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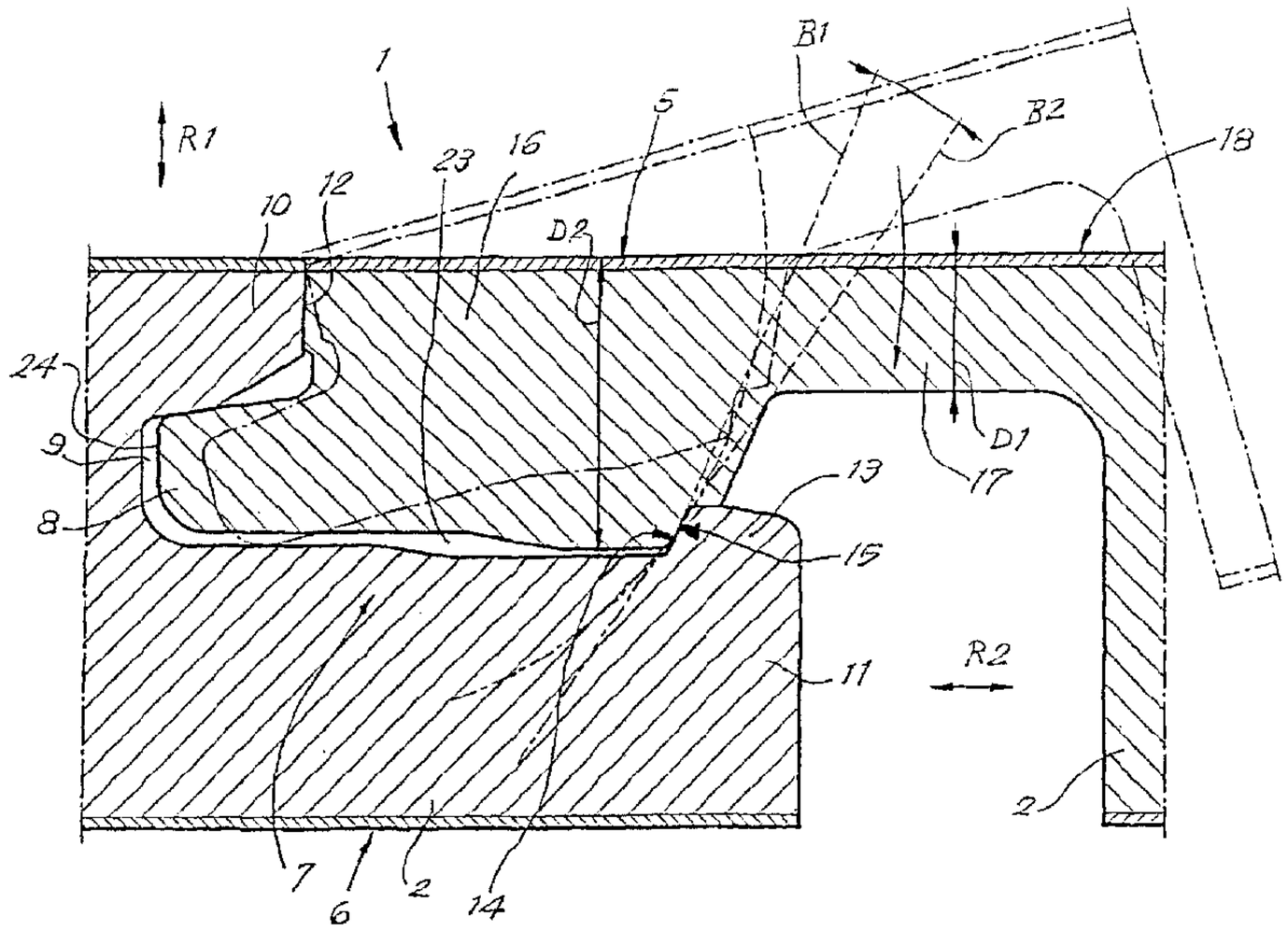
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(72) Inventeurs/Inventors:
THIERS, BERNARD PAUL JOSEPH, BE;
CAPPELLE, MARK GASTON MAURITS, BE

(73) Propriétaire/Owner:
FLOORING INDUSTRIES LIMITED, SARL, LU

(74) Agent: ROBIC

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(57) Abrégé/Abstract:
The invention concerns a floor covering consisting of hard panels which are provided, at least on two opposite edges, with coupling means made in one piece with the panels, whereby these coupling means provide for an interlocking in a direction (R1) perpendicular to the plane of the floor covering, as well as in a direction (R2) perpendicular to the edges concerned and parallel to the plane of the floor covering. These coupling means comprise a tongue and a groove. The lip which is situated on the bottom side of the groove is longer than the lip on the top side. The edge which is provided with the tongue is made flexible.

ABSTRACT

The invention concerns a floor covering consisting of hard panels which are provided, at least on two opposite edges, with coupling means made in one piece with the panels, whereby these coupling means provide for an interlocking in a direction (R1) perpendicular to the plane of the floor covering, as well as in a direction (R2) perpendicular to the edges concerned and parallel to the plane of the floor covering. These coupling means comprise a tongue and a groove. The lip which is situated on the bottom side of the groove is longer than the lip on the top side. The edge which is provided with the tongue is made flexible.

Floor covering.

The present invention concerns a floor covering, in particular of the type consisting of hard panels.

In particular, it concerns a floor covering formed of laminate panels, also called laminate parquet.

It is known that such laminate panels can be made of different layers. Usually, the panels are formed of boards on the basis of wood, such as chipboard or fiberboard, in particular MDF or HDF, upon which one or several layers, including a decorative layer, are provided at least on the top side. The decorative layer may be a printed paper layer, but in certain embodiments it may just as well be a layer of wood, in particular veneer. Such panels can also be made of other materials, for example merely synthetic material, or of a base plate on the basis of wood, such as chipboard, MDF or HDF and the like, upon which is provided, instead of a printed paper layer or veneer, another material such as cork, thin strips of wood and the like.

It is also known to couple these panels on their edges as they are laid, either by means of a conventional tongue and groove joint, whereby they are possibly glued together, either by means of a glueless coupling which provides for a mutual interlocking of the panels both in the horizontal and vertical direction, for example as described in international patent No. 97/47834.

The present invention aims a floor covering of hard panels, in particular laminate panels, which provides for new embodiments according to different aspects offering respective advantages.

