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(54) Panel assembly, panel for forming a covering; and method of manufacuring a panel

(57) In a panel assembly including panels (1,1'), each panel having edges comprising first coupling means (8) adapted to couple the panel (1) to second coupling means (9) of the opposite edge of another panel (1'), said coupling means being in the form of a tongue (12) and groove (13) and comprising integrated locking means (10,11) with an elastically deformable portion (14) on one of the panels (1) exerting a force on the other panel (1') so as to urge the panels towards each other when the panels are coupled, it is foreseen that the elastically deformable portion (14) is elastically deformable at least in a direction having a component parallel to the upper and lower panel surfaces and perpendicularly to the corresponding edge.

The invention concerns also a covering panel (1) with edges bearing coupling means to couple two adjacent panels (1 ,1'), the coupling means including locking means (10,11) with an elastically deformable portion (14) which is in a deformed state when the panels are coupled and provides a force urging the panels towards each other, wherein the elastically deformable portion (14) is provided at a position at a distance from the upper and lower panel surfaces.

The invention is also directed to a method of manufacturing a panel (1) comprising a core of basic material and first and second coupling means (8,9) at the edges (4;5; 6,7), the method including the steps of forming the core, preforming at least one of said coupling means (8,9) from a separate piece of material, attaching the at least one coupling means (8,9) to the core of the panel and machining it to obtain the final shape.

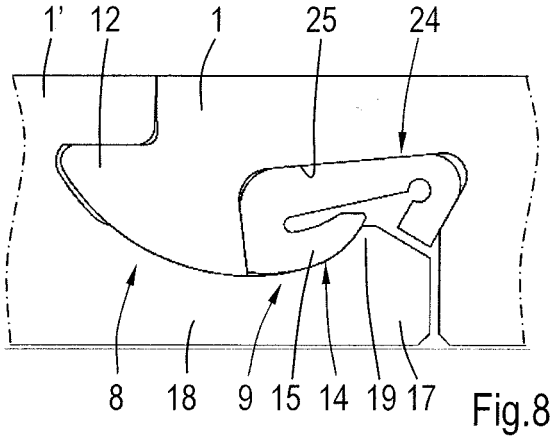

Fig.8

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Description

[0001] The present invention relates to a panel assembly including a plurality of panels adapted to be attached to each other to form a covering. Each panel comprises an upper surface and a lower surface and at least two opposite edges between these surfaces. One of the edges comprises first coupling means to couple a panel to second coupling means of the opposite edge of another panel. The first and second coupling means are substantially in the form of a tongue and groove and comprise integrated locking means preventing a drifting apart of both panels in a direction parallel to their surfaces and perpendicularly to their edges. The locking means are provided with an elastically deformable portion on one of the panels exerting a force on the other panel so as to urge the panels towards each other when the panels are coupled through their coupling means.

[0002] Such a panel assembly is for example known from WO 97/47834. In these prior art panels, the elastically deformable portion is a lower lip bordering the groove of the coupling means. This lip may be bent in downward direction and the lower lip remains in a bent condition when the panels are coupled. It therefore exerts an elastic force in upward direction, which is partly transferred into a force in horizontal direction urging the panels towards each other. This force counteracts the formation of gaps between the panels.

[0003] An object of the present invention is to provide an improved panel assembly, in particular regarding the formation of gaps.

[0004] To obtain this object, the panel assembly according to the invention is characterized in that the elastically deformable portion is elastically deformable at least in a direction having a component parallel to the upper and lower surfaces and perpendicularly to the corresponding edge.

[0005] By using such elastically deformable portion it is possible to exert a force which in itself is already directed at least partly in a direction to force the panels towards each other without requiring contact surfaces which has to transfer this elastic force into another direction. As a result, lower elastic forces may be provided without reducing the force with which the panels are urged towards each other. The elastically deformable portion remains deformed in the coupled position of the panels thereby maintaining the force which counteracts the formation of gaps between the panels. A correct position of the panels against each other at their upper surfaces is promoted if the force exerted by the elastically deformable portion is transferred between the panels mainly where the panels meet near their upper surfaces. The force for closing the gap between the panels is maximized if the coupling and locking means are configured such that, as seen in a direction parallel to the surfaces, only a force urging the panels towards each other is exerted between the panels when the panels are in their coupled position. Thus, in the latter case, the elastically deformable portion or any other portion of the coupling or locking means does not exert a force in another direction which could partly or completely undo the gap closing force.

[0006] According to the embodiment of claim 2, the elastically deformable portion can be integrated in the tongue-groove connection without affecting the function of the coupling and locking means. In this arrangement it is easy to keep the deformation of the elastically deformable portion internally, i.e. at a distance from the upper and lower surfaces of the panel, so that the deformation does not affect the appearance of the panel assembly, either at the upper or lower side. The fact that at least a part of the deformation takes place parallel to the upper and lower surfaces helps in that respect.

[0007] Although it is possible that the elastically deformable portion comprises a compressible part, it is preferred that the elastically deformable portion comprises a bendable portion which is in a bent position when the panels are coupled to each other.

[0008] In one embodiment, the bendable portion is made from a different material than a core material of the panel.

[0009] In this embodiment, the elastically deformable portion and the core material of the panel can each be adapted to the main function of the respective part of the panel, so that the elastically deformable portion may have favourable elastic properties without unduly increasing the cost price of the complete panel. This independency in the selection of the material for the elastically deformable material enables the use of highly elastic materials such that relatively small portions may provide the proper tension forces. The use of a separate material also reduces the risk of damaging the panel, which could happen if the elastically deformable portion would be made integral with the remainder of the panel, especially if the remainder of the panel is made from relatively brittle material.

[0010] In one series of embodiments, the elastically deformable portion is integrated with the tongue and is attached to or made in one piece with the tongue. In other embodiments the elastically deformable portion may be attached to or made in one piece with, i.e. integrated with, the lip bordering the groove, or the extension of the lip, and in particular the protrusion thereof.

[0011] If the elastically deformable portion and any other portion integrated therewith are attached to the remainder or core of the panel, this attachment may be chemically or mechanically, for example chemically by means of adhesive such as glue or by diffusion, or mechanically by interlocking elements or separate fasteners.

[0012] Preferably, the elastically deformable portion is provided at a position at a distance from the upper and lower surfaces, and could even be position completely inwardly of the panels when coupled, so that the deformable portion cannot be seen or have influence on the exterior of the panels.

[0013] The invention also covers a panel for use in the panel assembly as described herein.

[0014] The invention further includes a method of manufacturing a panel having at least two opposite edges, the panel comprising a core of basic material and first and second coupling means at the edges. The method includes the steps of forming the core of the panel and preferably preforming the edges of the panel, preforming at least one of the first and second coupling means from a separate piece of material, attaching the at least one of the first and second coupling means to the core of the panel and machining it to obtain the final shape.

[0015] It is advantageous if the machining step includes machining the at least one of the first and second coupling means and an adjacent portion of the core.

[0016] Further details and advantages of the invention will become clearer from the following description with reference to the drawings showing embodiments of the inventions by way of example.

[0017] Fig. 1 is a plan view of a panel for forming a floor covering.

