(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 379 165 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.06.2024 Bulletin 2024/23

(21) Application number: **24171306.4**

(22) Date of filing: **05.02.2020**

(51) International Patent Classification (IPC):
E04F 15/02 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E04F 15/02038; E04F 15/02011; E04F 2201/0161; E04F 2201/049; E04F 2201/0535; E04F 2201/0547; E04F 2201/0552; E04F 2201/0588

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **07.02.2019 BE 201905073**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
20708613.3 / 3 921 489

(71) Applicant: **Unilin, BV**
8710 Wielsbeke (BE)

(72) Inventor: **CAPPELLE, Mark**
8710 Wielsbeke (BE)

(74) Representative: **Unilin Technologies**
Patent Department
Ooigemstraat 3
8710 Wielsbeke (BE)

Remarks:
This application was filed on 19-04.2024 as a divisional application to the application mentioned under INID code 62.

(54) **PANEL AND COVERING FORMED WITH SUCH PANELS**

(57) Panel, comprising a top side (2), a bottom side (3) and a first edge (6) extending between the top and bottom side and having a first coupling part (10), and a second edge (7) extending between the top and bottom side and having a second coupling part (11), which coupling parts (10-11) make it possible to produce a horizontal and vertical lock between two such panels (1) by means of a vertical movement (M) of the one panel (1) with respect to the other panel (1).

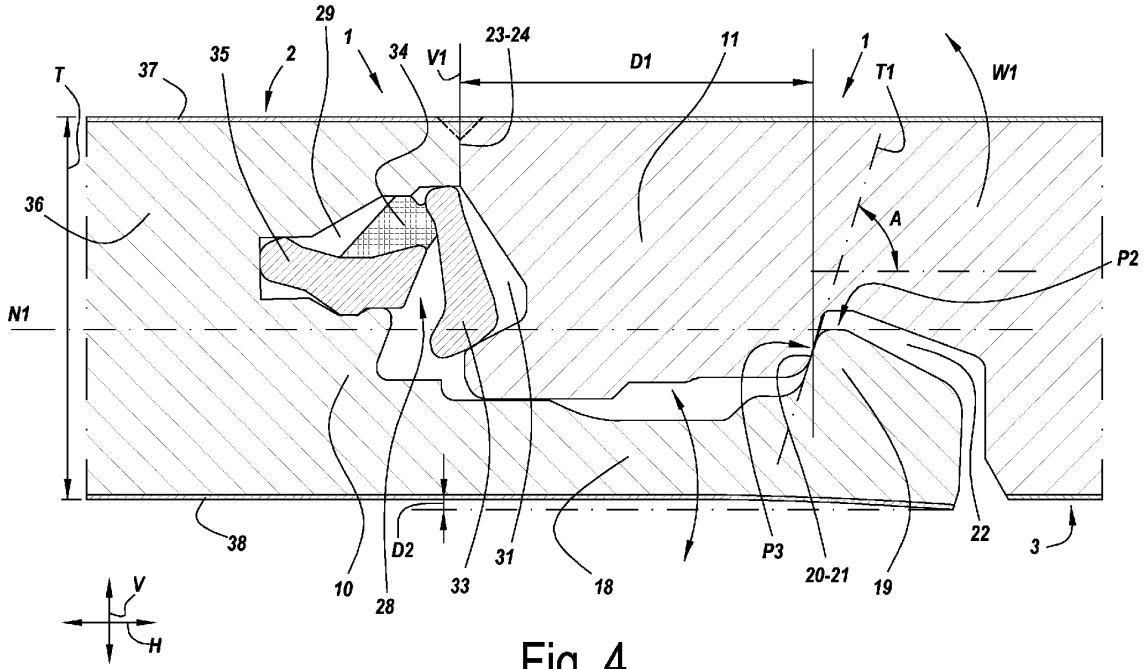

Fig. 4

EP 4 379 165 A2

Description

[0001] The present invention relates to a panel and to a covering produced using such panels.

[0002] More particularly, the invention relates to a panel which comprises a top side, a bottom side, a first edge extending between the top and bottom side and having a first coupling part and a second edge extending between the top and bottom side and having a second coupling part. The term "top side" of the panel is here generally understood to mean the side of the panel which is visible in the installed position of the panel, whereas the term "bottom side" of the panel is understood to mean the opposite side.

[0003] The coupling parts are of the so-called push-lock type. This means that they make it possible to bring about a horizontal and vertical lock between two such panels by means of a vertical movement of the one panel with respect to the other panel. This means that that the first edge can be coupled to the second edge by means of a movement of the first edge relative to the second edge substantially along the vertical direction or the direction at right angles to the surface to be produced by coupled or installed panels. The result of the coupling movement is a horizontal and vertical lock which has been produced between the mutually coupled edges. In the context of the present invention, the term "horizontal lock" is understood to mean in the horizontal direction or in the direction in the plane of the coupled panels and at right angles to the coupled edges, whereas the term a "vertical lock" is understood to mean a lock in the vertical direction or in the direction at right angles to the plane of the coupled panels.

[0004] The first coupling part comprises a lip which is preferably situated on the bottom side of the panel and has a first, upwardly directed locking element which forms a first locking surface. In the coupled position, this locking surface cooperates with a second locking surface which is formed in a first, downwardly directed locking groove of the second coupling part. The terms "upwardly" or "upward" are here understood to mean in a direction towards the top side of the panel, whereas the terms "downwardly" or "downward" are understood to mean in a direction towards the bottom side of the panel.

[0005] The cooperation between the first and second locking surface is aimed at partly or completely producing the horizontal lock.

[0006] The first coupling part furthermore comprises a first closure surface, which closure surface, in the coupled position, cooperates with a second closure surface of the second coupling part, as a result of which a vertical closure face is defined. The vertical closure face is situated at the location of a connecting j oint which is formed between the coupled panels and which is visible from above, i.e. from a top view of the coupled panels.

[0007] Panels of the above-described push-lock type are known per se. Essentially, there are two types of such push-lock systems, i.e. a single-part and two-part type. With push-lock systems of the single-part type, the coupling parts are designed to form a single entity with the actual panel. In other words, no separate insert or the like is used. Such single-part push-lock systems are described, for example, in the documents WO 01/02669 and WO 01/75247. An advantage of these push-lock systems is the fact that, due to the lack of a separate insert, they are easy to produce and relatively inexpensive. However, often a compromise has to be found with such systems between the strength of the lock on the one hand and the speed of installation on the other hand due to the limited properties of the actual material from which the panels are constructed. This is certainly the case with panels which are made of wood or wood-based material, such as MDF or HDF, which materials only have a limited elasticity.