According to the present invention, there is provided a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove, characterized in that the lip situated on the top side of the groove, hereafter called the upper lip, is longer than the lip situated on the bottom side of the groove, hereafter called the lower lip, and in that the above-mentioned coupling means contain coupling parts which provide for the interlocking in the horizontal direction, whereby these coupling parts consist at least of contact surfaces working in conjunction with one another, provided on the bottom side of the upper lip, outside the distal end of the lower lip, and on the opposite part of the edge of the other panel respectively.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein this floor panel is rectangular, i.e. square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled, whereby the first coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled, whereby said second coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the actual floor panel in distal direction; wherein said interlocking part, at a side facing towards the actual floor panel, comprises one of the aforementioned contact surfaces;

wherein said first coupling elements further define a part which is connected to the actual floor panel via a flexible zone in the shape of a local constriction, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the actual floor panel, comprises the other of the aforementioned contact surfaces;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at the top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to the plane of the floor panel, which is smaller than half the thickness of the floor panel;

wherein the edge provided with the flexible zone is bendable; and

wherein said second coupling elements comprise a tongue and a groove, whereby these second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein this floor panel is rectangular, i.e. square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled, whereby the first coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled, whereby said second coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the actual floor panel in distal direction; wherein said interlocking part, at a side facing towards the actual floor panel, comprises one of the aforementioned contact surfaces;

wherein said first coupling elements further define a part which is connected to the actual floor panel via a connection zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the actual floor panel, comprises the other of the aforementioned contact surfaces;

wherein said connection zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at the top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to the plane of the floor panel, which is smaller than half the thickness of the floor panel;

wherein the minimum thickness (D1) of the connection zone is smaller than 3 mm; and

wherein said second coupling elements comprise a tongue and a groove, whereby these second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein this floor panel is rectangular, i.e. square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled, whereby the first coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled, whereby said second coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the actual floor panel in distal direction; wherein said interlocking part, at a side facing towards the actual floor panel, comprises one of the aforementioned contact surfaces;

wherein said first coupling elements further define a part which is connected to the actual floor panel via a flexible zone in the shape of a local constriction, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the actual floor panel, comprises the other of the aforementioned contact surfaces and, at a side facing away from the actual floor panel, comprises a distal end surface, the distal end surface defining a vertical closing plane (V1); wherein the lowermost point of the contact surface of said part defines another vertical plane;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at the top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to the plane of the floor panel, which is smaller than half the thickness of the floor panel;

wherein said part with the contact surface comprises, between the vertical closing plane and the vertical plane defined by the lowermost point of the contact surface of said part, at least two other surfaces, these two other surfaces having a different inclination with respect to each other; and

wherein said second coupling elements comprise a tongue and a groove, whereby these second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

According to the present invention, there is also provided a method for installing floor panels, the floor panels being rectangular, i.e. square or oblong, and comprising a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panels are provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panels, so that two of such floor panels can be mutually coupled, whereby the first coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein the floor panels are provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panels, so that two of such floor panels can be mutually coupled, whereby said second coupling elements provide for an interlocking in a direction perpendicular to the plane of the coupled floor panels, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the plane of the coupled floor panels;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the actual floor panel in distal direction; wherein said interlocking part, at a side facing towards the actual floor panel, comprises one of the aforementioned contact surfaces;

wherein said first coupling elements further define a part which is connected to the actual floor panel via a flexible zone in the shape of a local constriction, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the actual floor panel, comprises the other of the aforementioned contact surfaces;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at the top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to the plane of the floor panel, which is smaller than half the thickness of the floor panel;

wherein said second coupling elements comprise a tongue and a groove, whereby these second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement; and

wherein the method comprises at least the following steps:

- a newly to install floor panel is coupled, with one of the edges of the second pair of opposite edges, to edges of the second pair of opposite edges of already laid floor panels in a preceding row by means of the turning movement; and
- the floor panel is coupled, with one of the edges of the first pair of opposite edges, to an opposite edge of the first pair of opposite edges of a preceding floor panel in the same row, whereby this coupling is accompanied by a bending of said flexible zone and whereby said part with the contact surface finally snaps down behind the contact surface of the interlocking part.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be

mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being bordered by an upper lip and a lower lip, the distal end of the upper lip defining a first vertical plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, and second cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone, whose center defines a second vertical plane, wherein said interlocking part is the only interlocking part being situated on the lower lip past the distal end of the upper lip;

wherein the top side of said interlocking part defines a first horizontal level, said first horizontal level intersecting the edge with the groove at a point situated proximally from said first vertical plane, with respect to the edge of the groove; wherein the bottom side of the part upon which the tongue is provided and which extends from the tip of the tongue to said second cooperating zone defines a second horizontal level; wherein the first and second horizontal levels define a third horizontal level situated therebetween; wherein the average height of said first cooperating zone defines a fourth horizontal level; wherein the distance between the first and second vertical planes is at least half of the distance between the third and fourth horizontal levels;

wherein said first cooperating zone is situated above said first horizontal level;

wherein, in the coupled situation, there is a free space under the tongue, which extends from the tip of the tongue up to a point being situated proximal from said first vertical plane, with respect to the edge with the groove; and

wherein, in the coupled situation, there is a space defined above the interlocking part.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being bordered by an upper lip and a lower lip, the distal end of the upper lip defining a vertical plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, second cooperating surfaces, on the top side of the lower lip and an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone, and third cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said third cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a third cooperating zone;

wherein the point of said first cooperating zone, which is situated most inwardly towards the groove, defines a third vertical plane; and

wherein said second cooperating zone is inclined with respect to the plane of the floor covering and, from the point which is situated most outwardly to the point which is situated most inwardly towards the groove, runs upwardly in the direction of the groove, wherein the point of said second cooperating zone, which is situated most inwardly towards the groove, is situated distally from said third vertical plane, with respect to the edge with the groove.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being bordered by an upper lip and a lower lip, the distal end of the upper lip defining a first vertical plane, said first vertical plane, in the coupled situation, forming a closing plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, and second cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone; and

wherein, in the coupled situation, there is a free space under the tongue, which extends from the tip of the tongue up to beyond said first vertical plane.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being bordered by an upper lip and a lower lip, the distal end of the upper lip defining a first vertical plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, and second cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone;

wherein the top side of said interlocking part defines a first horizontal level, said first horizontal level intersecting the edge with the groove at a point being situated proximally from said first vertical plane, with respect to the edge with the groove;

wherein said first cooperating zone is situated above the first horizontal level; and

wherein the distance between the first vertical plane and the distal end of the lower lip, measured along a direction parallel to the plane of the floor covering and perpendicular to the edges, is larger than the distance between the upper side of the floor panel and the intersection point between the first vertical plane and the top side of the lower lip, measured along a direction perpendicular to the plane of the floor covering.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being bordered by an upper lip and a lower lip, the distal end of the upper lip defining a first vertical plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, and second cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone;

