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(71) Applicant: **VÄLINGE FLOORING TECHNOLOGY AB** [SE/SE]; Prästavägen 513, SE-263 65 Viken (SE).

(72) Inventor: **PERVAN, Darko**; Bygatan 30, SE-263 61 Viken (SE).

(74) Agent: **ENGSTRAND, Ola**; Välinge Innovation AB, Prästavägen 513, SE-263 65 Viken (SE).

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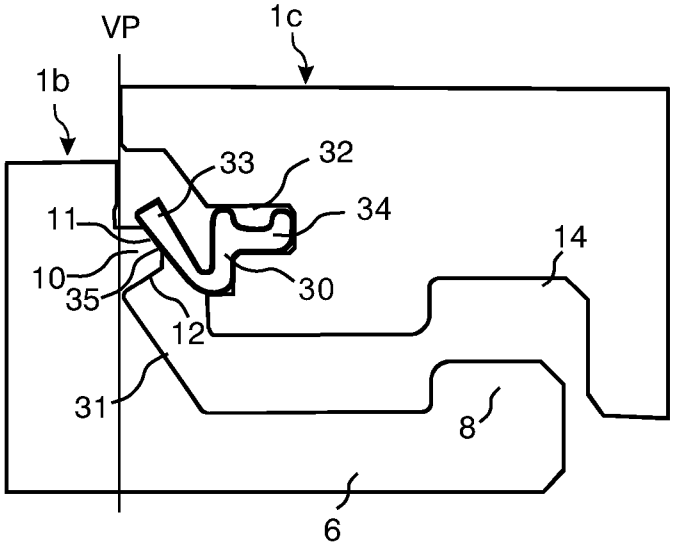
(54) Title: MECHANICAL LOCKING SYSTEM FOR FLOOR PANELS

Fig. 6a



(57) Abstract: Floor panels (1b, 1c) provided with a mechanical locking system comprising 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 may be locked by 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, powder based surfaces 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 adapted 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 may be squared and may have more than four sides, which are not parallel or perpendicular to each other.

It should be emphasized that embodiments of the invention may be applied to any floor panel preferably at the short edges and it may be combined with all types of known locking system on the long edges, where the floor panels are adapted to be joined using a mechanical locking system connecting the long edges in a vertical and/or horizontal direction. Embodiments of the invention may also be used for joining building panels, which preferably comprise a board material, such as wall panels, ceilings, and furniture components and similar.

Background of the invention

Floating floor panels such as 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 on all edges.

The main advantages of floating floors with mechanical locking systems are that they are easy to install. Several versions of locking systems are use on the market and there is a continuous demand for improvements related to production costs and function.

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 “fold panel” is meant a panel, with a locking groove configured to cooperate with a locking element for horizontal locking that is adapted to be angled and displaced vertically during 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 may 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 may be joined with just an angling of the long edges. This installation method generally referred to as "fold down" installation. An example of such a known "fold down" installation method is shown in figure 18 and 19 of WO 03/016654. A problem with this method is that a flexible snap tab, arranged at an edge of a first panel, must be pressed inwardly by a sharp upper edge of an adjacent edge of a second panel. .

WO 2006/043893 (Välinge Innovation AB) figure 13d describes a fold down locking system comprising a flexible tongue on the fold panel that locks against a rigid tongue formed in the edge of the adjacent strip panel. The flexible tongue has an inclined sliding surface at its outer and lower part that during folding slides against the rigid tongue and presses the flexible tongue inwardly into a sliding groove. The size of the sliding surface is limited by the thickness of the flexible tongue. This thickness is not possible to increase since such an increased thickens will also increase the thickness of the displacement groove and this will have a negative impact of the strength of the locking system.

Summary of the invention

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

More specifically the object is to provide a vertical snap locking system, which creates less snapping resistance during locking.

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.