[0008] With the two-part variant, a separate locking element is used to partly or completely produce the horizontal and/or vertical lock. In this case, the term "separate" is understood to mean that the locking element is not formed as a single entity with the actual panel, but involves a separate element which may, for example, be fitted by an installer of the panels or in the factory, i.e. during the production process of the panels. Such two-part systems are also known per se and are described, for example, in documents WO 2006/043893 and WO 2009/066153. An advantage of the two-part push-lock systems is the fact that they are less dependent on the actual material from which the panels are constructed. The material of the separate insert may be chosen in such a manner and irrespective from the material of the actual panels, that both the strength of the lock and the speed of installation result in a positive experience. It is thus no longer so important to find a compromise between these two elements. The use of the separate element may, however, result in a slightly more complicated production process and slightly increases the price of the push-lock system.

[0009] A drawback of the systems disclosed in the document WO 2009/066153, is the fact that, for some applications, the risk of gaps forming between the coupled panels is too great. Such formation of gaps may result in water or moisture penetrating into the coupling, which may be disastrous in spaces where large quantities of water are used, such as a bathroom or the like, in particular with moisture-sensitive panels, such as panels which are made of wood or wood-based material, such as MDF or HDF.

[0010] Document WO 2017/068523 describes different two-part push-lock systems, in which the principle of "pretension" is applied. In this case, a lip which is bent in the coupled position generates a force which pushes the panels towards each other and thus prevents the formation of gaps. However, it turns out that the vertical lock which is provided by the systems described is not satisfactory for some applications. With some applications, the occurrence of differences in height between the coupled panels is not counteracted to a sufficient degree.

[0011] The object of the present invention is firstly to alleviate one or several of the drawbacks mentioned in connection with two-part push-lock systems.

[0012] For this purpose, the invention, according to a first aspect, relates to a panel, comprising a top side, a bottom side and a first edge extending between the top and bottom side and having a first coupling part, and a second edge extending between the top and bottom side and having a second coupling part, which coupling parts make it possible to produce a horizontal and vertical lock between two such panels by means of a vertical movement of the one panel with respect to the other panel, wherein the first coupling part comprises a lip which is preferably situated on the bottom side of the panel and has a first, upwardly directed locking element which forms a first locking surface, which first locking surface, in the coupled position, cooperates with a second locking surface which is formed in a first, downwardly directed locking groove of the second coupling part, in order to partly or completely produce the horizontal lock, wherein the coupling parts comprise a second, separate locking element which, in the coupled position, cooperates with a second locking groove of the coupling parts in order to partly or completely produce the vertical lock and wherein the first coupling part comprises a first closure surface which, in the coupled position, cooperates with a second closure surface of the second coupling part, in this case defining a vertical closure face, characterized in that the separate locking element is part of the first coupling part, in that the lip is elastically bent in the coupled position, in such a way that a reactive force is generated which pushes the coupled panels against each other at the location of the cooperating closure surfaces, and in that the upwardly directed locking element, in the disengaged position, has an uppermost point which is situated at a vertical distance from the bottom side of the panel of at least 0.35 times, preferably at least 0.4 times and more preferably at least 0.45 times the thickness of the panel. In this case, the thickness of the panel is defined as being the vertical distance between the bottom side and the top side of the panel. The measures according to this first aspect offer the advantage that both the formation of gaps and the occurrence of differences in height are counteracted in an optimum manner. The risk of the formation of gaps is minimized due to the fact that pretension is provided in the coupling without this leading to a significant risk of disengagement of the coupling parts. The latter is achieved through the relatively high design of the upwardly directed locking element, as a result of which this locking element can be arranged relatively deeply in the downwardly directed locking groove, so that it can only be removed from the locking groove with difficulty, even in the bent position of the lip. Furthermore, the risk of differences in height can be kept under control more reliably, due to the fact that the separate locking element is provided in the first coupling part. The separate element can be made more robust in this location, thus providing a more reliable vertical lock, without this resulting in problems during installation, such as, for example, this separate element becoming trapped between the edges to be coupled, which is a significant risk with a separate locking element which is too robust and is provided in the second coupling part.

[0013] In the coupled position, the cooperating locking surfaces may define a central point which is situated at a horizontal distance from the vertical closure face which is at most once the thickness of the panel. This relatively short locking distance ensures that in particular the horizontal lock is reinforced further, which has a positive effect on counteracting the formation of gaps.

[0014] In the coupled position, the cooperating locking surfaces may define a tangent which forms an angle with the horizontal of 45 to 90 degrees, preferably from 65 to 90 degrees, but less than 90 degrees. Such an oblique orientation of the locking surfaces ensures efficient transmission of the force generated by the bent lip to the cooperating closure surfaces, which results in an optimum action of the pretension.

[0015] Viewed in the disengaged position, the lip may have a most distal point which is situated at a horizontal distance from the vertical closure face which is at least once the thickness of the panel. Such relatively long lip enhances the elastic properties thereof and thus ensures that it can easily be bent.

[0016] The lip may be bent over a maximum vertical distance of 0.0025 to 0.015 times, preferably of 0.005 to 0.0125 times the thickness of the panel. This ensures that the force generated by the bent lip is sufficiently large to counteract the formation of gaps efficiently without the ease of installation suffering any detrimental effect.

[0017] The upwardly directed locking element may be connected to another portion of the lip via a stepped portion of a top side of the lip, which stepped portion preferably runs upwards in the direction towards the upwardly directed locking element. Such a stepped portion ensures a stable connection of the upwardly directed locking element to the remaining portion of the lip, which improves the strength of the connection.

[0018] The lip may have a minimum thickness of at least 0.175 times the thickness of the panel, which ensures a stable design of the lip and thus has a positive effect on the strength of the connection.

[0019] The downwardly directed locking groove may have a bottom which runs substantially obliquely downwards in a direction away from the second locking surface. This ensures that the upwardly directed locking element can be made relatively high and can be inserted relatively deeply into the downwardly directed locking groove, whereas the connection of the second coupling part to the actual panel remains stable. The top side of the upwardly directed locking element may be adapted hereto and also run substantially obliquely downwards in a direction away from the first locking surface.

[0020] The first coupling part may have an upward side which comprises the closure surface, in which upward side a recess is provided which houses the separate lock-

ing element. This location of the separate locking element is ideal with a view to minimizing possible installation problems. In this case, the second locking groove is preferably provided in a distal side of the second coupling part, which distal side comprises the second closure surface.

[0021] The separate locking element may be deformable and/or movable and this preferably in an elastic way, the deformability and/or mobility of the separate element making it possible to reach the locked or coupled position between the respective edges. Such a separate element is known per se and described, for example, in documents WO 2006/043893 and WO 2009/066153.

