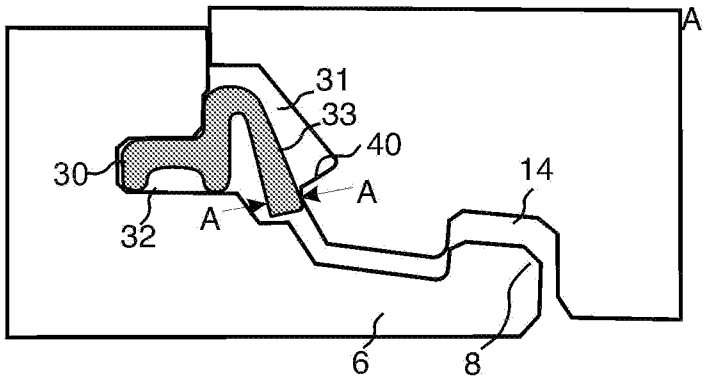


Fig. 8c

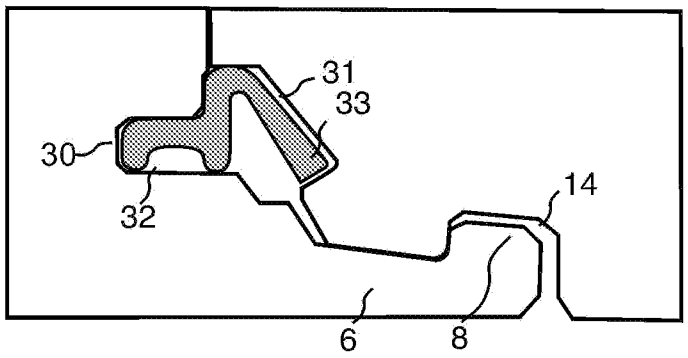


Fig. 8d

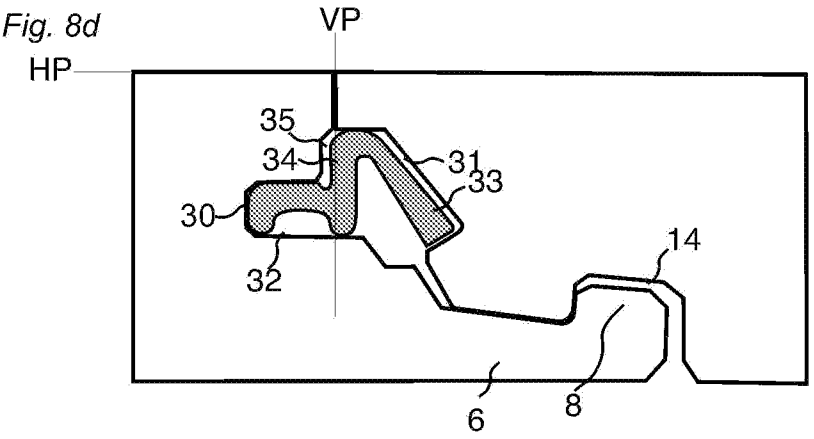


Fig. 9a

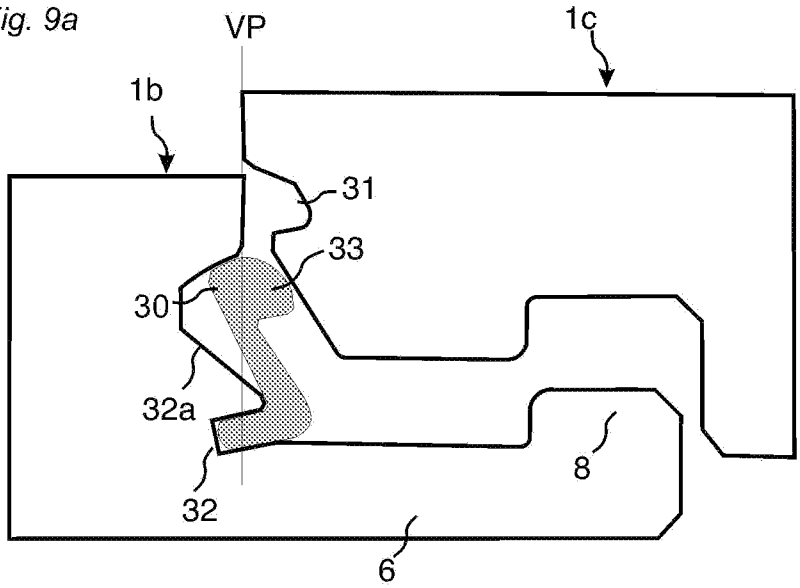


Fig. 9b

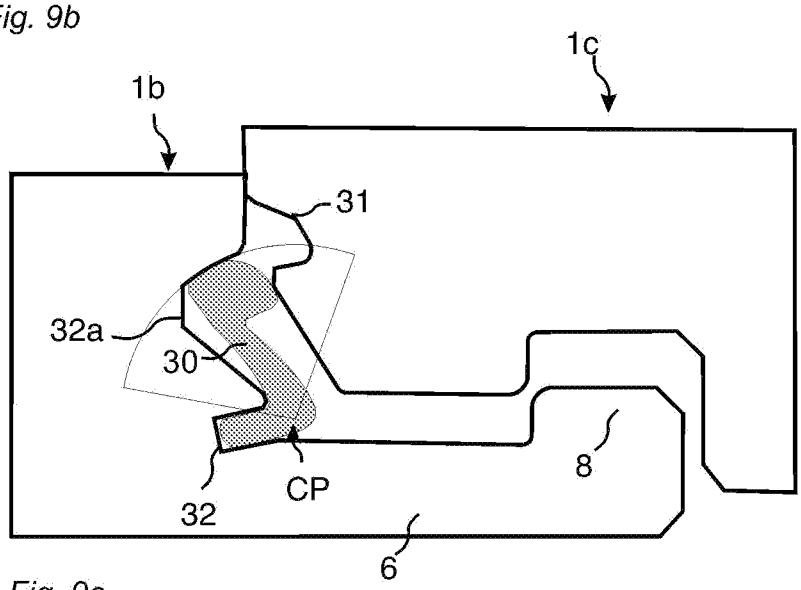


Fig. 9c

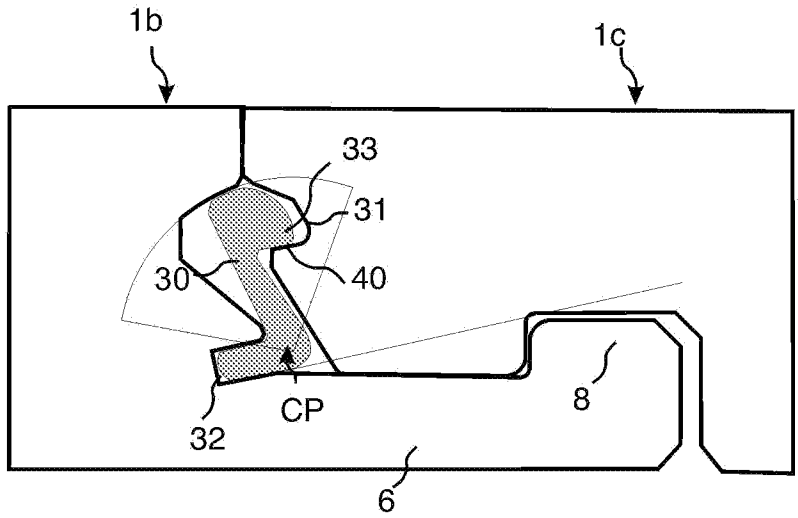


Fig. 10a

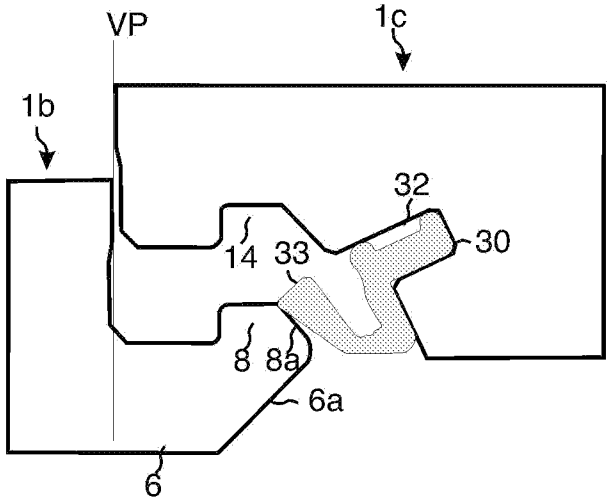


Fig. 10b

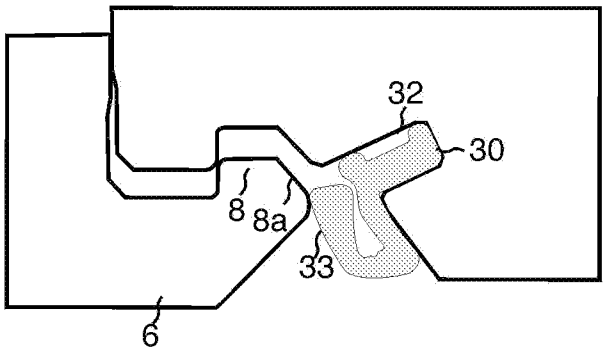


Fig. 10c

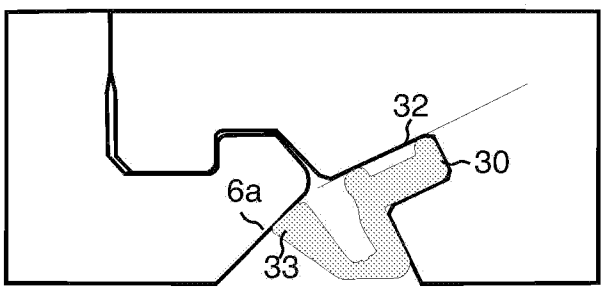
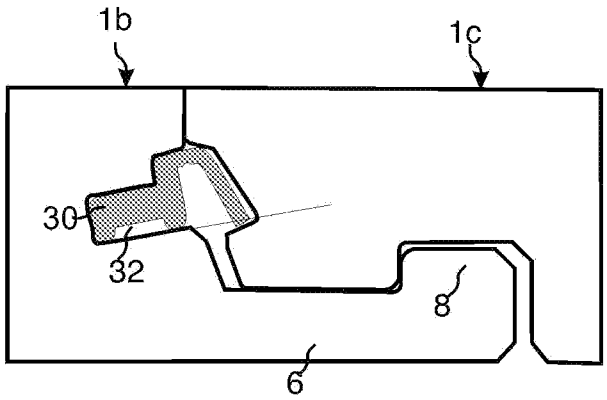


Fig. 10d



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/051479

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E04F, F16B

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2007079845 A1 (AKZENTA PANEELE & PROFILE GMBH ET AL), 19 July 2007 (2007-07-19); abstract; figures 22-25, 32-35; Details 33a, 32c, 31d --	1-9
Y	WO 2008068245 A1 (AKZENTA PANEELE & PROFILE GMBH ET AL), 12 June 2008 (2008-06-12); abstract; page 30, line 14 - page 32, line 29; figures 4a,16; Details 8r, 8a, 6c, 8 --	1-9
A	WO 03016654 A1 (AKZENTA PANEELE & PROFILE GMBH ET AL), 27 February 2003 (2003-02-27); abstract; figures 17-20; Details 37, 38, 39 --	1-9