A first aspect of the invention comprises a set of floor panels that are mechanically connectable to each other at a first and a second edge of a first and a second floor panel respectively, wherein upper edges of said first and second edge in a connected state define a vertical plane. The first edge is provided with a protruding tongue formed in one piece with the core of the first floor panel. Said protruding tongue extends beyond the vertical plane. The second edge is provided with a separate flexible tongue comprising an inner part, which is connected to a holding groove at the second edge, and an outer flexible snap tab that extends upwardly and in the connected state into a cavity under the protruding tongue for locking the first and the second floor panel to each other in a vertical direction. The first edge comprises a strip with a locking element. The second edge comprises a locking groove, which is open towards a rear side of the second floor panel that faces a subfloor. A locking surface of the locking element is configured to cooperate, in the connected state, with a locking surface of the locking groove for locking the first and the second floor panel to each other in a horizontal direction, which is at right angles to the first and second edge. The first and the second floor panel are mechanically connectable by a vertical displacement towards each other, wherein the flexible snap tab and the protruding tongue are configured to cooperate during said displacement such that at least a part of the flexible snap tab is, in a first stage, resiliently displaced, towards the second edge, by the protruding tongue, and that the flexible snap tab is, in a second stage, displaced towards the first edge to obtain the connected state.

The invention provides the advantages that the flexible snap tab may be displaced by an inclined guiding surface located on a rather soft tongue made of the same material as the core and such displacement may be made without contact with the hard upper panel surface.

The protruding tongue is preferably arranged above the strip. The protruding tongue may be arranged at the vertical plane and extend from the vertical plane.

The separate flexible tongue with the snap tab requires a smaller holding groove as compared to the displacement groove shown in WO 2006/043893 (Välinge Innovation AB) figure 13d. The smaller holding groove makes the connection stronger since the distance between the holding groove and the locking groove may be increased.

The protruding tongue preferably comprises an inclined or rounded guiding surface at its upper and outer part.

The protruding tongue and the snap tab is preferably configured such that the initial contact, during said vertical displacement, between the protruding tongue and the snap tab is at an upper part of the snap tab. The initial contact at the upper part decreases the force needed for the displacement of the snap tab, or a part of the snap tab. The decreased force makes it easier to connect the floor panels.

There may be a space between the upper parts of the protruding tongue and the second edge.

There may be is a space between the upper part of the strip and the second edge.

The protruding tongue preferably comprises a locking surface at its lower part that is inclined and in locked position in contact wit the flexible snap tab.

The locking surface of the protruding tongue is preferably arranged above the strip.

The flexible tongue may be glued into the holding groove.

The holding groove may comprise an upper wall and a lower wall and an inner wall extending between the upper and the lower wall. A glue is preferably provided at the upper, the lower and the inner wall. The flexible tongue may be glued to the upper, the lower and the inner wall.

The locking surface of the locking element and/or the locking surface of the locking groove preferably extend in an essentially vertical direction or at angle in a range of about 0 to about 45 degrees to the vertical plane.

Brief description of the drawings

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

Figs 1-5 illustrate known systems.

Figs 6a-c illustrate a first embodiment of the invention.

Figs 7a-b illustrate a second embodiment of the invention.

Figs 8a-b illustrate a third embodiment of the invention.

Detailed description

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

A known “fold down” installation method is described in figures 1-4. Locking of short edges 1b, 1c takes place with a scissors like movement where a flexible tongue 30 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. A flexible snap tab 33, 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 pressed inwardly, 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. The horizontal locking takes place when a locking element 8 located on a strip 6 on a first panel 1b, hereafter referred to as strip panel, cooperates with an adjacent second panel 1c, hereafter referred to as fold panel, such that the locking element 8 is inserted into a locking groove 14.

Figures 5a and 5b show that the flexible tongue 30 may be connected to an edge of the fold panel 1c or the strip panel strip panel 1b.

From a production perspective it is an advantage if the flexible tongue 30 is connected to a fold panel 1c because it is easy to insert such a flexible tongue into a holding groove 32. There is no protruding strip 6 and the insertion of the flexible tonged may be made with an inserting equipment comprising rather simple guiding devices that guide the tongue into the holding groove 32. A problem with such a flexible tongue 30, as shown in figure 5a, is that the locking system is difficult to lock since the snap tab must be pressed inwardly by a sharp upper edge.