[0022] The separate locking element is preferably made of one or several plastics, such as polyvinyl chloride (PVC) or acrylonitrile butadiene styrene (ABS).

[0023] The separate locking element may comprise a rotatable, preferably elastically rotatable, locking leg which, in the coupled position, cooperates with the second locking groove in order to partly or completely produce the vertical lock. Such rotatable locking leg is advantageous with a view to a quick installation procedure. When performing the coupling movement, the rotatable locking leg may initially be swung away, for example because the second coupling part pushes it away, in such a way that the respective edges can be coupled to each other, in order to then rebound, either completely or not, in order to reach the locking position. In this case, the locking leg thus actually performs a reciprocating movement.

[0024] The rotatable locking leg may be directed downwards, which is an advantageous configuration if the separate locking element is provided in the first coupling part.

[0025] The separate locking element may comprise a more flexible material part which makes a rotary movement of the locking leg possible. In this case, the expression "more flexible" is understood to mean that the material part is more flexible than the locking leg, for example due to the fact that it is made from a softer plastic. The more flexible material part makes it possible for the locking leg to be readily rotatable, which improves the ease of installation, despite the rotatable locking leg being of a robust design. The rotatable locking leg may be formed as a single entity with the more flexible material part. To this end, a co-extrusion technique may be used, for example. The rotatable locking leg may be made from, for example, rigid or semi-rigid polyvinyl chloride (PVC) or acrylonitrile butadiene styrene (ABS), whereas the more flexible material part may be made from, for example, soft PVC.

[0026] The separate locking element may comprise a securing part for securing the separate locking element in a recess provided for the purpose. The securing part may be designed in such a manner that this securing part fits into the recess in a clamping manner. The securing part may be formed as a single entity with the rotatable locking leg. If the separate locking element also comprises a more flexible material part, the rotatable locking leg, the more flexible material part and the securing part are preferably formed as a single entity with each other, for example by means of co-extrusion. The securing part is preferably made from the same material as the rotatable locking leg.

[0027] The first and second coupling part may be configured in such a way that they make it possible to disengage the respective edges by means of a turning movement. This results in a simple way of uninstalling the panels, for example in case an error occurred during installation or when replacing installed panels. The bendability of the lip and the optionally oblique orientation of the locking surfaces can contribute to a quick disengagement of the coupled edges by turning.

[0028] The lip and the upwardly directed locking element may be formed as a single entity with the panel. To this end, cutting and/or milling tools may be used.

[0029] The first coupling part may be formed entirely as a single entity with the actual panel except for the separate locking element.

[0030] The second coupling part may be formed entirely as a single entity with the actual panel.

[0031] The invention is used particularly advantageously with panels made of wood or wood-based material or with panels which comprise a core or core layer made of wood or wood-based material, wherein the first and/or second coupling part is at least partly made of and forms a single entity with this wood or wood-based material. Examples of such materials are solid wood, chipboard and fiberboard, such as MDF (Medium Density Fiberboard) and HDF (High Density Fiberboard). Such materials are water- and/or moisture-sensitive, hence the importance of avoiding water or moisture from penetrating in the coupling and keeping the connecting joint between coupled panels tight, thus preventing the formation of gaps. The measures according to the invention see to this and are thus particularly advantageous with this type of panels. A waterproof coating may be provided in the coupling in order to be able to keep infiltrating water or moisture out still more effectively. Such a coating may be provided, for example, at least at the location of the first and/or second closure surface.

[0032] The invention is extremely suitable for use with panels comprising an MDF or HDF core, in which the first and/or second coupling part is at least partly, and preferably substantially, in the case of the first coupling part except for the separate locking element, formed as a single part with the material of the MDF or HDF core. In this case, the term "substantially" is intended to indicate that the respective coupling parts may partly be composed of a possible top and/or counter layer which would be situated above and below the MDF or HDF core, respectively.

[0033] It is not excluded that the invention is used with panels made of a material other than a wood or wood-based material, such as panels made of or panels containing a core or core layer made of an optionally filled thermosetting material, for example thermosetting poly-

urethane, a filled or a non-filled thermoplastic material, for example polyvinyl chloride, polyethylene, polypropylene, polyethylene terephthalate or thermoplastic polyurethane, a mineral or ceramic material, cement fiber plate or magnesium oxide plate. Other materials are not excluded.

[0034] The thickness of the panels may range from 3 to 20 millimeters. However, panels which are thinner or thicker are not excluded. A typical thickness of panels having an MDF or HDF core ranges from 6 to 12 millimeters and is typically around 8 millimeters.

[0035] The panel may be a decorative panel, i.e. a panel which has a decor on its top side, such as a wood or stone decor. This decor can be effectuated by a wooden top layer which is applied to a core of the panel or by a carrier sheet which is applied to a core of the panel and which is printed thereon, such as a paper sheet printed with a decor or a plastic film printed with a decor.

[0036] The invention makes it possible to design the top side of the panel so as to be free from chamfers or bevels on the first and/or second edge. Such chamfers or bevels are sometimes provided in order to mask any differences in height between the coupled panels. Due to the fact that the invention makes it possible to minimize the risk of such differences in height, it makes it possible to omit chamfers or bevels, in such a way that the top side of the final covering produced by means of such panels may be flat. However, it is not excluded that the top side of the panel may be provided with a chamfer or a bevel on the first and/or second edge in order, for example, to mask a possible difference in height which would occur nevertheless or to produce, for example, a plank effect in the final covering.

[0037] The invention may be used with rectangular panels which, in practice, are the most common panels. Preferably, the short edges are provided with the first and second coupling part, but it is not excluded that the first and second coupling part are used on the long edges.

[0038] When using the first and second coupling part on the short edges, the long edges may also be provided with coupling parts, but this does not necessarily have to be the case. The coupling parts on the long edges may be of the push type, i.e. of the type which makes it possible to produce a horizontal and vertical lock between two such panels by means of a vertical movement of the one panel with respect to the other panel, and may thus be of the same type as the coupling parts on the short edges. However, to this end, the coupling parts on the long edges do not have to be identical to the coupling parts on the short edges and do not even have to have the measures of the invention. In case the coupling parts on the long edges are also of the push type, the coupling parts on the long and short edges may be configured in such a manner that they allow the panel to be coupled by both a long edge and a short edge to adjacent panels in one and the same vertical movement.