[0018] Fig. 2 is a transverse sectional view of a panel assembly including a plurality of panels connected to each other.

[0019] Fig. 3 is an enlarged cross-sectional view of one edge of a panel showing a first embodiment of the invention.

[0020] Fig. 4 shows the part of the panel of Fig. 3, but coupled with another panel.

[0021] Figs. 5a, b, c, illustrate the final manufacture of the coupling means of the panel of Figs. 3 and 4.

[0022] Fig. 6 is a view corresponding to that of Fig. 3, but showing an alternative embodiment, in particular regarding the attachment of the coupling and locking means to the remainder of the panel.

[0023] Fig. 7 is a view corresponding to that of Fig. 3, but showing a further alternative embodiment of the invention.

[0024] Fig. 8 shows the part of the panel assembly of Fig. 7, but coupled with another panel.

[0025] Fig. 8a shows the elastically deformable portion of Fig. 7 and 8 separately and on a larger scale.

[0026] Fig. 9 is a view corresponding to Fig. 4, but showing another embodiment of the invention.

[0027] Fig. 10 shows the part of the panel assembly of Fig. 9, but coupled with another panel.

[0028] Fig. 10a shows the elastically deformable portion of Fig. 9 and 10 separately and on a larger scale.

[0029] Fig. 11 is a view corresponding to that of Fig. 9, but showing still a further embodiment of the invention.

[0030] Fig. 12 shows the part of the panel of Fig. 11, but coupled with another panel.

[0031] Fig. 12a shows the elastically deformable portion of Fig. 11 and 12 separately and on a larger scale.

[0032] Fig. 13 is a view corresponding to that of Fig. 12, but showing still another embodiment of the invention.

[0033] Fig. 13a shows the elastically deformable portion of Fig. 13 separately and on a larger scale.

[0034] Fig. 14 is a view corresponding to that of Fig. 11, but showing still a further embodiment of the invention.

[0035] Fig. 15 shows the part of the panel of Fig. 14, but coupled with another panel.

[0036] Figs. 16 and 17 are views corresponding to that of Fig. 14, illustrating the manufacture of the elastically deformable portion of Fig. 14.

[0037] Fig. 1 shows schematically a panel 1 from an assembly of panels which are adapted to be attached to each other to form a covering. The panels may be used as floor panels to form a floor covering, but the panels may also be used as wall panels, ceiling panels or panels for covering other surfaces. The surfaces may be indoor or outdoor surfaces.

[0038] In a particular embodiment, the panels may be constructed as laminate panels for forming a laminate flooring which is well known in the art. These laminate panels are used to imitate planks or tiles of natural material, such as wood, stone or any other material. Generally these laminate panels comprise a core of a relatively cheap material, in particular a wood based material, such as a material including wood particles or fibres, such as MDF/HDF, a wood plastic composite (WPC) or other composites including plastics. The core of these panels is covered at their upper surface 2 by a decorative layer, formed for example from transfer foil or a laminate of paper layers immersed with resin. The lower surface 3 of the panels may be covered by another layer, for example a water-proof coating or sheet. However the invention is also applicable to panels made from wood, plastic or other material with or without separate upper and/or lower layers.

[0039] Fig. 1 shows that the panel 1 is rectangular having four edges, but the panel may also have another number of edges. The embodiment of Fig. 1 has two pairs of opposite edges, 4, 5 and 6, 7 respectively these edges are at a level between the upper and lower surfaces 2, 3. The edges 4, 6 comprise first coupling means 8, while the edges 5, 7 comprise second coupling means 9. The first coupling means 8 of one panel is intended to be coupled to the second coupling means of an adjacent panel 1 and this is true for both the edges 4, 5 and 6, 7. In practice the first coupling means 8 of the edges 4, 6 and the second coupling means 9 of the edges 5, 7 will be identical, but this is not necessary, only if the panels should be able to be coupled to each other in different orientations.

[0040] Fig. 2 shows three panels 1 coupled to each other through their first and second coupling means 8, 9.

[0041] Fig. 2 also shows that the coupling means 8, 9 comprise locking means 10, 11 which prevent the panels 1 from drifting apart in a direction parallel to their surfaces 2, 3 and perpendicularly to their edges 4, 5. These locking means are configured such that they exert a force urging the panels 1 towards each other (i.e. perpendicular to their edges) while the panels are in their coupled condition. This force counteracts the formation of gaps be-

tween the panels, in particular at the position near the upper surfaces 2 where the panels 1 meet each other. This position may be exactly at the upper surface in the situation of Fig. 2, but in case the upper edges of the panels 1 are machined for example to form a V-groove between the panels, the panels will meet at a distance from the upper surface 2. Fig. 2 also shows that the first coupling means include a tongue 12, while the second coupling means 9 include a groove which is able to receive at least a portion of the tongue 12 therein so as to lock the panels 1 with respect to each other in a direction perpendicularly to their surfaces 2, 3, i.e. in vertical direction. The shape of the tongue and groove 12, 13 may have all kinds of configurations and orientations as long as they include surfaces that restrict movements in a direction perpendicularly to the surfaces 2, 3. For the sake of completeness it is noted that the invention may also be used with an alternative embodiment of the coupling means, wherein the tongue and groove are oriented mainly in a direction perpendicularly to the surfaces 2, 3.

[0042] Figs. 3-5 show a first embodiment of the coupling and locking means according to the invention. All embodiments have in common that the locking means 10 or 11 includes an elastically deformable portion which is able to deform at least in a direction parallel to the surfaces 2, 3, such as to exert a force on the panels 1 urging them towards each other. This elastically deformable portion thereby counteracts the formation of gaps between the panels 1 and making the connection free from play.

[0043] In the embodiment shown in Fig. 3, the elastically deformable portion is in the form of an elastically bendable lip 15. This lip is formed on a side of the tongue 12 remote from the free end of the tongue 12. This lip 15 extends from the lower side of the tongue and extends obliquely upwardly in a direction away from the free end of the tongue 12. The outer surface of the lip 15 in this case forms a continuation of the lower side of the tongue. The shape, thickness and length of the lip may be varied to adapt it to the circumstances.

[0044] In the embodiment shown in Fig. 3, the elastically deformable portion 14 is formed in one piece with locking means 10 and the first coupling means 8 that are formed separately from the remainder of the panel 1, for example the core thereof. This allows a selection of a material for the coupling and locking means which is best suited for the function thereof. In particular the elastically deformable portion 14 will be made of a plastic or rubber like material having the desired elastic properties, such as PP, PE, PVC and the like, but also a metal such as spring steel or the like is conceivable.

[0045] The integrated piece of the coupling means and locking means is attached to the remainder of the panel by means of adhesive, in this case by gluing the upper side of the piece to a co-operating surface of the remainder of the panel 1 at a position behind the tongue 12.