Figures 6a-6c 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 fold panel 1c for horizontal locking of two adjacent edges of the fold panel 1c and the strip panel 1b is provided. The strip panel comprises a protruding tongue 10 with an upper inclined or rounded guiding surface 11 and a lower locking surface 12. The fold panel 1c comprises a flexible tongue 30 in a holding groove 32, which is open towards the vertical plane VP. The flexible tongue 30 has an inner part 34 connected into the holding groove 32 and a flexible snap tab 33 with a sliding surface 35 extending outwardly and upwardly. The sliding surface 35, that preferably is located at an upper part of the flexible snap tab, cooperates with the guiding surface 11 during a vertical displacement of the fold panel 6c and causes a pressure force that bends the flexible snap tab 33 inwardly towards the holding groove 32 as shown in figures 6a- 6b. The snap tab 33 snaps back toward its initial position and into the cavity 31 when the edges 1b, 1c are aligned horizontally and the lower locking surface 12 on the lower part of the protruding tongue 10 locks against the upper part of the snap tab 33 as shown in figure 6c. The flexible snap tab 33 and the protruding tongue 10 lock the edges vertically parallel to the vertical plane VP. The locking element 8 and the locking groove 14 lock the edges in a horizontal direction perpendicular to the vertical plane VP. The strip 6 and the protruding tongue 10 form a cavity 31 that in connected state accommodates an outer part of the flexible snap tab 33. The protruding tongue is preferably arranged above the strip, at the vertical plane and

extends from the vertical plane. The locking surface of the protruding tongue is preferably arranged above the strip.

The inclined guiding surface 11 facilitates an easy locking since the flexible snap may not be in contact during locking with the upper sharp edge of the panel surface. The guiding surface may be used to facilitate an easy locking even in the case that a contact may exist during folding between the upper edge and the flexible snap tab 11.

The lower locking surface 12 may be inclined and the locking may be made with a pre tension such that the snap tab 11 in locked position is pressed against a lower part of the protruding tongue 10.

Figure 7a shows that there may be a space S1 between the upper part of the tongue 10 and the adjacent panel edge. The vertical locking is accomplished with an upper contact point A between the protruding tongue 10 and the flexible snap tab 33, and a lower contact point B between the strip 6 and a lower edge of the fold panel 1c. The snap tab may be flexible or rigid depending on the design and material composition. Polymer materials are preferred and the flexible tongue may comprise several different materials in for example the inner part or in the snap tab. The flexible tongue 30 may comprise a knee joint 36 with increased flexibility that facilitates bending and/or displacement of the snap tab. The locking groove 14 and the holding groove 32 are preferably horizontally displaced, in order to obtain a strong locking system, and preferably with a distance D1 that is at least about 30% of the floor thickness T. The upper part of the locking groove 14 and the inner part of the holding groove 32 are preferably also displaced vertically with a distance D2.

Figure 7b shows that there may be a space S2 between the upper part of the strip 6 and the lower edge of the adjacent fold panel 1c. The vertical locking is in this embodiment accomplished with a lower contact point B between the protruding tongue 10 and the flexible snap tab 33, and an upper contact point A between the protruding tongue 10 and an upper part of the fold panel 1c that overlaps the protruding tongue.

Figure 8a shows an embodiment where the upper edges of the panels are in contact with each other and the guiding surface 11 extends downwardly from the panel surface. The knee joint 36 comprises a flexible material 37 that is softer than the inner part 34 and the snap tab 33. The flexible tongue 30 comprises an inner part 34 that comprises a lower part 34a located under the flexible snap tab 33.

Figure 8b shows an embodiment where the holding groove 32 comprises glue 38 and the flexible tongue 30 is glued into the holding groove. This gives a stronger locking system and cracks C extending primarily between the holding groove 32 and the locking groove 14 may be avoided. The lowest part of the flexible tongue 30 may be located essentially on the same horizontal plane as the lower and outer part 39 of the fold panel 1c. The holding groove may comprise an upper wall and a lower wall and an inner wall extending between the upper and the lower wall. The glue is preferably provided at the upper, the lower and the inner wall. The flexible tongue is preferably glued to the upper, the lower and the inner wall.

CLAIMS

1. A set of floor panels which are mechanically connectable to each other at a first and a second edge of a first and a second floor panel (1b, 1c) respectively, wherein upper edges of said first and second edge in a connected state define a vertical plane (VP), characterized in that

the first edge is provided with a protruding tongue (10) formed in one piece with the core of the first floor panel, said protruding tongue (10) extends beyond the vertical plane (VP),

the second edge is provided with a separate flexible tongue (30)

the flexible tongue comprises an inner part (34), which is connected to a holding groove (32) at the second edge, and an outer flexible snap tab (33) that extends upwardly and in the connected state into a cavity (31) under the protruding tongue for locking the first and the second floor panel to each other in a vertical direction,

the first edge comprises a strip (6) with a locking element (8),

the second edge comprises a locking groove (14), which is open towards a rear side of the second floor panel that faces a subfloor,

a locking surface of the locking element is configured to cooperate, in the connected state, with a locking surface of the locking groove for locking the first and the second floor panel to each other in a horizontal direction, which is at right angles to the first and second edge,

wherein the first and the second floor panel are mechanically connectable by a vertical displacement towards each other, wherein the flexible snap tab (33) and the protruding tongue (10) are configured to cooperate during said displacement such that at least a part of the flexible snap tab (33) is, in a first stage, resiliently displaced towards the second edge, by the protruding tongue (10), and that the flexible snap tab (33) is, in a second stage, displaced towards the first edge, to obtain the connected state.