[0039] In an alternative, the coupling parts on the long edges may be of the turning type, i.e. of the type which makes it possible to produce a horizontal and vertical lock between two such panels by means of a turning movement of the one panel with respect to the other panel. To this end, the coupling parts on the long edges may, for example, be in the form of a locking tongue and groove connection, as is known per se, for example, from document WO 97/47834. If the coupling parts on the long edges are of the turning type, the coupling parts on the long and short edges may be configured in such a way that they make it possible to couple the panel by both a long edge and a short edge to the adjacent panels in one and the same turning movement. In the field, such turning movement is also referred to as "fold-down movement" and is known per se, for example from document WO 01/75247.

[0040] It is not excluded that the invention is used with panels other than rectangular panels. Using coupling parts of the push type on both pairs of edges may be useful, for example, with square panels. Panels other than rectangular or square panels are not excluded.

[0041] The panel is preferably a floor panel, but it is not excluded that the invention is used with other types of panels, such as for example wall, ceiling or door panels.

[0042] With the same object and according to a second aspect, the invention relates to a panel, comprising a top side, a bottom side and a first edge extending between the top and bottom side and having a first coupling part and a second edge extending between the top and bottom side and having a second coupling part, which coupling parts make it possible to produce a horizontal and vertical lock between two such panels by means of a vertical movement of the one panel with respect to the other panel, wherein the first coupling part comprises a lip which is preferably situated on the bottom side of the panel and has a first, upwardly directed locking element which forms a first locking surface, which first locking surface, in the coupled position, cooperates with a second locking surface which is formed in a first, downwardly directed locking groove of the second coupling part, in order to partly or completely produce the horizontal lock, wherein the coupling parts comprise a second, separate locking element which, in the coupled position, cooperates with a second locking groove of the coupling parts in order to partly or completely produce the vertical lock and wherein the first coupling part comprises a first closure surface which, in the coupled position, cooperates with a second closure surface of the second coupling part, thus defining a vertical closure face, characterized in that the separate locking element is part of the first coupling part, in that the lip is elastically bent in the coupled position, in such a way that a reactive force is generated which pushes the coupled panels against each other at the location of the closure surfaces, and in that the upwardly directed locking element, in the disengaged and/or coupled position has an uppermost point, which uppermost point defines a horizontal level which is situated above at least a portion of the separate locking el-

ement. As with the first aspect, the measures according to this second aspect offer the advantage that both the formation of gaps and the occurrence of differences in height are counteracted in an optimum manner.

[0043] The panel according to the second aspect may have one or several of the features which are described in connection with the first aspect, without the upwardly directed locking element, viewed in the disengaged position, having to have an uppermost point which is situated at a vertical distance from the bottom side of the panel of at least 0.35 times the thickness of the panel, although it is not excluded that the panel also has this feature.

[0044] The invention also relates to a covering which is produced using panels which are configured according to the first and/or second aspect. The covering is preferably a decorative covering, such as a decorative floor or wall covering.

[0045] In order to show the features of the invention in more detail, some preferred embodiments are described below by way of example and without being limited thereto, with reference to the accompanying drawings, in which:

- Fig. 1 shows a panel according to the invention in top view;
- Fig. 2 shows an enlarged cross section along line II-II in Fig. 1;
- Fig. 3 shows an enlarged cross section along line III-III in Fig. 1; and
- Fig. 4 shows an enlarged view of the coupling parts from Fig. 3, however in the coupled position.

[0046] Fig. 1 shows a panel 1 according to the invention in top view. The panel 1 is a floor panel of the decorative type. However, the decor is not shown in Fig. 1. By means of several such panels 1, a decorative floor covering can be produced.

[0047] The panel 1 has a top side 2 and a bottom side 3. The panel 1 is rectangular and thus has a pair of long edges 4-5 and a pair of short edges 6-7, which long and short edges 4-5-6-7 extend between the top side 2 and the bottom side 3. On the long edges 4-5, the panel 1 comprises coupling parts 8-9 and on the short edges 6-7 coupling parts 10-11.

[0048] Fig. 2 shows the coupling parts 8-9 on the long edges 4-5 and also shows how these edges 4-5 can be coupled to each other. The coupling parts 8-9 are configured in such a way that they make it possible to produce a horizontal and vertical lock between two such panels 1 by means of a turning movement W of the one panel 1 and the other panel 1. The coupling parts 8-9 also make it possible to couple two such panels 1 by means of a substantially horizontal movement S of the one panel 1 relative with respect to the other panel 1. When carrying out this horizontal movement S, the lip 12 is bent elastically, as is indicated by the arrow, and a so-called click-fit or snap-fit effect occurs.

[0049] The coupling parts 8-9 are designed in the form of a locking tongue and groove connection, i.e. a tongue and groove connection which not only produces a vertical but also a horizontal lock. The coupling part 8 comprises a groove 12 which is configured to receive the tongue 13 of the coupling part 9 in order thus to produce the vertical lock. More particularly, the top side of the tongue 13, in the coupled position, cooperates with the bottom side of a top lip 14 which delimits the groove along the top in order to produce the vertical lock. The groove 12 is delimited along the bottom by a bottom lip 15 which is provided with an upwardly directed locking element 16. In the coupled position, this locking element 16 cooperates with a downwardly directed locking groove 17 on the tongue 13 in order to produce the horizontal lock. The bottom lip 15 extends beyond the distal or free end of the top lip 14 in the horizontal direction.

[0050] The coupling parts 8-9 are made of and formed as a single entity with the material of the actual panel 1.

[0051] The panel 1 has a thickness T of 3 to 20 millimeters, more particularly approximately 8 millimeters.

[0052] Fig. 3 shows the coupling parts 10-11 on the short edges 6-7 and also shows how these edges 6-7 can be coupled to each other. The coupling parts 10-11 make it possible to produce a horizontal and vertical lock between two such panels 1 by means of a vertical movement M of the one panel 1 with respect to the other panel 1. The coupling parts 8-9 and 10-11 are designed in such a way that they make it possible to couple the panel 1 in one and the same turning movement by both a long edge and a short edge to adjacent such panels 1. This thus involves a panel 1 of the so-called fold-down type.

[0053] The coupling part 10 comprises a lip 18 which is situated on the bottom side 3 of the panel 1 and has an upwardly directed locking element 19 which forms a locking surface 20. In the coupled position, this locking surface 20 cooperates with a locking surface 21 which is formed in a downwardly directed locking groove 22 of the coupling part 11 in order to produce the horizontal lock.

[0054] The coupling part 10 comprises a first closure surface 23 which, in the coupled position, cooperates with a second closure surface 24 of the second coupling part 11, which cooperating closure surfaces, in the coupled position, define a vertical closure face V1.

[0055] Viewed in the disengaged position, the lip 18 has a most distal point P which is situated at a horizontal distance D from the vertical closure face V1 of at least once the thickness T of the panel 1.