[0046] Fig. 4 shows two panels 1, 1' in their coupled position in which the tongue 12 is inserted in the groove of the panel 1'. Vertical surfaces 16 near the upper surfaces 2 of the panels 1, 1' are in contact with each other and are forced against each other as a result of the force exerted by the elastically deformable portion 14 of the locking means 10 onto the co-operating locking means 11. In the present embodiment, the locking means 11 of the other panel 1' is formed as an extension 17 of a lip 18 bordering the lower side of the groove 13. On this extension 17 on the lip 18 there is formed an upward protrusion 19 overlapping with the elastically deformable portion 14 in a direction perpendicularly to the surfaces 2, 3, or in other words they overlap such that the elastically deformable portion 14 is blocked by the protrusion 19 when the tongue is moved out of the groove 13 in a direction parallel to the upper side of the tongue. The only manner of removing the tongue 12 from the groove 13 is by rotating the panel 1 bearing the tongue 12 with respect to the other panel 1'. Coupling of the panels 1, 1' will be accomplished by angling the tongue 12 into the groove 13, such that the lower side of the tongue 12 slides along the upper side of the lip 18, of its extension 17 and of the lip 15. During this coupling movement, the lip 15 of the elastically deformable portion 14 will be bent gradually and will remain in its bent condition when panels 1, 1' are in their coupled position. In this coupled condition the outer surface of the elastically deformable portion is lying smoothly against the counter-surface on the extension 17 of the lip 18 and the upward protrusion 19. Due to the oblique position of the lip 15 in the coupled position of the panels 1, 1', the bending of the lip 15 will exert a force on the panel both in a direction parallel to the surfaces 2, 3 and in a direction perpendicularly to these surfaces 2, 3. The amount of deformation of the deformable portion 14 and the direction of deformation may be chosen such as to exert a force in a desired direction and of a desired magnitude. The selection of the material for the lip 15 and the shape and size of the lip 15 will also determine the tension force in the coupled condition of the panels 1, 1'.

[0047] Fig. 5 shows how the coupling means, in this case the tongue 12 of the first coupling means 8 is finished by machining, while the first coupling means 8 is already attached to the remainder of the panel 1. In this way, the accuracy of the attachment has no or hardly any influence on the position of the tongue 12 with respect to the remainder of the panel 1. Fig. 5a shows how the pre-formed, but unfinished coupling means together with the elastically deformable portion 14 is attached to the remainder of the panel 1, the edge of which is preformed, whereas in Fig. 5b the machine tool M is shown when it is finishing the tongue 12 of the first coupling means 8. Fig. 5c shows the panel 1 and first coupling means 8 in its finished condition.

[0048] Fig. 6 shows a second embodiment of the invention incorporating one major change with respect to the first embodiment of Figs. 3-5 concerning the connection of the first coupling means 8 to the remainder of the panel. In this embodiment, the first coupling means 8 is

attached to the remainder of the panel 1 through at least mechanical means. The first coupling means 8 and the remainder of the panel 1 comprise interlocking elements 20, 21, here a dove-tailed groove and projection, as well as an additional groove 22 and projection 23 providing additional mechanical stability. Of course, it is possible to strengthen the attachment by adding adhesive as well.

[0049] Figs. 7, 8 and 8a show a further embodiment in which the locking means 10, and in particular the elastically deformable portion 14 is formed as a separate piece 24 attached to the remainder of the panel 1 and to the coupling means 8, which in this case is formed integral with the remainder of the panel 1, but which could also be formed as a further separate piece.

[0050] In the embodiment shown in Figs. 7, 8 and 8a the separate piece 24, including the elastically deformable portion 14 again formed as a bendable lip 15, forms a folded U-shaped profile extending along the respective edge 4 of the panel 1 and being partly inserted into and attached to a hollow 25 formed at the side of the tongue 12 remote from the free end of this tongue. The attachment of the separate piece 24 to the core of the panel 1 is mechanical or takes place through a combined chemical and mechanical means. The hollow 25 is dove-tailed on at least one side 26, while one leg 27 of the U-shaped portion 24 is bendable or deformable or is connected to the rest of the separate piece 24 through a film hinge 28 or the like (see two positions in Fig. 8a) to tightly fit into the hollow 25 and to press against the side 26 of the hollow 25 to prevent removal of the separate piece 24. Glue or other adhesive may be applied to strengthen the attachment. The elastically bendable lip 15 will operate in a manner similar to the embodiments of Figs. 3-6.

[0051] A further embodiment is shown in Figs. 9, 10, 10a. This embodiment is a variation of the embodiment of Figs. 7, 8. The bendable lip 15 is not formed as an extension of the leg of the U-shaped profile, but is now formed as a separate lip depending from the central web of the U-shape. This structure makes the position of the lip 15 with respect to the panel less dependent of the correct position of the legs of the U-shaped profile in the hollow 25. The lip 15 of this embodiment is directed in the direction of insertion of the coupling means 8, in stead of in the opposite direction as in the embodiment of Fig. 7.

[0052] Another embodiment is shown in Figs. 11, 12, 12a. Again the elastically bendable lip 15, forming the elastically deformable portion 14 is formed on a separate piece now indicated by reference numeral 29. This separate piece 29 is clipped around the tongue 12 of the first coupling means 8 and forms the outer surface of the tongue up to the upper side of the tongue 12 where it contacts the upper side of the groove 13 of the other panel 1', although it is conceivable that the clip completely encloses the tongue 12. A rib 30 on the inner side of separate piece 29 is engaged around a corresponding wall on the back side of the tongue 12, that is integrated with the remainder of the panel 1, to complete the mechanical connection. The separate piece 29 is lying tightly against the tongue 12 of the first coupling means 8 up to the rib 30, where the lip 15 starts. There the separate piece is lying at a distance from the remainder of the panel 1 in its position of rest so as to be able to move closer to the coupling means in order to be bent, see Fig. 12a.

[0053] Figs. 13 and 13a show still a further embodiment. This embodiment differs from those already described in that the elastically deformable portion is now formed as part of the second coupling means 9. In the embodiment shown, the elastically deformable portion 14 is again formed as a lip, in this case lip 32 formed on the upward protrusion 19 on the extension 17 of the lower lip 18 bordering the groove 13 of the second coupling means 9. The lip extends obliquely downwardly from the substantially the upper side of the protrusion in the direction of the groove 13 in panel 1'. The lip 32, the protrusion 19 and the lip extension 17 are formed as a separate piece 33 attached to the remainder of the panel 1'. The attachment of this separate piece 33 to the remainder of the panel 1' includes at least mechanical means, here in the form of a clip 34 including a rib 35 engaging in a groove 36 in the lower side of the panel 1'. A rib 37 engages a recess 38 in the upper side of the lower lip 18. Of course it would be conceivable to form the lip 18 as part of the separate piece 33, or the other way around, to only form the elastically deformable portion 14 or the elastically deformable portion 14 and the upper protrusion 19 as a separate piece attached to the remainder of the panel 1'.

[0054] The tongue 12 of the first coupling means 8 has a shape which is different from that of the former embodiments, but the coupling and locking means function in a similar manner. The bendable lip 32 co-operates with an inclined contact surface 39 which is positioned such that in the coupled position of the panels 1, the upper protrusion 19 and lip 32 overlap with this inclined contact surface 39 and this contact surface deforms the lip 32 to a bent position, such that the lip 32 exerts an elastic force on the inclined contact surface 39 and consequently the panel 1 to urge it towards the other panel 1', thereby counteracting play between the panels 1, 1'.