2. The set of floor panels as claimed in claim 1, wherein an outer part of the protruding tongue (10) comprises an inclined or rounded guiding surface (11) at its upper and outer part.

3. The set of floor panels as claimed in claim 1 or 2, wherein the protruding tongue (10) is arranged above the strip (6).

4. The set of floor panels as claimed in any one of the preceding claims, wherein the protruding tongue (10) is arranged at the vertical plane and extends from the vertical plane.

5. The set of floor panels as claimed in any one of the preceding claims, wherein a space (S1) is provided between the upper parts of the protruding tongue (10) and the second edge.

6. The set of floor panels as claimed in any one of the preceding claims, wherein a space (S2) is provided between the upper part of the strip (6) and the second edge

7. The set of floor panels as claimed in any one of the preceding claims, wherein the protruding tongue (10) comprises at its lower part a locking surface (12) which in the connected state is configured to cooperate with the flexible snap tab (33).

8. The set of floor panels as claimed in claim 7, wherein the locking surface (12) of the lower part of the protruding tongue is inclined.

9. The set of floor panels as claimed in claim 7 or 8, wherein the locking surface (12) of the lower part of the protruding tongue (10) is arranged above the strip (6).

10. The set of floor panels as claimed in any one of the preceding claims, wherein the protruding tongue (10) and the snap tab (33) is configured such that the initial contact, during said vertical displacement, between the protruding tongue and the snap tab is at an upper part of the snap tab.

11. The set of floor panels as claimed in any one of the claims, wherein the flexible tongue (30) is glued into the holding groove (32).

12. The set of floor panels as claimed in any one of the preceding claims, wherein the holding groove (32) comprise an upper wall and a lower wall and an inner wall extending between the upper and the lower wall.

13. The set of floor panels as claimed in claim 12, wherein a glue is provided at the upper, the lower and the inner wall.

14. The set of floor panels as claimed in claim 12 or 13, wherein the flexible tongue is glued to the upper, the lower and the inner wall.