[0056] The locking element 19 is connected to another portion of the lip 18 via a stepped portion 25 of a top side of the lip 18. The stepped portion 25 runs upwards in the direction towards the locking element 19.

[0057] The lip 18 has a minimum thickness T2 which is at least 0.175 times the thickness T of the panel 1.

[0058] The locking groove 22 has a bottom 26 which runs substantially obliquely downwards, in a direction away from the second locking surface 21. The locking

element has a top side 27 which is adapted thereto and runs substantially obliquely downwards, in the direction away from the first locking surface 20.

[0059] The coupling part 10 is provided with a separate locking element 28. This locking element is arranged in a recess 29 which is provided in an upward side 30 of the first coupling part 10. The upward side 30 comprises or forms the closure surface 23. In the coupled position, the separate element 28 cooperates with a locking groove 31 which is provided in a distal side 32 of the coupling part 11 in order to produce the vertical lock.

[0060] The separate locking element 28 is elastically deformable and comprises a rotatable locking leg 33 which, in the coupled position, cooperates with the locking groove 31. The separate locking element 28 comprises a more flexible material part 34 which makes a rotary movement of the locking leg possible, and a securing part 35, by means of which securing part 35 the separate element 28 is secured in the recess 29. The separate element 28 is formed as a single entity by means of co-extrusion. The more flexible material part 34 is more flexible than the locking leg 33 and than the securing part 35, which elements 33 and 35 are made from the same material.

[0061] Viewed in the disengaged position, the locking element 19 has an uppermost point P1, which is situated at a vertical distance H1 from the bottom side 3 of the panel 1 of at least 0.45 times the thickness T of the panel 1. This uppermost point P1 defines a horizontal level N, which horizontal level N is situated above at least a portion of the separate locking element 28.

[0062] Fig. 4 shows an enlarged view of the coupling parts 10-11 from Fig. 3, however in the coupled position.

[0063] In the coupled position, the lip 18 is elastically bent in such a way that a reactive force is generated which pushes the coupled panels 1 against each other at the location of the cooperating closure surfaces 23-24. The lip 18 is bent over a maximum vertical distance D2.

[0064] Viewed in the coupled position, the upwardly directed locking element 19 has an uppermost point P2 which defines a horizontal level N1 which horizontal level N1 is situated above at least a portion of the separate locking element 28.

[0065] In the coupled position, the cooperating locking surfaces 20-21 define a central point P3 which is situated at a horizontal distance D1 from the vertical closure face V1 of at most once the thickness T of the panel 1.

[0066] In the coupled position, the cooperating locking surfaces 20-21 define a tangent T1 which forms an angle A with the horizontal of 45 to 85 degrees, preferably of 65 to 85 degrees, but is smaller than 90 degrees.

[0067] The coupling parts 10-11 are configured in such a way that they make it possible to disengage the respective edges 6-7 by means of a turning movement W1. To this end, the lip 18 is able to bend as indicated by the arrow.

[0068] The panel 1 comprises an HDF core 36, a top layer 37 situated on top of the HDF core 36 and a counter layer 38 arranged under the HDF core 36. The top layer 37 comprises at least one paper sheet which is printed with a decor and impregnated and a wear layer which is arranged over the printed paper sheet, comprising an impregnated paper sheet, optionally provided with wear-resistant particles, such as corundum particles. The counter layer 38 comprises at least one impregnated paper sheet. The detailed structure of the top and counter layer is not shown.

[0069] Except for the separate locking element 28, the coupling part 10 is made of and formed as a single entity with the material of the actual panel 1. The coupling part 11 is completely made of and formed as a single entity with the material of the actual panel 1.

[0070] The top side 2 of the panels 1 is free from bevels or chamfers on the edges 6-7. However, it is not excluded that such bevels are provided, for example as indicated by a dashed line.

[0071] For the sake of clarity, the horizontal and vertical direction are indicated by the arrows H and V, respectively, in Fig. 4.

[0072] The invention also relates to one or more of the items as listed below:

1.- Panel, comprising a top side (2), a bottom side (3) and a first edge (6) extending between the top and bottom side and having a first coupling part (10), and a second edge (7) extending between the top and bottom side and having a second coupling part (11), which coupling parts (10-11) make it possible to produce a horizontal and vertical lock between two such panels (1) by means of a vertical movement (M) of the one panel (1) with respect to the other panel (1), wherein the first coupling part (10) comprises a lip (18) which is preferably situated on the bottom side (3) of the panel (1) and has a first, upwardly directed locking element (19) which forms a first locking surface (20), which first locking surface (20), in the coupled position, cooperates with a second locking surface (21) which is formed in a first, downwardly directed locking groove (22) of the second coupling part (11), in order to partly or completely produce the horizontal lock, wherein the coupling parts (10-11) comprise a second, separate locking element (28) which, in the coupled position, cooperates with a second locking groove (31) of the coupling parts (10-11) in order to partly or completely produce the vertical lock and wherein the first coupling part (10) comprises a first closure surface (23) which, in the coupled position, cooperates with a second closure surface (24) of the second coupling part (11), in this case defining a vertical closure face (V1), characterized in that the separate locking element (28) is part of the first coupling part (10), in that the lip (18) is elastically bent in the coupled position, in such a way that a reactive force is generated which pushes the coupled panels (1) against each other at the location of the cooperating closure surfaces

(23-24), and in that the upwardly directed locking element (19), viewed in the disengaged position, has an uppermost point (P1) which is situated at a vertical distance (H1) from the bottom side (3) of the panel (1) of at least 0.35 times, preferably at least 0.4 times and more preferably at least 0.45 times the thickness (T) of the panel (1).

2.- Panel according to item 1, wherein, in the coupled position, the cooperating locking surfaces (20-21) define a central point (P3) which is situated at a horizontal distance (D1) from the vertical closure face (V1) which is at most once the thickness (T) of the panel (1).

3.- Panel according to item 1 or 2, wherein, in the coupled position, the cooperating locking surfaces (20-21) define a tangent (T1) which forms an angle (A) with the horizontal from 45 to 85 degrees, preferably from 65 to 85 degrees, but less than 90 degrees.

4.- Panel according to any of the preceding items 1 to 3, wherein, viewed in the disengaged position, the lip (18) has a most distal point (P) which is situated at a horizontal distance (D) from the vertical closure face (V1) which is at least once the thickness (T) of the panel (1).

5.- Panel according to any of the preceding items 1 to 4, wherein the lip (18) is bent over a maximum vertical distance (D2) of 0.0025 to 0.015 times, preferably of 0.005 to 0.0125 times the thickness (T) of the panel (1).