wherein the top side of said interlocking part defines a first horizontal level; wherein the bottom side of the part upon which the tongue is provided and which extends from the tip of the tongue to said second cooperating zone defines a second horizontal level; wherein the first and second horizontal levels define a third horizontal level situated right therebetween;

wherein the average height of the first cooperating zone defines a fourth horizontal level;

wherein the tip of the tongue defines a second vertical plane;

wherein the top side of the lower lip, proximally from said interlocking part with respect to the edge with the groove, is free from contact zones being situated below said third horizontal level;

wherein the distance between the first vertical plane and the second vertical plane, measured along a direction parallel to the plane of the floor covering and perpendicular to the edges, is larger than the distance between said fourth horizontal level and the intersection point between the first vertical plane and the top side of the lower lip, measured along a direction perpendicular to the plane of the floor covering; and

wherein the distance between the first vertical plane and the distal end of the lower lip, measured along a direction parallel to the plane of the floor covering and perpendicular to the edges, is larger than the distance between the upper side of the floor panel and the intersection point between the first vertical plane and the top side of the lower lip, measured along a direction perpendicular to the plane of the floor covering.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being

bordered by an upper lip and a lower lip, the distal end of the upper lip defining a first vertical plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, and second cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone;

wherein the top side of said interlocking part defines a first horizontal level; wherein the bottom side of the part upon which the tongue is provided and which extends from the tip of the tongue to said second cooperating zone defines a second horizontal level; wherein the first and second horizontal levels define a third horizontal level situated right therebetween;

wherein the top side of the lower lip, proximally from said interlocking part with respect to the edge with the groove, is free from contact zones being situated below said third horizontal level;

wherein said first cooperating zone is inclined with respect to the plane of the floor covering and runs downwardly in the direction of the tip of the tongue; and

wherein the distance between the first vertical plane and the distal end of the lower lip, measured along a direction parallel to the plane of the floor covering and perpendicular to the edges, is larger than the distance between the upper side of the floor panel and the intersection point between the first vertical plane and the top side of the lower lip, measured along a direction perpendicular to the plane of the floor covering.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being bordered by an upper lip and a lower lip, the distal end of the upper lip defining a first vertical plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, and second cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone;

wherein the top side of said interlocking part defines a first horizontal level, said first horizontal level intersecting the edge with the groove at a point situated proximally from said first vertical plane, with respect to the edge of the groove;

wherein said first cooperating zone is situated above said first horizontal level; and

wherein the bottom side of the edge with the tongue comprises a substantially flat portion, which is situated below said first horizontal level.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is a laminate floor panel made of a board on the basis of wood, upon which one or several layers, including a decorative layer, are provided;

wherein the floor panel is provided, at least at two opposite edges, with coupling parts made in one piece with the floor panel, as a result of which several of such floor panels can be mutually coupled to one another, wherein said coupling parts, in a coupled situation, provide for an interlocking in a direction perpendicular to a plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, wherein said coupling parts comprise a tongue and a groove, said groove being bordered by an upper lip and a lower lip, the distal end of the upper lip defining a first vertical plane, and said lower lip extending further than the distal end of the upper lip;

wherein said coupling parts comprise first cooperating surfaces, on the top side of the tongue and the bottom side of the upper lip respectively, said first cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a first cooperating zone, and second cooperating surfaces, on an interlocking part that is situated on the lower lip, past the distal end of the upper lip, and on an opposite part of the other floor panel respectively, said second cooperating surfaces, in the coupled situation, working in conjunction with one another and forming a second cooperating zone, whose center defines a second vertical plane;

wherein the top side of the interlocking part defines a first horizontal level; wherein the bottom side of the part upon which the tongue is provided and which extends from the tip of the tongue to said second cooperating zone defines a second horizontal level; wherein the first and second horizontal levels define a third horizontal level situated therebetween; wherein the average height of said first cooperating zone defines a fourth horizontal level; wherein the distance between the first and second planes is at least half of the distance between the third and fourth horizontal levels;

wherein the top side of the lower lip defines a concave arched surface, said concave arched surface including the cooperating surface on the interlocking part and extending up to beyond said first vertical plane; and

wherein, in the coupled situation, there is a space above the interlocking part.

Other general aspects of the present invention are also mentioned hereinbelow.

For example, according to the present invention, there is also provided a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove, characterized in that the lip situated on the top side of the groove, hereafter called the upper lip, is longer than the lip situated on the bottom side of the groove, hereafter called the lower lip, and in that the above-mentioned coupling means contain coupling parts which provide for the interlocking in the horizontal direction, whereby these coupling parts consist at least of contact surfaces working in conjunction with one another, provided on the bottom side of the upper lip, outside the distal end of the lower lip, and on the opposite part of the edge of the other panel respectively.

According to the present invention, there is also provided a floor panel, for forming a decorative floor covering,

wherein said floor panel is made of synthetic material;

wherein said floor panel comprises two pairs of opposite edges;

wherein the first pair of opposite edges comprises coupling means, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the

floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel;

wherein the second pair of opposite edges comprises coupling means made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel, said coupling means at said second pair of opposite edges comprising a tongue and a groove, said groove being bordered by an upper lip and a lower lip, and said coupling means comprising coupling parts which provide for the interlocking in the horizontal direction;

wherein said upper lip has a distal end and said lower lip extends beyond the distal end of the upper lip;

wherein said upper lip has a bottom side and wherein said tongue has a top side comprising a contact surface for co-operation with the bottom side of the upper lip;

wherein said contact surface at the top side of the tongue is inclined with respect to the plane of the panel, said contact surface sloping down in a direction towards the tip of the tongue;

wherein said coupling parts which provide for the interlocking in the horizontal direction comprise an upwardly directed part at the lower lip, the top side of this part defining a horizontal level;

wherein the coupling means at the second pair of edges are configured such that they allow for assembly of two of such panels by means of a movement of rotation of one panel in respect to the other;

wherein the coupling means at the second pair of edges are configured such that in the coupled condition of two of such panels said inclined contact surface at the top side of the tongue is mainly located above said horizontal level;

wherein said tongue has a tip portion being defined as the portion of the tongue that is located underneath the upper lip; and

wherein said tip portion has a lower side which, in a coupled condition of two of such panels, is at least partially located underneath said horizontal level.