Fig. 1

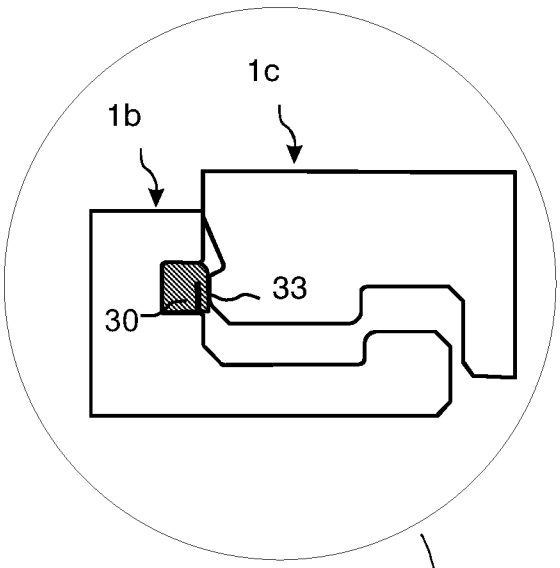


Fig. 2

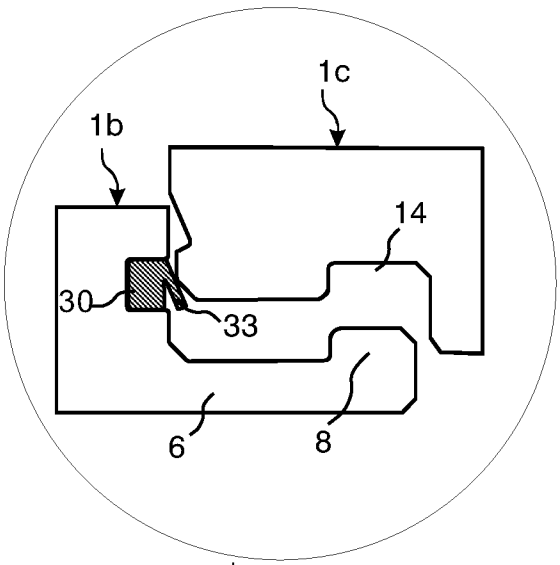


Fig. 3

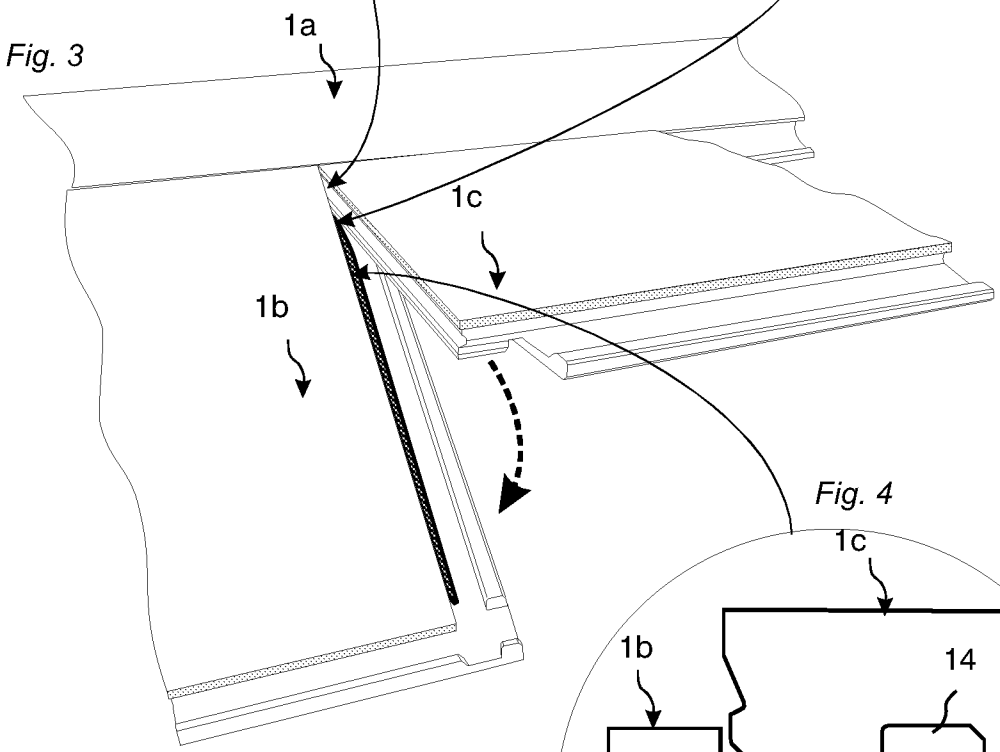
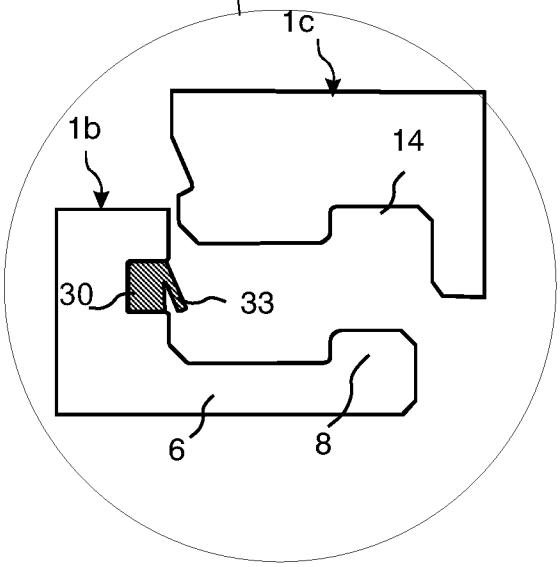