6.- Panel according to any of the preceding items 1 to 5, wherein the upwardly directed locking element (19) is connected to another portion of the lip (18) via a stepped portion (25) of a top side of the lip (18), which stepped portion (25) runs upwards in the direction towards the upwardly directed locking element (19).

7.- Panel according to any of the preceding items 1 to 6, wherein the lip (18) has a minimum thickness (T2) which is at least 0.175 times the thickness (T) of the panel (1).

8.- Panel according to any of the preceding items 1 to 7, wherein the downwardly directed locking groove (22) has a bottom (26) which runs substantially obliquely downwards in a direction away from the second locking surface (21).

9.- Panel according to any of the preceding items 1 to 8, wherein the first coupling part (10) has an upward side (30) which comprises the first closure surface (23), in which upward side (30) a recess (29) is provided which houses the separate locking element (28).

10.- Panel according to any of the preceding items 1 to 9, wherein the separate locking element (28) is deformable and/or movable, preferably in an elastic way.

11.- Panel according to item 10, wherein the separate locking element (28) comprises a rotatable locking leg (33) which, in the coupled position, cooperates with the second locking groove (31) in order to partly or completely produce the vertical lock.

12.- Panel according to item 11, wherein the separate locking element (28) comprises a more flexible material part (34) which makes a rotary movement of the locking leg (33) possible.

13.- Panel according to any of the preceding items 1 to 12, wherein the first and second coupling part (10-11) are configured in such a way that they make it possible to disengage the respective edges (6-7) by means of a turning movement (W1).

14.- Panel according to any of the preceding items 1 to 13, wherein the lip (18) and the upwardly directed locking element (19) are formed as a single entity with the actual panel (1).

15.- Panel according to any of the preceding items 1 to 14, wherein the first coupling part (10) is formed entirely as a single entity with the actual panel (1), except for the separate locking element (28).

16.- Panel according to any of the preceding items 1 to 15, wherein the second coupling part (11) is formed entirely as a single entity with the actual panel (1).

17.- Panel according to any of the preceding items 1 to 16, wherein the panel (1) comprises a core (36) or core layer made of wood or wood-based material, such as MDF or HDF, and wherein the first and/or second coupling part is at least partly made of this wood or wood-based material.

18.- Panel according to any of the preceding items 1 to 17, wherein the thickness (T) of the panel (1) ranges from 3 to 20 millimeters.

19.- Panel according to any of the preceding items 1 to 18, wherein the panel (1) is of the decorative type.

20.- Panel according to any of the preceding items 1 to 19, wherein the top side (2) of the panel (1) is free from chamfers or bevels on the first and/or sec-

ond edge.

21.- Panel according to any of the preceding items 1 to 20, wherein the panel (1) is rectangular and the first and second edges form the short edges of the panel.

22.- Panel according to item 21, wherein the panel (1) comprises coupling parts (8-9) on the long edges (4-5), which coupling parts (8-9) make it possible to produce a horizontal and vertical lock between two such panels (1) by means of a turning movement (W) of the one panel (1) with respect to the other panel (1).

23.- Panel according to any of the preceding items 1 to 22, wherein the panel (1) is a floor panel.

24.- Panel, comprising a top side (2), a bottom side (3) and a first edge (6) extending between the top and bottom side and having a first coupling part (10), and a second edge (7) extending between the top and bottom side and having a second coupling part (11), which coupling parts (10-11) make it possible to produce a horizontal and vertical lock between two such panels (1) by means of a vertical movement (M) of the one panel (1) with respect to the other panel (1), wherein the first coupling part (10) comprises a lip (18) which is preferably situated on the bottom side (3) of the panel (1) and has a first, upwardly directed locking element (19) which forms a first locking surface (20), which first locking surface (20), in the coupled position, cooperates with a second locking surface (21) which is formed in a first, downwardly directed locking groove (22) of the second coupling part (11), in order to partly or completely produce the horizontal lock, wherein the coupling parts (10-11) comprise a second, separate locking element (28) which, in the coupled position, cooperates with a second locking groove (31) of the coupling parts (10-11) in order to partly or completely produce the vertical lock and wherein the first coupling part (10) comprises a first closure surface (23) which, in the coupled position, cooperates with a second closure surface (24) of the second coupling part (11), in this case defining a vertical closure face (V1), characterized in that the separate locking element (28) is part of the first coupling part (10), in that the lip (18) is elastically bent in the coupled position, in such a way that a reactive force is generated which pushes the coupled panels (1) against each other at the location of the cooperating closure surfaces (23-24), and in that the upwardly directed locking element (19), viewed in the disengaged and/or coupled position, has an uppermost point (P1/P2) which defines a horizontal level (N/N1), which horizontal level (N/N1) is situated above at least a portion of the separate locking element (28).

25.- Panel according to item 24, wherein the panel (1) has one or several features from the preceding items 1 to 23 without the upwardly directed locking element (19), viewed in the disengaged position, having to have an uppermost point (P1) which is situated at a vertical distance (H1) from the bottom side (3) of the panel (1) of at least 0.35 times the thickness (T) of the panel (1), but wherein this is not excluded.

26.- Covering produced with panels according to any of the preceding items 1 to 25, wherein this covering is preferably a floor covering, more preferably a decorative floor covering.

[0073] The present invention is by no means limited to the above-described embodiments, but such panels and coverings may be produced according to different variants without departing from the scope of the present invention.

Claims

1. Panel, comprising a top side (2), a bottom side (3) and a first edge (6) extending between the top and bottom side and having a first coupling part (10), and a second edge (7) extending between the top and bottom side and having a second coupling part (11), which coupling parts (10-11) make it possible to produce a horizontal and vertical lock between two such panels (1) by means of a vertical movement (M) of the one panel (1) with respect to the other panel (1), wherein the first coupling part (10) comprises a lip (18) which is preferably situated on the bottom side (3) of the panel (1) and has a first, upwardly directed locking element (19) which forms a first locking surface (20), which first locking surface (20), in the coupled position, cooperates with a second locking surface (21) which is formed in a first, downwardly directed locking groove (22) of the second coupling part (11), in order to partly or completely produce the horizontal lock, wherein the coupling parts (10-11) comprise a second, separate locking element (28) which, in the coupled position, cooperates with a second locking groove (31) of the coupling parts (10-11) in order to partly or completely produce the vertical lock and wherein the first coupling part (10) comprises a first closure surface (23) which, in the coupled position, cooperates with a second closure surface (24) of the second coupling part (11), in this case defining a vertical closure face (V1), **characterized in that** the separate locking element (28) is part of the first coupling part (10), **in that** the lip (18) is elastically bent in the coupled position, in such a way that a reactive force is generated which pushes the coupled panels (1) against each other at the location of the cooperating closure surfaces (23-24), and **in that** the upwardly directed locking element (19), viewed

in the disengaged position, has an uppermost point (P1) which is situated at a vertical distance (H1) from the bottom side (3) of the panel (1) of at least 0.35 times, preferably at least 0.4 times and more preferably at least 0.45 times the thickness (T) of the panel (1) and wherein a waterproof coating is provided at least at the location of the first and/or second closure surface (23, 24).