According to the present invention, there is also provided a floor panel, for forming a decorative floor covering,

wherein said floor panel is made of synthetic material;

wherein said floor panel comprises two pairs of opposite edges;

wherein the first pair of opposite edges comprises coupling means, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel;

wherein the second pair of opposite edges comprises coupling means made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel, said coupling means at said second pair of opposite edges comprising a tongue and a groove, said groove being bordered by an upper lip and a lower lip, and said coupling means comprising coupling parts which provide for the interlocking in the horizontal direction;

wherein said upper lip has a distal end and said lower lip extends beyond the distal end of the upper lip;

wherein said upper lip has a bottom side and wherein said tongue has a top side comprising a contact surface for co-operation with the bottom side of the upper lip;

wherein said contact surface at the top side of the tongue is inclined with respect to the plane of the panel, said contact surface sloping down in a direction towards the tip of the tongue;

wherein said coupling parts which provide for the interlocking in the horizontal direction comprise an upwardly directed part at the lower lip, having an inwardly directed contact surface, the top side of the upwardly directed part defining a horizontal level;

wherein said contact surface at the lower lip is located at a distance beyond the distal end of the upper lip, thereby defining a lip portion in the lower lip extending between a position defined by the distal end of the upper lip and said inwardly directed contact surface;

wherein the coupling means at the second pair of edges are configured such that they allow for assembly of two of such panels by means of a movement of rotation of one panel in respect to the other;

wherein, seen in a cross-section, the thickness of said lower lip varies within said lip portion;

wherein said tongue has a tip portion being defined as the portion of the tongue that is located underneath the upper lip; and

wherein said tip portion has a lower side which, in a coupled condition of two of such panels, is at least partially located underneath said horizontal level.

According to the present invention, there is also provided a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove, characterized in that the lip situated on the top side of the groove, hereafter called the upper lip, is longer than the lip situated on the bottom side of the groove, hereafter called the lower lip, and in that the above-mentioned coupling means contain coupling parts which provide for the interlocking in the horizontal direction, whereby these coupling parts consist at least of contact surfaces working in conjunction with one another, provided on the bottom side of the upper lip, outside the distal end of the lower lip, and on the opposite part of the edge of the other panel respectively.

According to the present invention, there is also provided a floor panel, for forming a decorative floor covering,

wherein this floor panel is of the type that is merely made of synthetic material;

wherein this floor panel comprises two pairs of opposite edges;

wherein the first pair of opposite edges comprises coupling means, as a result of which several of such panels can be mutually coupled to one another, whereby these

coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel;

wherein the second pair of opposite edges comprises coupling means made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel, said coupling means comprising a tongue and a groove, said groove being bordered by an upper lip and a lower lip, and said coupling means comprising coupling parts which provide for the interlocking in the horizontal direction;

wherein said upper lip has a distal end and said lower lip extends beyond the distal end of the upper lip;

wherein the coupling means at the second pair of edges are configured such that they allow for assembly of two of such panels by means of a movement of rotation of one panel in respect to the other; and

wherein the coupling means at the second pair of edges are configured such that in the coupled condition of two of such panels a free space exists under the tongue, said free space extending as of the tip of the tongue up to at least a location at the underside of the tongue that is located beyond the distal end of the upper lip.

According to the present invention, there is also provided a floor panel, for forming a decorative floor covering,

wherein this floor panel comprises two pairs of opposite edges;

wherein the first pair of opposite edges comprises coupling means, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel;

wherein the second pair of opposite edges comprises coupling means, as a result of which several of such panels can be mutually coupled to one another, whereby these

coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor panel, said coupling means comprising a tongue and a groove, said groove being bordered by an upper lip and a lower lip, wherein said upper lip has a distal end and said lower lip extends beyond the distal end of the upper lip;

wherein the coupling means at the second pair of edges comprise first coupling parts, second coupling parts and third coupling parts,

said first coupling parts being formed of contact surfaces on the top side of the tongue and the bottom side of the upper lip respectively,

said second coupling parts being formed of contact surfaces, on the top side of the lower lip and an opposite part of a coupled panel respectively, and

said third coupling parts allowing for an horizontal interlocking and being formed of contact surfaces on an interlocking part situated on the lower lip yet further than the free end of the upper lip and on an opposite part of a coupled panel respectively;

wherein in a coupled condition of two of such panels, said second coupling parts with respect to the panel are situated proximal from the third coupling parts;

wherein said first coupling parts, second coupling parts and third coupling parts are configured such that in the coupled condition the second coupling parts are at a location beyond the upper edge of the panel;

wherein the coupling means at the second pair of edges are configured such that in the coupled condition of two of such panels a free space exists under the tongue, said free space extending as of the tip of the tongue up to said location of said second coupling parts;

wherein said interlocking part of the third coupling parts extends upward from the lower lip, thereby defining an upper end, said upper end defining a horizontal level, the contact surfaces of said second coupling parts being located lower than said horizontal level;

wherein said tongue has a most distal front surface that generally extends downwards from a position above said horizontal level to a position below said horizontal level;

wherein said lower lip is made in one piece with the panel, said lower lip having a lower surface that at least up to underneath the contact surface of said interlocking part is coplanar with the lower side of the panel; and

wherein in the coupled condition of two of such panels, at the second pair of edges, the mean distance between the co-operating contact surfaces of the first coupling parts and the co-operating contact surfaces of the third coupling parts, measured in a direction parallel to the plane of the floor panels, is larger than the mean distance between the co-operating contact surfaces of the first coupling parts and the co-operating contact surfaces of the second coupling parts, measured in a direction vertical to the plane of the floor panels.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is rectangular, square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in a given plane, the first coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in the given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in the given plane, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the

floor panel in distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a flexible zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein the edge provided with the flexible zone is bendable; and

wherein said second coupling elements comprise a tongue and a groove, and the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is rectangular, square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in a given plane, the first coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in the given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in the given plane, cooperate with each other and

provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the floor panel in distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a connection zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces;

wherein said connection zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein the minimum thickness (D1) of the connection zone is smaller than 3 mm; and

wherein said second coupling elements comprise a tongue and a groove, wherein the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

According to the present invention, there is also provided a floor panel for forming a floor covering, wherein the floor panel is rectangular, square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in a given plane, the first coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor

panels can be mutually coupled in a given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in a given plane, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the floor panel in distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a flexible zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces and, at a side facing away from the floor panel, comprises a distal end surface, the distal end surface defining a vertical closing plane (V1); wherein the lowermost point of the contact surface of said part defines another vertical plane;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein said part with the contact surface comprises, between the vertical closing plane and the vertical plane defined by the lowermost point of the contact surface of said part, at least two other surfaces, the two other surfaces having a different inclination with respect to each other; and

wherein said second coupling elements comprise a tongue and a groove, the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