Fig. 4



KNOWN TECHNOLOGY

Fig. 5a

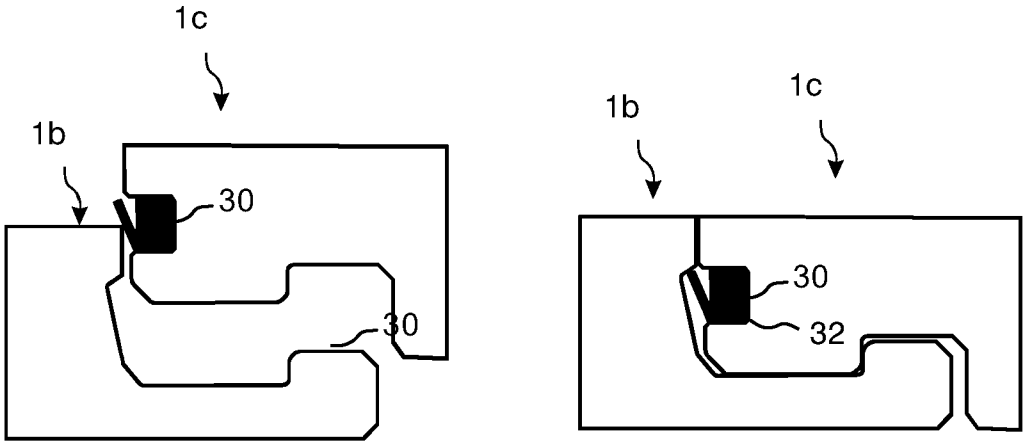
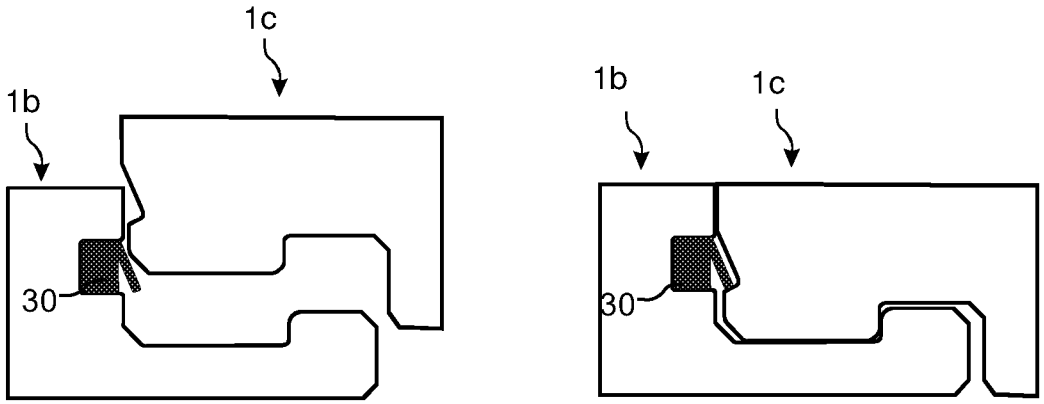