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14-04-2011	15-04-2011

Name and mailing address of the ISA/SE	Authorized officer
Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Örjan Nylund Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/051479

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1: Claims 1-9, directed to a set of floor panels comprising a flexible snap tab (33) displaced inwardly around a centre point (CP) located at an upper part of the flexible tongue (30) and spaced from the lower part of the holding groove (32).

2: Claims 10-12, directed to a set of floor panels wherein the inner part (IP) comprises one or several vertical cross sections (B-B, B'-B') and wherein at least one of said vertical cross sections (B-B, B'-B') is larger than said thickness (A-A) of the flexible snap tab (33) and/or another vertical cross section (B-B, B'-B') in the inner part (IP).

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-9

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/051479

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 102007035648 A1 (AGEPAN TARKETT LAMINATEPARK EI), 29 January 2009 (2009-01-29); abstract; figures 2-4; Detail 24 -- --------	1-9

International application No.
PCT/SE2010/051479

Continuation of: second sheet

International Patent Classification (IPC)

E04F 15/02 (2006.01)
E04F 15/04 (2006.01)

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

WO	2007079845	A1	19/07/2007	CA	2624177	A1	19/07/2007
				DE	102006011887	A1	19/07/2007
				EP	1984586	A1	29/10/2008
				MX	2008004539	A	04/09/2008
				US	20080236088	A1	02/10/2008
WO	2008068245	A1	12/06/2008	CA	2672877	A1	12/06/2008
				CN	101617092	A	30/12/2009
				DE	102006057491	A1	12/06/2008
				EP	2089596	A1	19/08/2009
				US	20100043333	A1	25/02/2010
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				DE	20122553	U1	23/03/2006
				DE	20222005	U1	19/08/2010
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				EP	1953309	A1	06/08/2008
				EP	1669512	A2	14/06/2006
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				US	20080010938	A1	17/01/2008
				US	20040211143	A1	28/10/2004
DE	102007035648	A1	29/01/2009	NONE			