[0055] Figs. 14-17 show another embodiment of a panel 1 having an elastically deformable portion 14. In this embodiment the elastically deformable portion comprises an elastically compressible portion 40 on the coupling means 8 of the panel 1. This embodiment functions similar to the embodiment of Fig. 3, for example. However, the compressible portion 40, which is formed as a separate piece, should have elastic compressible properties to perform the required function.

[0056] Fig. 14 shows the compressible portion 40 in the relaxed state, and in Fig. 15, two panels 1 are coupled through their coupling means 8, 9 and locking means 10, 11 and it can be clearly seen that the compressible portion 40 is compressed and will exert a tension force having a substantial component urging the panels 1 towards each other. It would also have been possible to provide

the compressible portion on the second coupling means 9, i.e. the locking means 11 thereof, for example on the protrusion 19 of the lip extension 17. It might be formed in one piece with other parts, but generally it should have other properties regarding its compressibility, but there are manufacturing methods to obtain this.

[0057] Figs. 16 and 17 show the manner in which the compressible portion 40 of Figs. 14 and 15 could be applied. In Fig. 16, the first coupling means 8 and locking means 10 are roughly formed and an overdose of elastically compressible material 41 is injected into the recess behind the tongue 12.

[0058] In Fig. 17 it is shown that a machine tool M finally forms the lower side of the locking means 10, including the compressible portion 40 and the adjacent recess 42 in the lower side of the panel 1. This results in a smooth transition from the material of the remainder of the panel 1 to the compressible portion 40, as well as in accurate dimensions thereof.

[0059] The invention is not limited to the embodiments described here in before and shown in the drawings, which may be varied in different manners within the scope of the appended claims. Features of the different embodiments shown and described may be applied in other combinations.

[0060] As an example of further possibilities it is noted that the locking means could be provided at or near the free end of the tongue or other coupling means instead of remote there from. The function of the elastically deformable portion there could be similar to the embodiments shown in the drawings. The elastically deformable portion could also be provided adjacent the upper lip of the panel or within the groove. Generally the elastically deformable portion will be provided along the whole edge of the panel, but it would also be possible to provide the portion only along one or more selected parts of the respective edge. If the material of the panel and the manufacturing method allow, the coupling and locking means including the elastically deformable portion could be made in one piece with the remainder of the panel. Anyhow, it is preferred that the locking means and the elastically deformable portion are preinstalled in the factory and should not be installed during laying of the covering. The deformation of the elastically deformable portion could be completely in a direction parallel to the surfaces of the panel, but according to the invention at least a (substantial) part of the deformation should be in this direction, for example more than half, approximately.

Claims

1. Panel assembly including a plurality of panels a0dapted to be attached to each other to form a covering, each panel comprising an upper surface and a lower surface and at least two opposite edges between these surfaces, one of the edges comprising first coupling means to couple the panel to second coupling means of the opposite edge of another panel, the first and second coupling means are substantially in the form of a tongue and groove and comprise integrated locking means preventing a drifting apart of both panels in a direction parallel to their surfaces and perpendicularly to their edges, the locking means being provided with an elastically deformable portion on one of the panels exerting a force on the other panel so as to urge the panels towards each other when the panels are coupled through their coupling means, the elastically deformable portion being elastically deformable at least in a direction having a component parallel to the upper and lower surfaces and perpendicularly to the corresponding edge.

2. Panel assembly of claim 1, wherein the tongue has a portion facing away from a free end of the tongue and the groove is bordered near one of the surfaces, preferably the lower surface, by a lip having an extension and a protrusion thereon cooperating with the tongue portion such that in a coupled position of two panels the protrusion and the tongue portion overlap in a direction perpendicular to their surfaces, the elastically deformable portion being positioned between the overlapping protrusion and the tongue portion.

3. Panel assembly of claim 1 or 2, wherein the elastically deformable portion comprises a bendable portion which is in a bent position when the panels are coupled to each other.

4. Panel assembly of claim 3, wherein the elastically deformable portion is made from a different material than a core material of the panel.

5. Panel assembly of claim 3, wherein elastically deformable portion, in particular the bendable portion, is integrated with the tongue and is in particular made in one piece with the tongue.

6. Panel assembly of claim 3, wherein the elastically deformable portion, in particular the bendable portion, is a separate piece connected to the tongue.

7. Panel assembly of claim 5, wherein the separate piece is an open box- or U-shaped elongate profile attached partly in a hollow behind the tongue.

8. Panel assembly of claim 5, wherein the separate piece is a clip-like profile clipped around the free end of the tongue and lying close to the tongue except for the bendable portion.

9. Panel assembly of to one of claims 4 - 8, wherein the bendable portion is in the form of a lip, in particular extending from a position near the lower side of the tongue in upward direction, preferably obliquely and

more preferably in a curve as a substantially continuous extension of the lower side of the tongue.

10. Panel assembly of to claim 2 or 3, wherein the elastically deformable portion is formed at the protrusion on the extension of the lip.

11. Panel assembly of claim 10, wherein the elastically deformable portion, the protrusion and preferably also the extension of the lip are made in one piece, and are in particular attached to a core of the panel made from a different material.

12. Panel assembly of claim 10 or 11, wherein the elastically deformable portion comprises a bendable portion, which particularly extends from a position near the upper side of the protrusion in downward direction, preferably obliquely.

13. Panel assembly of any of the preceding claims, wherein the elastically deformable portion of the one panel has a surface lying smoothly against a cooperating surface of the other panel when these panels are connected.

14. Panel assembly of claim 1 or 2, wherein the elastically deformable portion is made of a compressible part attached to the tongue and made of another material than the tongue.

15. Panel assembly of any of the preceding claims, wherein the coupling and locking means are configured such that, as seen in a direction parallel to the surfaces, only a force urging the panels toward each other is exerted between the panels when the panels are in their coupled position, this force being transferred between the panels mainly where the panels meet near their upper surfaces.

16. Panel for use in forming a covering, in particular for a floor, wall or the like, comprising at least a core of a basic material, in particular a wood-based material, and preferably a decorative layer on top of the core, the panel having an upper and lower surface and at least two opposite edges at a level between these surfaces, the edges bearing coupling means to couple two adjacent panels through their co-operating coupling means in a coupled position, the coupling means including locking means to prevent a drifting apart of the coupled panels during use, the locking means including an elastically deformable portion which is in a deformed state when the panels are in their coupled and locked position and provides a force urging the panels towards each other, wherein the elastically deformable portion is provided at a position at a distance from the upper and lower surfaces.

17. Panel of claim 16, wherein the elastically deformable portion is formed as part of a separate piece being attached to the core of the panel.

18. Method of manufacturing a panel having at least two opposite edges, the panel comprising a core of basic material and first and second coupling means at the edges, the method including the steps of forming the core of the panel, preferably preforming the edges of the panel, preforming at least one of the first and second coupling means from a separate piece of material, attaching the at least one of the first and second coupling means to the core of the panel and machining it to obtain the final shape.

19. Method of claim 18, wherein the machining step includes machining the at least one of the first and second coupling means and an adjacent portion of the core.