Fig. 5b



KNOWN TECHNOLOGY

Fig. 6a

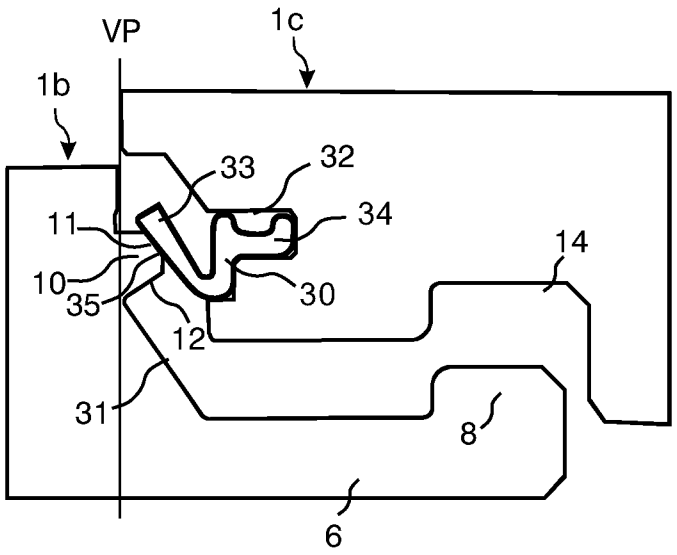


Fig. 6b

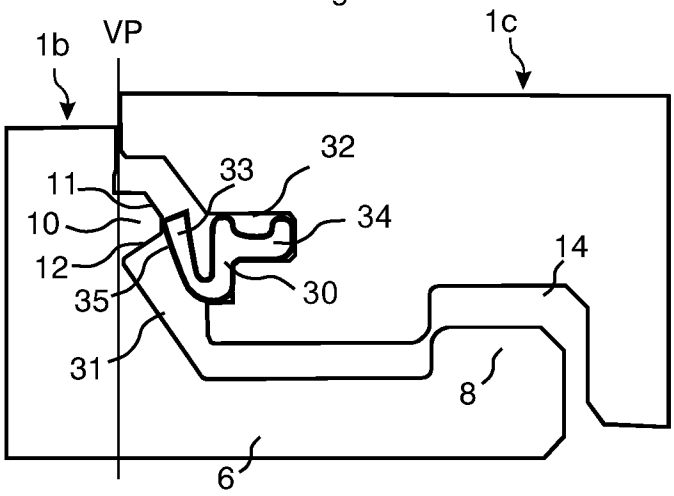


Fig. 6c

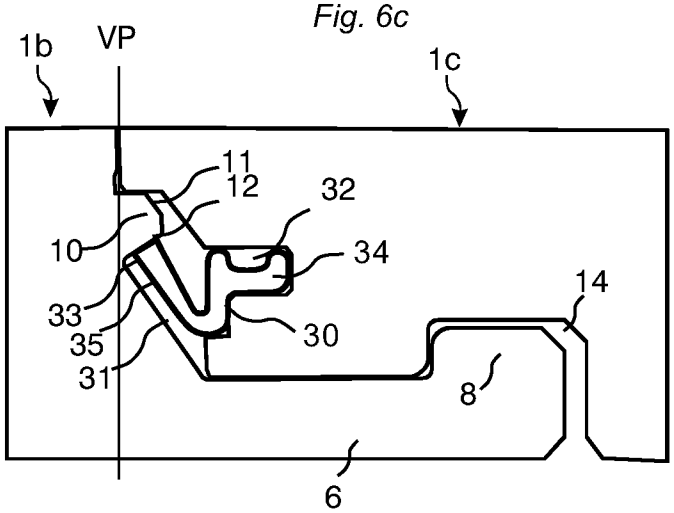
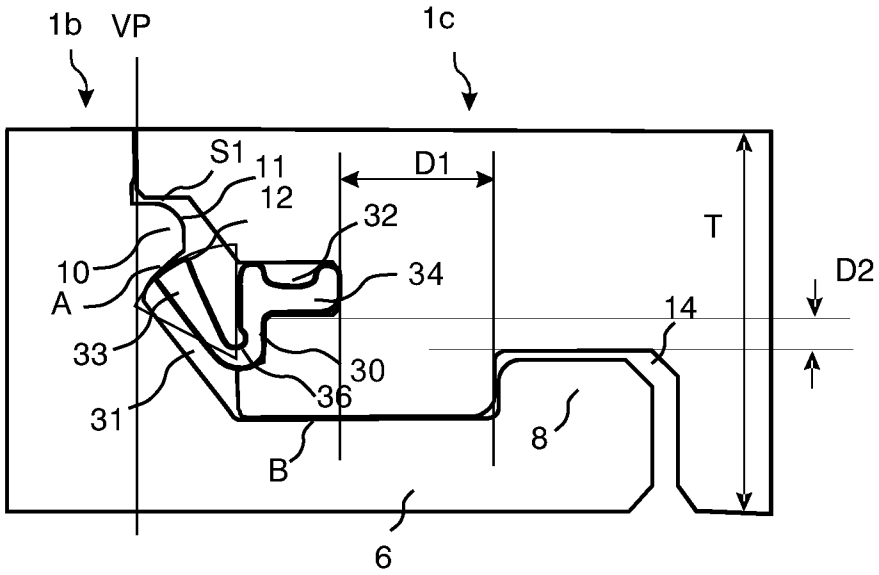


Fig. 7a


1b
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1c
S1
11
12
D1
32
T
D2
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34
A
14
33
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36
31
8
B
6