2. Panel according to claim 1, wherein the top side of the panel is provided with a chamfer or a bevel on the first and/or second edge.

3. Panel according to claim 1 or 2, wherein the lip (18) has a minimum thickness (T2) which is at least 0.175 times the thickness (T) of the panel (1).

4. Panel according to any of the preceding claims, wherein, in the coupled position, the cooperating locking surfaces (20-21) define a tangent (T1) which forms an angle (A) with the horizontal from 45 to 85 degrees, preferably from 65 to 85 degrees, but less than 90 degrees.

5. Panel according to any of the preceding claims, wherein, viewed in the disengaged position, the lip (18) has a most distal point (P) which is situated at a horizontal distance (D) from the vertical closure face (V1) which is at least once the thickness (T) of the panel (1).

6. Panel according to any of the preceding claims, wherein the lip (18) is bent over a maximum vertical distance (D2) of 0.0025 to 0.015 times, preferably of 0.005 to 0.0125 times the thickness (T) of the panel (1).

7. Panel according to any of the preceding claims, wherein the upwardly directed locking element (19) is connected to another portion of the lip (18) via a stepped portion (25) of a top side of the lip (18), which stepped portion (25) runs upwards in the direction towards the upwardly directed locking element (19).

8. Panel according to any of the preceding claims, wherein the separate locking element (28) is deformable and/or movable, preferably in an elastic way.

9. Panel according to any of the preceding claims, wherein the first and second coupling part (10-11) are configured in such a way that they make it possible to disengage the respective edges (6-7) by means of a turning movement (W1).

10. Panel according to any of the preceding claims, wherein the lip (18) and the upwardly directed locking element (19) are formed as a single entity with the actual panel (1).

11. Panel according to any of the preceding claims, wherein the first coupling part (10) is formed entirely as a single entity with the actual panel (1), except for the separate locking element (28).

12. Panel according to any of the preceding claims, wherein the second coupling part (11) is formed entirely as a single entity with the actual panel (1).

13. Panel according to claim 12, wherein, in the coupled condition, the second coupling part (11) rests upon the lip (18) of the first coupling part (10).

14. Panel according to claim 12 or 13, wherein, in the coupled condition, the second coupling part (11) contacts the lip (18) of the first coupling part (10) at a first contact location at the height of the first locking surface (20) and the second locking surface (21) and at a second contact location at the height of the distal section of the second coupling part (11) and the proximal section of the lip (18), wherein a space is present between the lip and the second coupling part (11) and this between the first contact location and the second contact location.

15. Panel according to any of the preceding claims, wherein the panel (1) comprises a core (36) or core layer made of wood or wood-based material, such as MDF or HDF, and wherein the first and/or second coupling part is at least partly made of this wood or wood-based material.