According to the present invention, there is also provided a method for installing floor panels, the floor panels being rectangular, square or oblong, and comprising a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panels are provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panels, so that two of such floor panels can be mutually coupled in a given plane, whereby the first coupling elements provide for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panels are provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panels, so that two of such floor panels can be mutually coupled in the given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in the given plane, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the floor panel in a distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a flexible zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein said second coupling elements comprise a tongue and a groove, the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement; and

wherein the method comprises at least the following steps:

coupling a newly to install floor panel to one of the edges of the second pair of opposite edges, to edges of the second pair of opposite edges of already laid floor panels in a preceding row by means of the turning movement; and

coupling the floor panel to one of the edges of the first pair of opposite edges, to an opposite edge of the first pair of opposite edges of a preceding floor panel in the same row, such that bending of said flexible zone and the part with the contact surface snaps down behind the contact surface of the interlocking part when coupling the floor panel to the preceding floor panel.

Other aspects, embodiments, possible variants and/or resulting advantages, all being preferred and/or optional, are briefly summarized hereinbelow.

For example, according to a first aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided, at least on two opposite edges, with coupling means made in one piece with the panels, so that several of such panels can be mutually coupled, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove and whereby the lip which is situated on the bottom side of the groove, thereafter called the lower lip, is longer than the lip on the top side, hereafter called the upper lip, characterized in that the edge which is provided with the tongue, is made flexible.

As the edge onto which the tongue is provided is flexible, deflections arising during the coupling of the panels are absorbed by this edge, and the above-mentioned upper lip is safeguarded against large deflections, as a result of which the material cannot possibly split due to the bending of the lower lip.

The lower lip is preferably even made rigid, by making it sufficiently thick, so that any bending in this lip is entirely excluded.

According to a first possibility, the above-mentioned flexibility is obtained by making at least the tongue flexible. According to a second possibility, which is preferably combined with the first one, and which contributes even more to the required flexibility being obtained, the tongue is situated on a part which is connected to the actual panel via a flexible zone in the shape of a local constriction.

Specific advantages of the embodiment according to the first aspect are further explained in the following detailed description.

The coupling means are preferably made such that they allow the panels to be coupled by pushing them laterally towards one another.

According to a second aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove and whereby

the lip situated on the bottom side of the groove, hereafter called the lower lip, is longer than the lip on the top side, hereafter called the upper lip, characterized in that the coupling means consist at least of first coupling parts, formed of contact surfaces working in conjunction with one another, on the top side of the tongue and the bottom side of the upper lip respectively; second coupling parts formed of contact surfaces, on the top side of the lower lip and an opposite part of the other panel respectively; and third coupling parts providing for the horizontal interlocking, which are situated on the lower lip, yet further than the free end of the upper lip, whereby these third coupling parts are situated between the first and second ones.

As a result, the vertical forces which are created when walking over the floor covering, are divided over two places, which results in a better distribution of the forces.

The third coupling parts preferably consist of an inwardly directed contact surface provided near the free end of the lower lip, on this lip, and a contact surface working in conjunction with it which is formed on the other panel.

The second coupling parts preferably consist of a contact surface formed on the top side of the free end of the lower lip, as well as a contact surface working in conjunction with it on the bottom side of the other panel.

Moreover, a free space is preferably provided under the tongue extending as of the tip of the tongue up to the third coupling parts. As a result, the tongue can be put more easily in the groove, without having to take very precise tolerances into account.

According to a third aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges, so that several of such panels can be mutually coupled, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove and whereby the lip which is situated on the bottom side of the groove, hereafter called the lower lip, is longer than the lip on the top side, hereafter called the upper lip, characterized in that the coupling means consist at least of first coupling parts formed of contact surfaces working in conjunction with one another, on the top side of the tongue and the bottom side of the upper lip respectively; second coupling parts formed of contact surfaces, on the top side of the lower lip and an opposite part of the other panel respectively; and third coupling parts which provide for the horizontal interlocking situated on the lower lip, yet further than the free end of the upper lip, whereby the second coupling parts are situated between the first and the third ones, and whereby these second coupling parts consist of contact surfaces working in conjunction with one another and

defining a local contact zone situated in the middle or practically in the middle between the tip of the tongue and the third coupling parts.

By making use of such a local contact zone, there remains a space between this zone and the tip of the tongue, on the bottom side of the latter, which makes sure that there is freedom of movement for the tongue when the panels are joined.

According to a fourth aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove, characterized in that the lip situated on the top side of the groove, hereafter called the upper lip, is longer than the lip situated on the bottom side of the groove, hereafter called the lower lip, and in that the above-mentioned coupling means contain coupling parts which provide for the interlocking in the horizontal direction, whereby these coupling parts consist at least of contact surfaces working in conjunction with one another, provided on the bottom side of the upper lip, outside the distal end of the lower lip, and on the opposite part of the edge of the other panel respectively.

As the interlocking takes place on the upper lip, it is easier to check the reliability of the interlocking while the floor is being laid than in the case where the interlocking takes place on the lower lip.

According to a fifth aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby said coupling means comprise a tongue and a groove, characterized in that the lip situated on the top side of the groove, hereafter called the upper lip, is longer than the lip situated on the bottom side of the groove, hereafter called the lower lip, and in that the above-mentioned coupling means contain coupling parts which provide for the interlocking in the horizontal direction, whereby these coupling parts make it possible for these panels to be mutually disconnected by turning them down with their bottom side and towards one another.

Thanks to the use of coupling means which make it possible for the panels to be disconnected by turning them downward, and preferably to be exclusively disconnectable by this movement, is obtained that such panels fit particularly

tight on the coupling means concerned, and are pushed even closer towards one another when being walked on.

The panels are hereby preferably rectangular, and they are provided with coupling means on two pairs of edges which make it possible for the panels to be disconnected by means of an upward rotation in order to be unlocked, whereas, on the other pair of edges, as mentioned above, they are provided with coupling means which only allow for a disconnection by turning the coupled panels with their bottom side towards one another. Also the opposite turning movements increase the guarantee that such a coupling remains always available.

It should be noted that in the case of longitudinal panels, the coupling means which allow for a disconnection by turning the panels upward are preferably provided on the longitudinal sides, whereas the coupling means which allow for a disconnection by turning the panels down, are preferably provided on the shortest sides.

According to a sixth aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby said coupling means

comprise a tongue and a groove, characterized in that the interlocking in the horizontal direction is at least formed of coupling parts in the shape of a local protrusion in the top side of the above-mentioned tongue, which meshes in a recess in the lip which borders the top side of the groove.