Fig. 7b

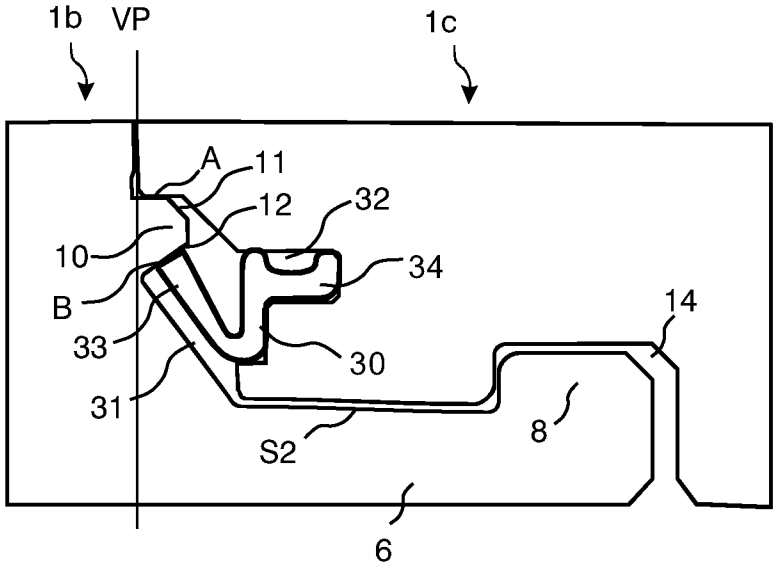
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Fig. 8a

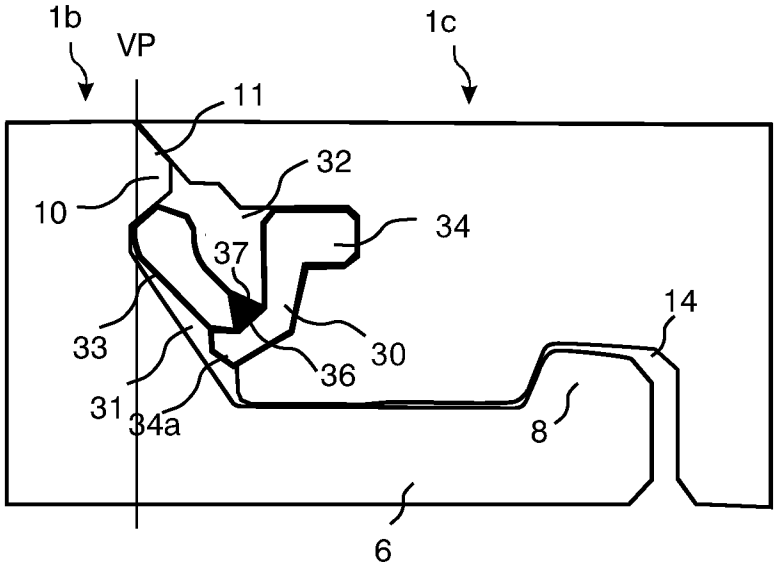
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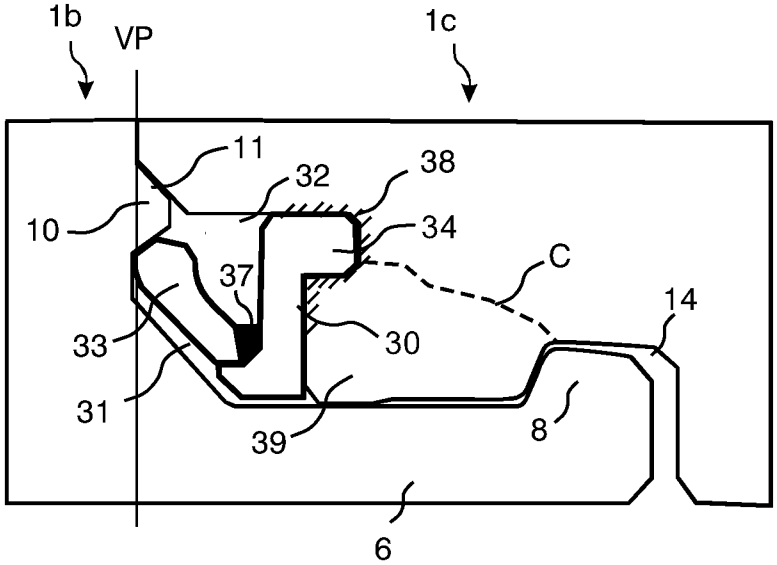
Fig. 8b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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/051374

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

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.
X	US 20100043333 A1 (HANNIG HANS-JUERGEN), 25 February 2010 (2010-02-25); paragraph [0087]; figures 7a,7b; Details 6f, 8a	1-14
Y	--	3-4, 9
A	WO 2006043893 A1 (VAELINGE INNOVATION AB ET AL), 27 April 2006 (2006-04-27); page 21, line 22 - line 32; page 33, line 11 - line 17; figures 6a-c; claim 1	1-14
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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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

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