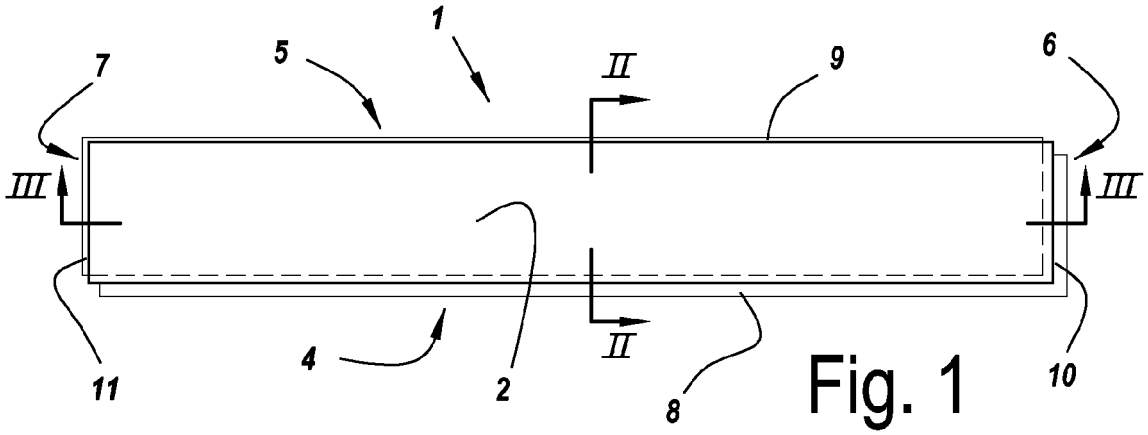

Fig. 1

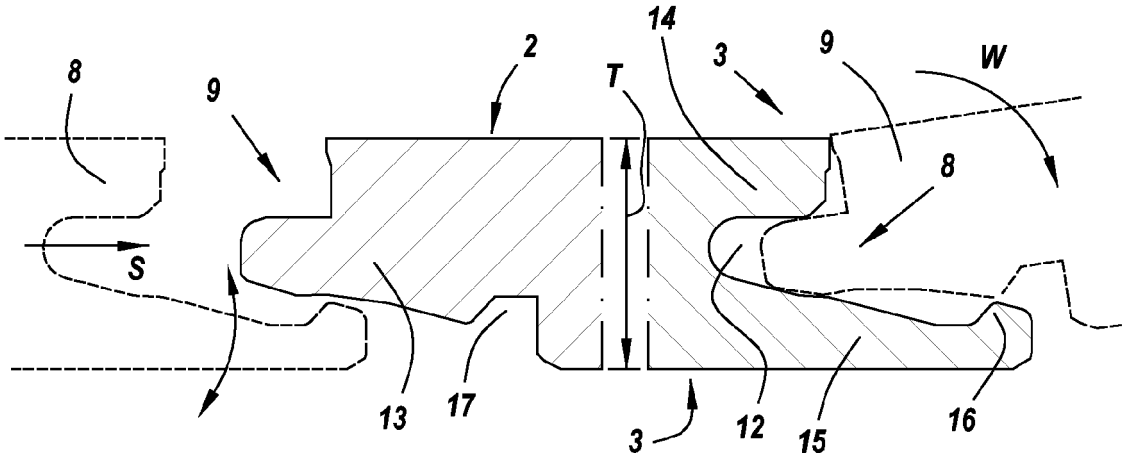

Fig. 2

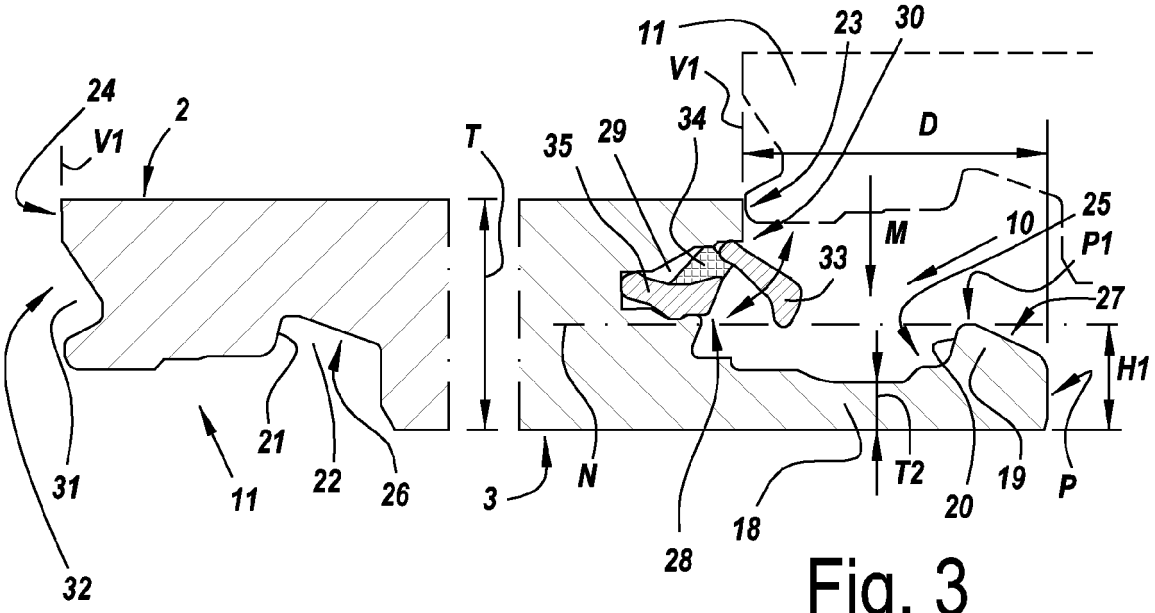

Fig. 3

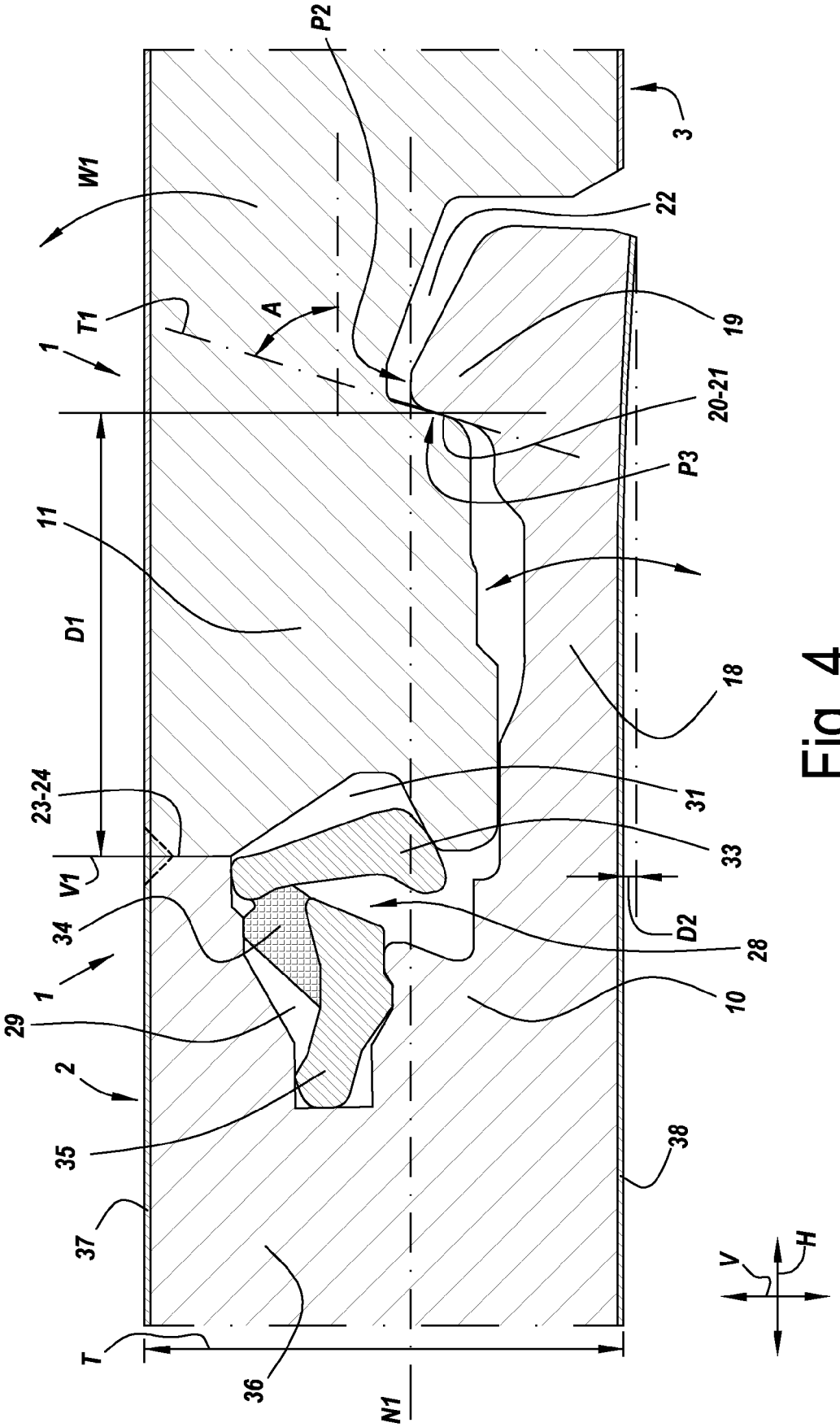
P2
3
W1
22
T1
A
19
1
20-21
P3
11
D1
18
23-24
31
33
V1
34
D2
28
1
10
29
2
35
38
37
T
36
N1
V
H

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 0102669 A **[0007]**
- WO 0175247 A **[0007] [0039]**
- WO 2006043893 A **[0008] [0021]**
- WO 2009066153 A **[0008] [0009] [0021]**
- WO 2017068523 A **[0010]**
- WO 9747834 A **[0039]**