An advantage of this embodiment consists in that, since the protrusion is local, the recess can also have relatively small dimensions, and the upper lip is only weakened locally.

According to the sixth aspect, there is preferably no interlocking in the horizontal direction on the lower lip.

According to a seventh aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, and whereby:

- the above-mentioned coupling means comprise a tongue and a groove, whereby this groove is bordered by a lip on the bottom side, the top side respectively, hereafter called the lower lip and the upper lip respectively, whereby the distal end of the upper lip defines a vertical plane, hereafter called plane V1;
- the lower lip is longer than the upper lip;

- there is an interlocking part on the part of the lower lip which extends past the free end of the upper lip, with a contact surface which, when coupled, works in conjunction with a contact surface which is provided on the other panel, whereby these contact surfaces form a contact zone when coupled, whose center defines a vertical plane, hereafter called plane V2;
- before the above-mentioned interlocking part, in the direction of the groove, is formed a space in the lower lip which is open on the top side;
- in the coupled situation, there is a contact zone in the cross section in which the top side of the tongue makes contact with the bottom side of the upper lip, whereby the point of this contact zone which is situated most inwardly defines a first vertical plane, hereafter called plane V3, the most outwardly situated point of this contact zone defines a second vertical plane, hereafter called plane V4, and both planes V3 and V4 define a vertical plane situated right in between, hereafter called plane V5;
- the top side of the interlocking part defines a horizontal level, hereafter called level N1;
- the bottom side of the part upon which the tongue is provided and which extends from the tip of the tongue to the interlocking zone, defines a horizontal level, hereafter called level N2;
- the levels N1 and N2 define a horizontal level situated right in between, hereafter called level N3;
- the average height of the contact zones between the top side of the tongue and the bottom side of the upper lip define a horizontal level, hereafter called level N4;

- the distance between the planes V1 and V2 is at least half of the distance between the levels N3 and N4;

characterized in that the floor covering further provides at least in the combination of the following characteristics:

- that the panels, and basically also the above-mentioned lips, are made of fiberboard of the type MDF or HDF;
- that the coupling means are made such that the panels can be assembled by pushing them towards one another; and
- that the above-mentioned space extends to beneath the upper lip, such that this space is in conformity with at least one of the following two characteristics:

a) that the part of this space which is situated under the level N3 extends inwardly to at least past the plane V1;
b) that the part of this space which is situated under the level N1 extends inwardly to at least past the plane V5.

When all the above-mentioned criteria are met, an embodiment is obtained according to the invention whereby the above-mentioned space is relatively large compared to the other parameters on the one hand, and, thanks to the specific application of the MDF or HDF material, the structure nevertheless remains sufficiently stable on the other hand. The relatively large space which is formed in the lower lip offers the advantage that the tongue can take place in the groove more easily, as well as the advantage that the tongue can be made relatively massive.

According to a particular embodiment, this floor covering is characterized in that the panels are rectangular and in

that coupling means are formed on both pairs of edges which offer an interlocking in the horizontal and vertical direction, whereby these coupling means are formed as mentioned above on at least one pair of said edges, and whereby on at least two edges standing at right angles to one another, use is made of a groove which is bordered by an upper lip and a lower lip respectively, whereby the lower lip each time protrudes further than the upper lip, such that two such longer lips meet in at least one angle of the panel, whereby at least the above-mentioned space continues up to the end of the panel in said angle, in other words extends through the far end of the lip standing at right angles. As the above-mentioned space is made continuous, also a large flexibility can be guaranteed in the angle concerned, as the interlocking parts of the longitudinally directed lower lip and the transversely directed lower lip are then disconnected by this continuous recess.

According to an eight aspect, the invention provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, and whereby:

- the above-mentioned coupling means comprise a tongue and a groove, whereby this groove is bordered by a lip on

the bottom side, the top side respectively, hereafter called the lower lip and the upper lip respectively;

- the lower lip is longer than the upper lip;
- there is an interlocking part on the part of the lower lip which extends past the free end of the upper lip, with a contact surface which, when coupled, works in conjunction with a contact surface which is provided on the other panel; and
- before the above-mentioned interlocking part, in the direction of the groove, is formed a space in the lower lip which is open on the top side;

characterized in that the coupling means are made such that the panels can be assembled by pushing them towards one another, and in that in the bottom side of the part onto which the tongue is provided, and which extends from the tip of the tongue up to the interlocking zone, is provided an excavation, such that this excavation co-operates with the interlocking part in a position in which the tongue is situated in front of the groove. Thus is obtained that, while the tongue is being fit in, something as if it were falls down at the time when the interlocking part takes place in the excavation, so that, next, the tongue is better positioned in front of the groove of the other panel.

The floor coverings consisting of hard panels known until now, and which allow for a glueless interlocking, do not make it possible to temporarily remove panels from the middle of the floor covering after the floor covering has been entirely laid. This is disadvantageous in that it is difficult to replace damaged panels, as well as impossible

to locally remove the floor covering, for example to work on or in the rough floor, to lay or remove cables under the floor covering, etc. With the known systems, the panels always need to be systematically removed as of an edge of the floor covering.

Also, according to a ninth aspect, the invention aims a floor covering made of hard panels, whereby it is possible to remove any panel whatsoever from an existing floor covering, and to put it back, without the floor covering having to be systematically broken up as of an edge of the whole.

According to this ninth aspect, the invention to this end provides for a floor covering consisting of hard panels, whereby these panels are provided with coupling means on at least two opposite edges made in one piece with the panels, as a result of which several of such panels can be mutually coupled to one another, whereby these coupling means provide for an interlocking in a direction perpendicular to the plane of the floor covering, as well as in a direction perpendicular to the edges concerned, and parallel to the plane of the floor covering, whereby the above-mentioned coupling means are made such that two coupled panels, starting from a flat position, can be turned towards one another with their bottom sides over at least a certain angle on the one hand, and this turning movement makes it possible for said two panels to be removed from in between adjacent panels on the other hand.

According to a first preferred embodiment, the coupling means are made such that they make it possible for the two panels, when they are situated in a floor covering, to be lifted with their coupled edges, such that there is a disconnection on at least one of the opposite edges providing for a connection with the adjacent panels.

According to a second preferred embodiment, the coupling means are made such that they make it possible for the two panels, when they are situated in a floor covering, to be lifted with their coupled edges, such that the coupling, in particular the vertical coupling, is interrupted on the edges concerned and a disconnection becomes possible.