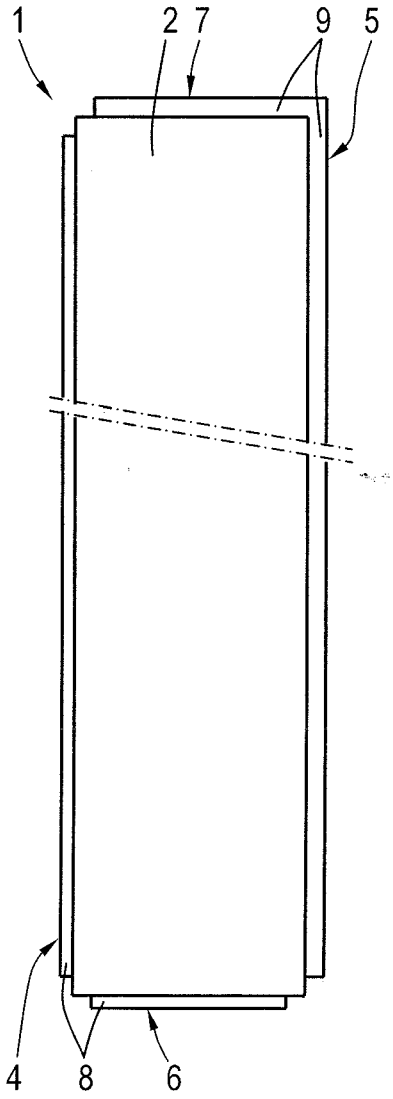

Fig.1

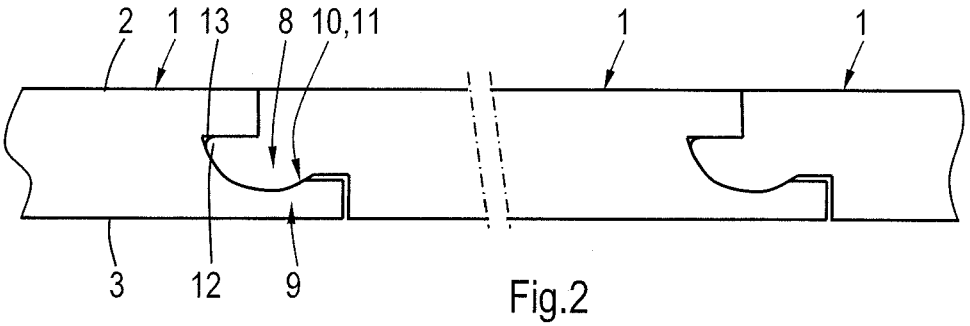

Fig.2

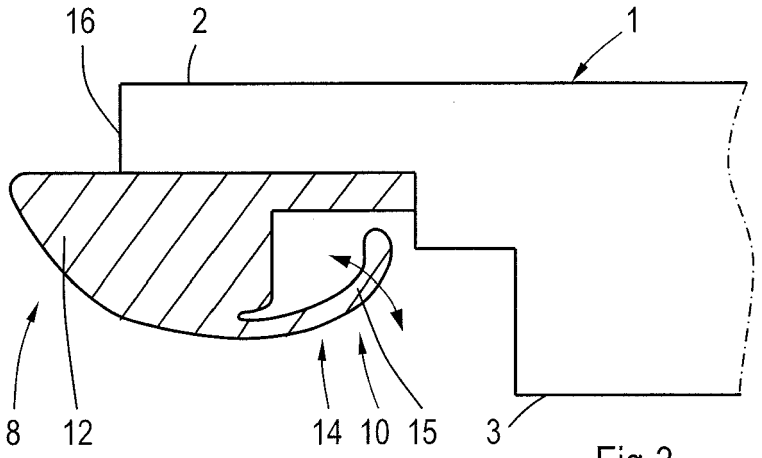

Fig.3

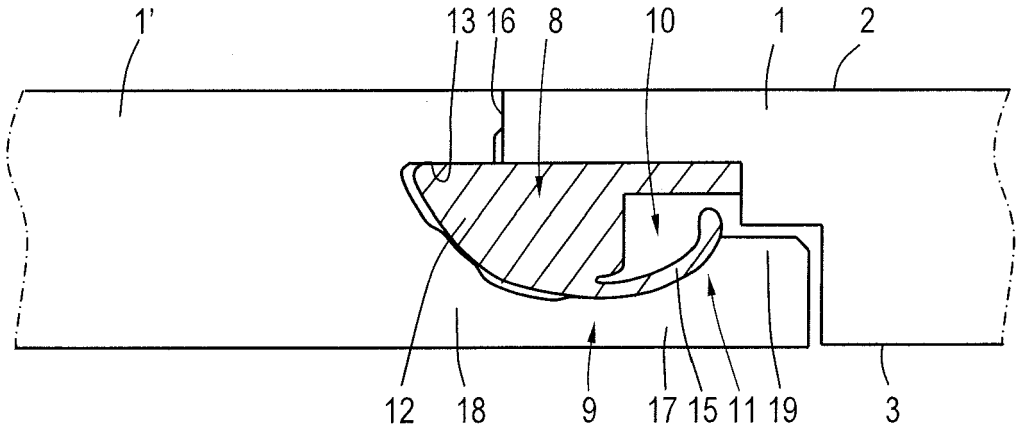

Fig.4

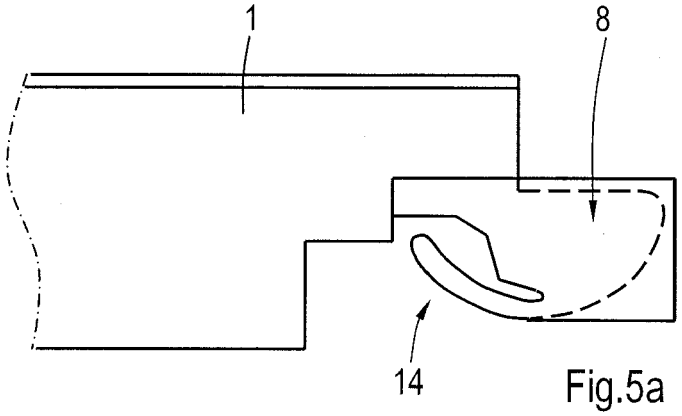

Fig.5a

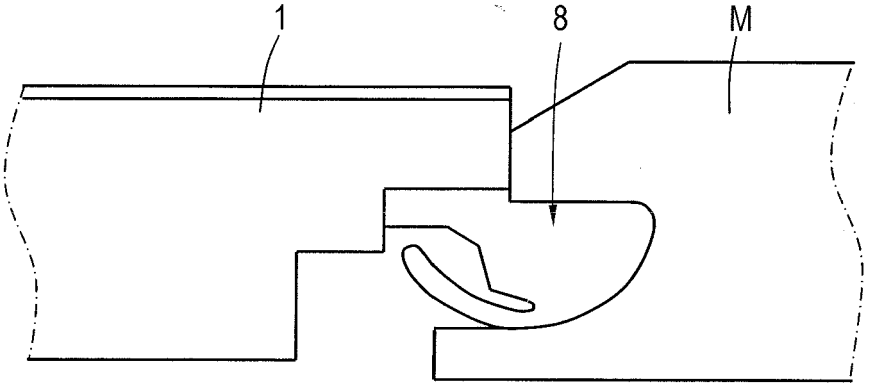

Fig.5b

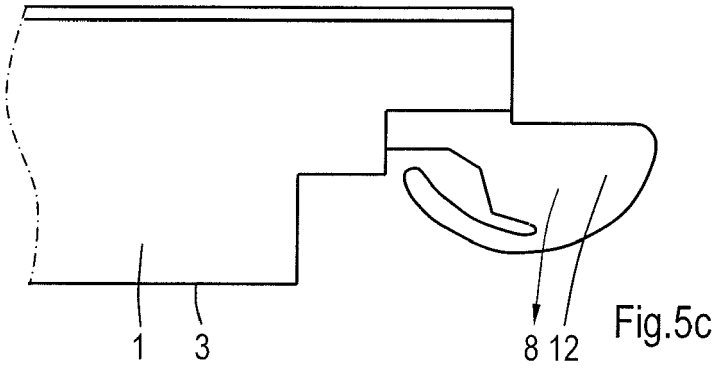

Fig.5c

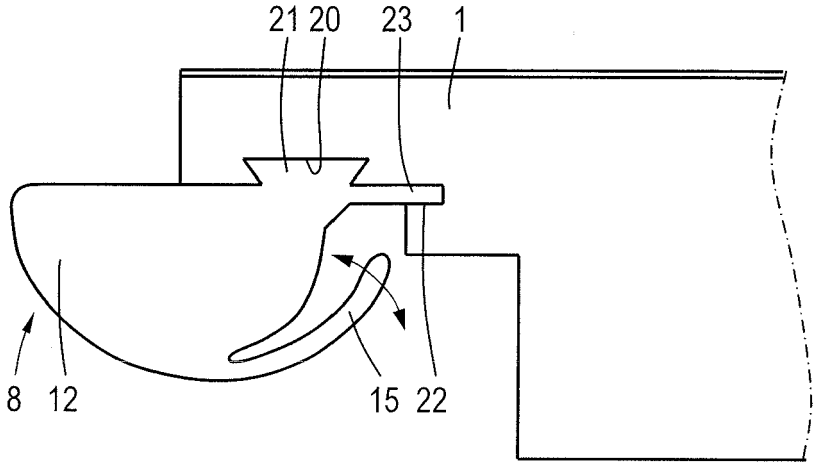

Fig.6

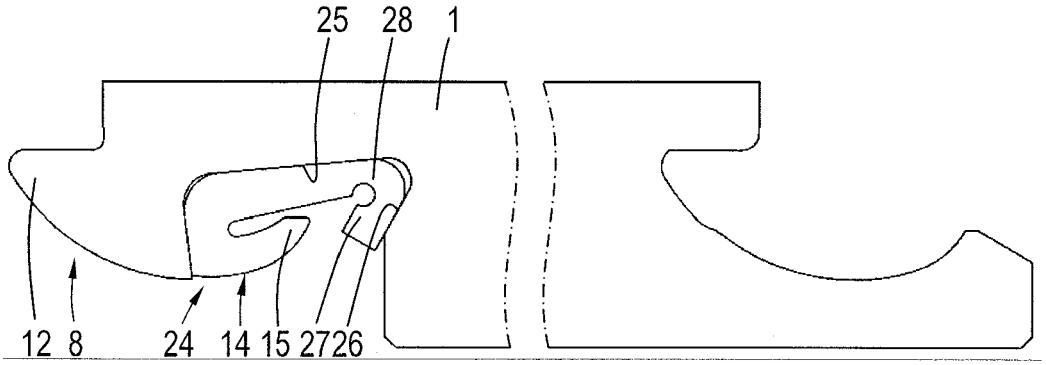

Fig.7

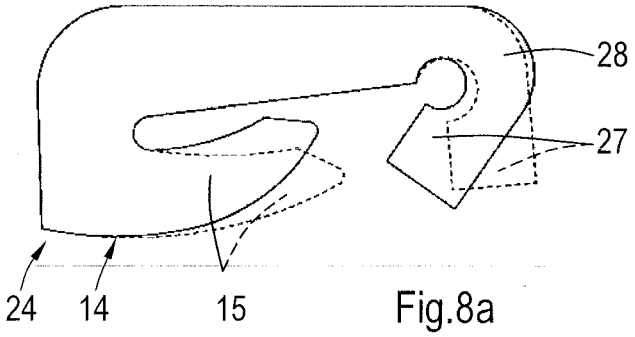

Fig.8a

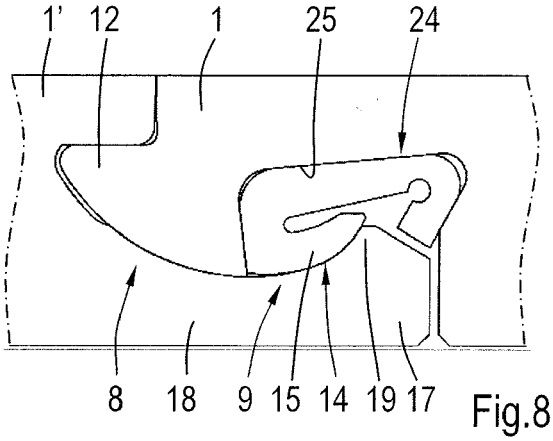

Fig.8

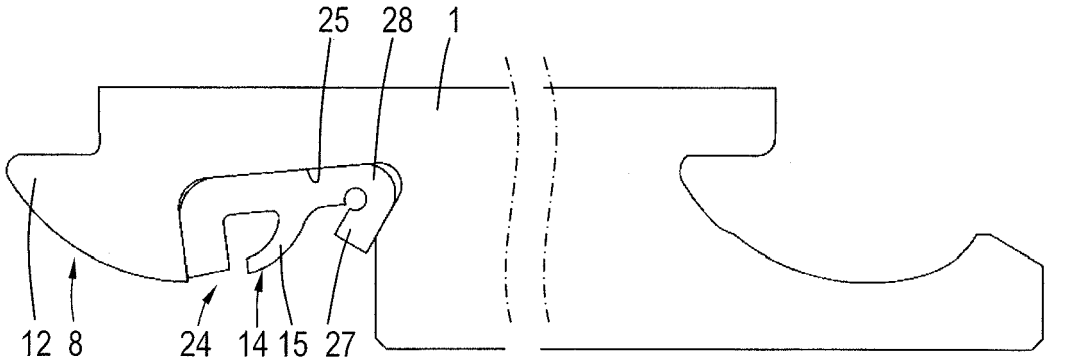

Fig.9

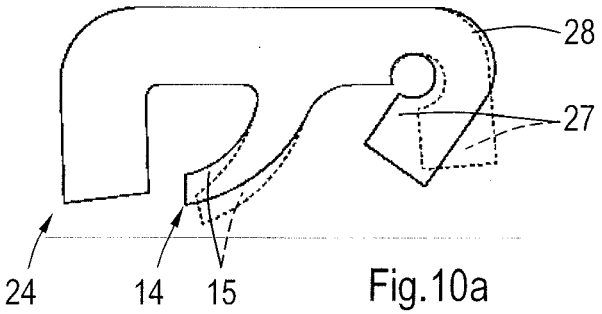

Fig.10a

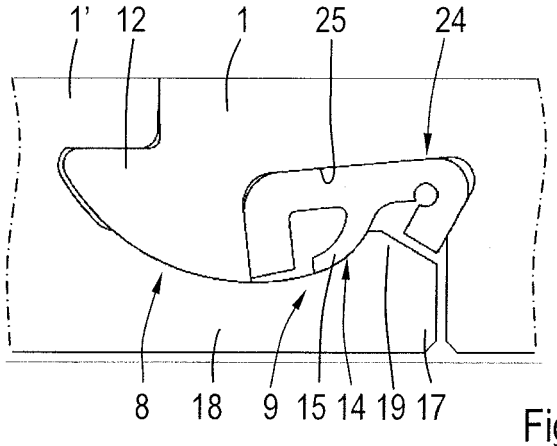

Fig.10

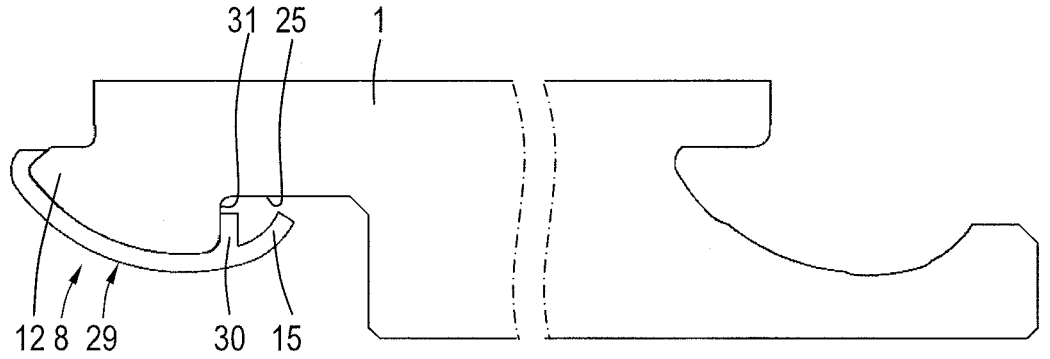

Fig.11

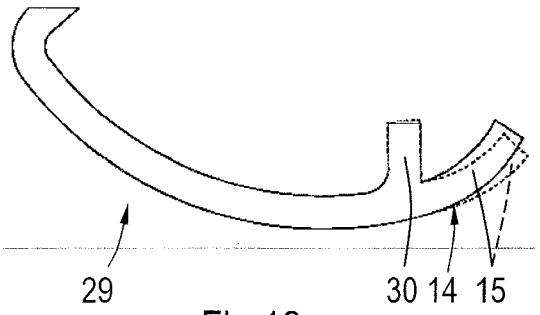

Fig.12a

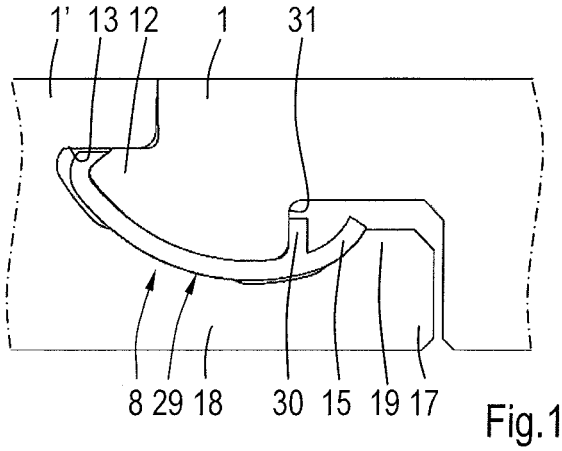

Fig.12

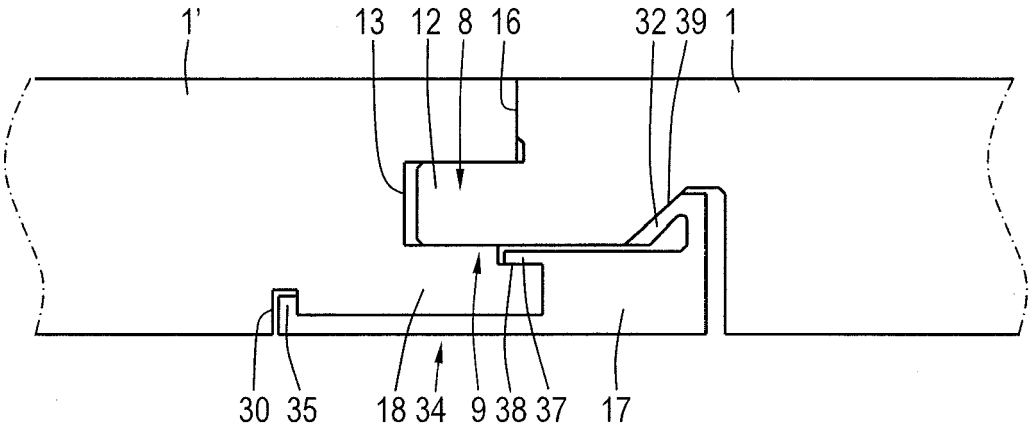

Fig.13

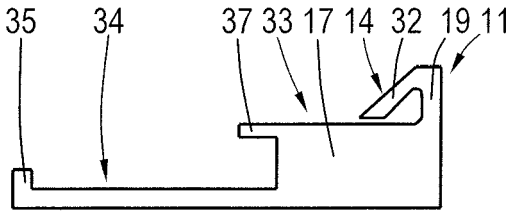

Fig.13a

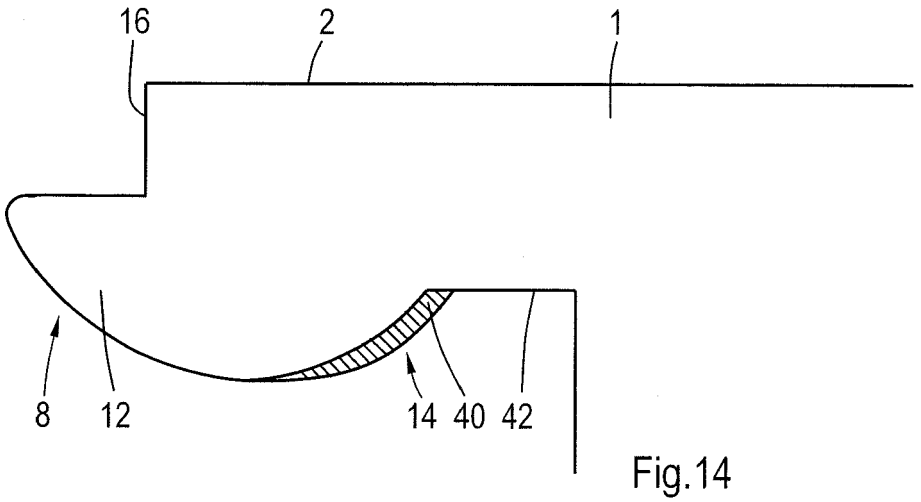

Fig.14