According to a particularly practical embodiment, the floor covering is characterized in that the coupling means mainly consist of a tongue and a groove, whereby the lip which is situated on the bottom side of the groove is longer than the lip on the top side, and the interlocking is obtained mainly in the horizontal direction thanks to an interlocking part on the lip situated on the bottom side of the groove and an interlocking part working in conjunction with it on the bottom side of the other panel, whereby these coupling means make it possible for the panels to be assembled by means of a turning movement and whereby, in the coupled position, spaces are provided above the first-mentioned interlocking part as well as under the second-mentioned interlocking part which allow for a further turning movement.

The above-described nine aspects of the invention may occur as separate or they can be mutually combined, in any possible combination, provided the embodiments as described according to the above-mentioned nine aspects do not have any contradictory qualities.

Naturally, the invention also concerns panels with which the above-described floor coverings can be made.

In order to better explain the characteristics of the invention, the following preferred embodiments are described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 schematically represents a hard panel;
figure 2 schematically represents a part of a floor covering made of hard panels;
figure 3 represents an embodiment of coupling means applied in a floor covering according to the invention, seen from a section which corresponds for example to section III-III in figure 2;
figure 4 represents a section according to line IV-IV in figure 2;
figure 5 represents a variant of figure 4;
figures 6 to 8 represent the coupling means from figure 3 in different positions;
figure 9 represents a variant of the coupling means from figure 3;
figure 10 represents another variant;

figures 11 to 13 represent the variant from figure 10 in different positions;

figure 14 represents another variant;

figure 15 represents yet another variant;

figures 16 and 17 represent the coupling means from figure 15 in two other positions;

figure 18 represents an angular part of a panel according to the invention;

figure 19 represents a section of another embodiment according to the invention;

figure 20 represents a section of another embodiment of a floor covering according to the invention;

figure 21 represents the part indicated by F21 in figure 20 to a larger scale;

figure 22 represents how the panels of the floor covering from figure 20 can be disconnected, connected respectively;

figure 23 represents the part indicated by F23 in figure 22 to a larger scale;

figure 24 represents a view analogous to that in figure 21 for another variant;

figure 25 represents how the panels of figure 24 can be mutually disconnected, connected respectively;

figure 26 represents the part indicated by F26 in figure 25 to a larger scale.

As represented in figures 1 and 2, the invention concerns a floor covering 1, as well as the hard panels 2 of which such a floor covering 1 is made.

As described in international patent application No. 97/47834, it is known that such panels 2 can be connected without any glue being required by making use of coupling means which, when the panels 2 are rectangular, provide for an interlocking in a direction R1, perpendicular to the plane of the floor covering 1, at least on one pair of opposite edges 3-4, and preferably on both pairs of edges 3-4, 5-6 respectively, as well as in a direction R2 perpendicular to the edges 3-4 or 5-6 concerned, and parallel to the plane of the floor covering 1.

Coupling means can be used hereby which allow for different coupling methods, but preferably a coupling by rotating as well as by pushing the panels together. The latter makes it possible for such panels 2 to be coupled to one another in a known manner by first rotating them into one another on their edges 3-4, as represented by means of the panel 2A in figure 2 with a movement of rotation W1, and by subsequently snapping them together on their edges 5-6 by means of a translation T1. According to a variant, the connection on the edges 3-4 of the panels 2 concerned, can also be realized by starting from a position as is schematically indicated by reference 2B, and by coupling the panel 2 concerned by means of a translation T2.

Also, while a panel 2A is maintained in the rotated position, a following panel 2C can be coupled to the edges 5 and 6 concerned, either by means of a translation T3, or by means of a mutual rotation between the panels 2A and 2C, after which both panels 2A and 2C are then turned down so as to be locked to the preceding row of panels.

As mentioned in the introduction, the present invention aims different new embodiments of coupling means to mutually connect such panels 2.

Figure 3 represents an embodiment according to the above-mentioned first aspect of the invention.

Also, in this embodiment, the floor covering 1 consists of hard panels 2 which are provided with coupling means 7 made in one piece with the panels 2 on at least two opposite edges, in this case 5-6, so that several of such panels 2 can be mutually connected to one another. These coupling means 7 provide for an interlocking in the direction R1, as well as R2.

Further, these coupling means 7 have a tongue 8 provided on the edge 5, and a groove 9 provided on the edge 6, in which the tongue 8 fits. The groove 9 is hereby bordered on the top side by means of a lip 10, hereafter called the upper lip. At the bottom, it is bordered by a lip 11, hereafter called the lower lip, which is longer than the top lip 10, in other words, which extends further than the distal end 12 of the lip 10 in the horizontal direction.

The interlocking in the direction R2 is obtained as the lower lip 11 forms an interlocking part 13 with an inwardly directed contact surface 14 which can co-operate with an opposite contact surface 15 formed on the edge 5 when being coupled.

According to the invention, the edge 5 which is provided with the tongue 8 is made flexible, whereas the lip 11 is preferably made rigid, the latter by making it relatively thick, as is clearly visible in figure 3.

The edge 5 is made such that it can bend in several places. Thus, for example, the tongue 8 is flexible, but even more important is that this tongue 8 is preferably situated on a part 16, as represented, which is connected to the actual panel 2 via a flexible zone 17 in the shape of a local constriction.

This flexible zone 17 is preferably situated on the place as indicated in figure 3, in other words seen as of the tongue 8, past the contact surface 15, and said flexible zone 17 has a thickness D1, according to the direction R1, which is smaller than half the thickness of the panels 2 and/or smaller than 2/3 of the thickness D2 of the part 16 upon which the tongue 8 is situated.

If the panels 2 are made of fiberboard, of the type MDF or HDF, the thickness D1 is preferably even smaller than 3 mm, and better still smaller than 2 mm.

The flexible zone 17 is situated against the top side 18 of the panel 2 concerned, which is particularly useful when MDF or HDF board is used, as such materials have a larger density on the outer surfaces, and thus the thickness on these places can be maximally reduced so as to obtain an optimal flexibility.

Apart from the advantages already mentioned in the introduction, the invention according to the first aspect also offers the following advantageous characteristics:

- As the contact surface 14 is situated relatively high, said contact surface 14 can be provided in a more vertical position, without much deviation from the tangential directions P1 and P2 represented in figure 3. Thus is obtained a solid interlocking.
- As the flexibility of the connection is situated in the top side of the panel, this results in the interlocking being pulled even more tightly together when a tensile force is exerted on the panels.
- In the design of figure 3 is created a stress concentration on the top side of the panel 2, right behind the tongue 8, which results in a bending. As a consequence, the stress concentration is transferred to the strongest place of the board. During the joining, it is practically impossible for forces to be created in the deepest point of a groove 9, so that it is almost excluded that splits are created at this deepest point.