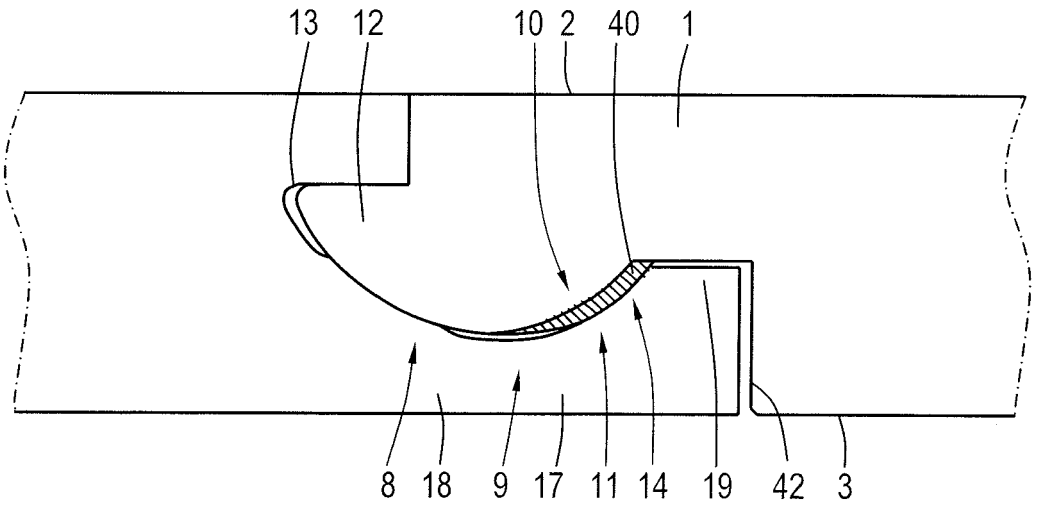

Fig.15

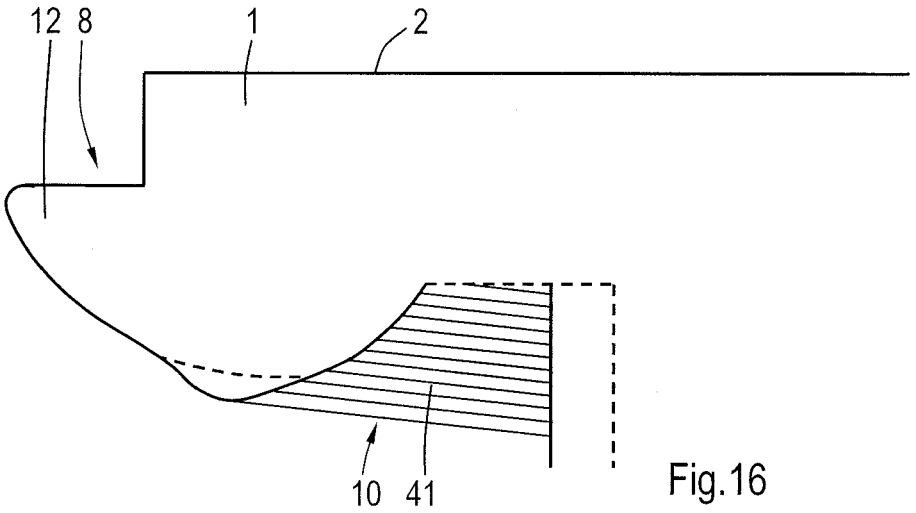

Fig.16

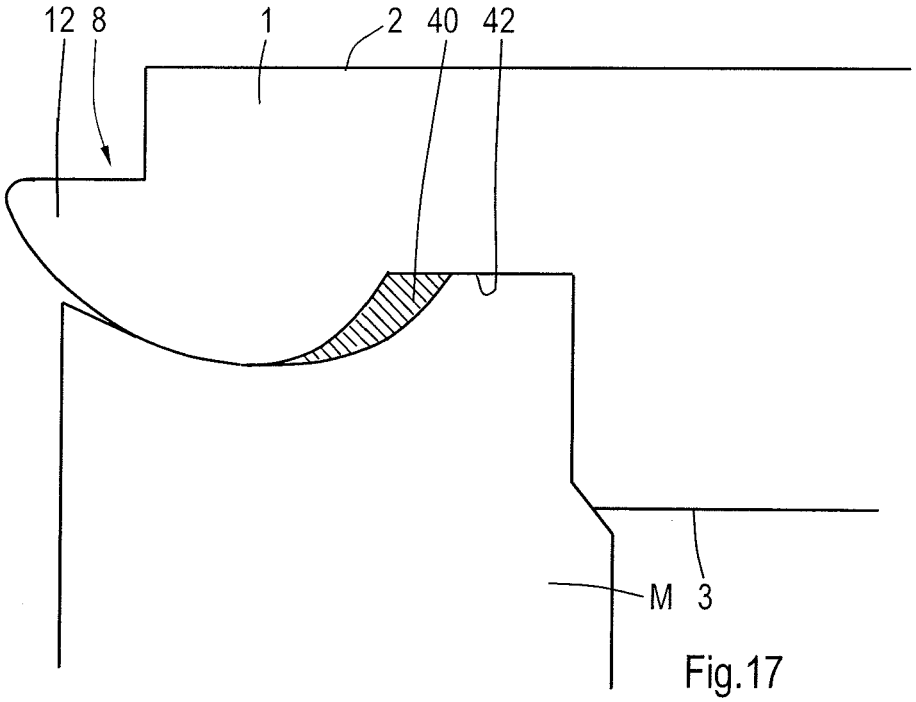

Fig.17

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 12 1339

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	WO 00/47841 A (PERSTORP FLOORING AB [SE]; MAARTENSSON GOERAN [SE]) 17 August 2000 (2000-08-17) * page 2, paragraph 3 - page 3, paragraph 1 * * page 6, paragraph 4 - page 7, paragraph 1; figure 2 *	1-4,6, 10,12	
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-/--

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	23 April 2008	Fournier, Thomas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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& : member of the same patent family, corresponding document

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 12 1339

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	23 April 2008	Fournier, Thomas

CATEGORY OF CITED DOCUMENTS

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European Patent Office

Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see additional sheet(s)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 07 12 1339

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-15

Panel assembly including panels, each panel having edges comprising first coupling means adapted to couple the panel to second coupling means of the opposite edge of another panel, the first and second coupling means being in the form of a tongue and groove and comprise integrated locking means provided with an elastically deformable portion on one of the panels exerting a force on the other panel so as to urge the panels towards each other when the panels are coupled through their coupling means, the elastically deformable portion being elastically deformable at least in a direction having a component parallel to the upper and lower surfaces and perpendicularly to the corresponding edge.

---

2. claims: 16-17

Covering panel comprising a core with edges bearing coupling means to couple two adjacent panels through their cooperating coupling means, the coupling means including locking means with an elastically deformable portion which is in a deformed state when the panels are in their coupled and locked position and provides a force urging the panels towards each other, wherein the elastically deformable portion is provided at a position at a distance from the upper and lower surfaces.

---

3. claims: 18-19

Method of manufacturing a panel having at least two opposite edges, the panel comprising a core of basic material and first and second coupling means at the edges, the method including the steps of forming the core of the panel, preforming at least one of the first and second coupling means from a separate piece of material, attaching the at least one of the first and second coupling means to the core of the panel and machining it to obtain the final shape.

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