According to the above-mentioned second aspect of the invention, which in the given example of figure 3 is combined with the above-mentioned first aspect, the coupling means 7 consist at least of first coupling parts formed of contact surfaces 19-20 working in conjunction with one another, on the top side of the tongue 8 and the bottom side of the upper lip 10 respectively; second coupling parts formed of contact surfaces 21-22, on the top side of the lower lip 11 and the opposite part 16 of the

other panel 2 respectively; and third coupling parts which provide for the horizontal interlocking situated on the lower lip 11, but further than the free end 12 of the upper lip 10, formed of the above-mentioned contact surfaces 14 and 15. What is special here, is that the third coupling parts are situated between the first and the second ones.

The second coupling parts are preferably situated immediately next to the third coupling parts. The contact surface 21 is hereby formed of the top side of the above-mentioned interlocking part 13, whereas the contact surface 22 is situated precisely opposite to it.

According to the embodiment of figure 3, there is a free space 23 under the tongue 8 which extends as of the tip 24 of the tongue 8 up to the third coupling parts, in other words the contact surface 14.

The coupling means 7 are mainly designed to be provided on one pair of edges 5-6, whereas coupling means 25 are preferably provided on the other edges 3-4, as represented in figure 4 or figure 5, which are described in international patent application No. 97/47834 and which make it possible for the panels 2 concerned to be assembled along their top edges, disassembled respectively, at least by means of a movement of rotation. In the case where the panels 2, as represented, are longitudinal, the coupling means 7 will preferably be provided on the short edges 5-6.

What precedes does not prevent, however, that the coupling means 7 are provided on both pairs of edges 3-4 and 5-6, or

on the longitudinal edges 3-4, whereas another connection is provided for on the short edges.

Nor is it excluded to provide the panels 2 on merely one pair of edges with coupling means, in this case the coupling means 7.

Further, the coupling means 7 are preferably made such that the panels 2 with their edges concerned, in this case the edges 5 and 6, can be connected to one another by pushing the panels 2 freely towards one another, as is represented step by step in figures 6 to 8, and as will be further described into more detail. Moreover, the coupling means 7 are made such that the edges concerned, in this case the edges 5 and 6, can also be connected to one another by means of a movement of rotation, disconnected respectively, as is represented by means of a dot and dash line in figure 3.

The laying of the floor covering 1, with panels 2 containing coupling means 7, can then for example, yet not necessarily, be carried out as follows. In a situation as represented in figure 2, the panel 2A is first connected with its edge 3 to an edge 4 of already laid panels by presenting the panel 2A at an angle and by rotating the above-mentioned edges 3-4 into one another, so that a connection such as for example in figure 4, or, as an alternative, figure 5, is created.

Then, the panel 2A can be connected to the preceding panel with a translation T1, whereby the situations as

represented in figures 6 to 8 are successively witnessed on the coupling means 7. It is clear that this is accompanied by a bending in the tongue 8, and to a larger extent also in the flexible zone 17, whereby the part 16 with the contact surface 15 finally snaps down behind the contact surface 14.

Figure 9 represents an embodiment which is realized according to the above-mentioned third aspect of the invention. The coupling means 26 used hereby represent first coupling parts analogous to the coupling means 7, formed by contact surfaces 19 and 20, and third coupling parts formed by contact surfaces 14 and 15. What is special hereby, is that the above-mentioned second coupling parts are situated between the first and third ones, and that the second coupling parts consist of contact surfaces 27-28 working in conjunction with one another and which define a local contact zone 29 which is situated in the middle or practically in the middle between the tip 24 of the tongue 8 and the third coupling parts, in other words the contact surface 14.

As represented in figure 9, a bulge 30 can be provided in the lower lip 11 on the contact zone 29.

Figures 10 to 13 represent an embodiment for different positions with coupling means 31 which are in conformity with the above-mentioned fourth aspect of the invention. The upper lip 10 is hereby longer than the lower lip 11, and the coupling means 25 which realize the interlocking in the horizontal direction consist of coupling parts formed

of contact surfaces 32-33 working in conjunction with one another, which are provided on the bottom side of the upper lip 10, outside the distal end of the lower lip 11, and on the opposite part of the edge of the other panel 2 respectively.

The coupling means 31 are hereby made such that the connection can be realized by pushing the panels 2 towards one another with the edges 5-6 concerned, for example over a base, whereby they systematically fit into one another, as represented in figures 10 to 12.

As shown in the figures, the tongue 8 has one end 34 which has been made thinner. There is also a free space 35 between the free end 36 of the lower lip 11 and the opposite part 37 under the tongue 8 of the other panel 2.

The embodiment of figures 10 to 13 also illustrates the fifth aspect of the invention, in other words that the edges, in this case the edges 5-6, are provided with coupling means 31 which make it possible for the panels 2 concerned to be mutually disconnected by rotating them with their bottom sides 38 down and towards one another, as is specifically shown in figure 13. The above-mentioned space 35 is helpful thereby.

The embodiment of figures 10 to 13 also corresponds to the sixth aspect of the invention, characterized in that the interlocking in the horizontal direction is formed of coupling parts in the shape of a local protrusion 39 in the

top side 40 of the above-mentioned tongue 8, which meshes in a recess 41 in the upper lip 10.

Figure 14 represents a variant which also applies the above-mentioned characteristics of the sixth aspect of the invention.

Other particularities of this embodiment, which must not all be combined according to variants which are not represented, consist in that the top side 40 of the tongue 8, with the exception of the local protrusion 39, is mainly parallel to the surface of the floor covering 1, and in that the bottom side 42 of the tongue 8 is mainly formed of a smoothly bent surface which reaches up to the top side 40 of the tongue 8. Also this embodiment makes it possible for the panels 2 to be assembled by means of a mainly horizontal movement.

Figure 15 represents a connection with coupling means 43 realized according to the above-mentioned seventh aspect of the invention. It concerns a connection whereby:

- the coupling means 43 comprise a tongue 8 and a groove 9, whereby this groove 9 is bordered on the bottom side, the top side respectively, by a lip, hereafter called the lower lip 11 and the upper lip 10 respectively, whereby the distal end 12 of the upper lip 10 defines a vertical plane, hereafter called plane V1;
- the lower lip 11 is longer than the upper lip 10;
- there is an interlocking part 13 on the part of the lower lip 11 which extends past the free end 12 of the upper lip 10, with a contact surface 14 which, when

coupled, works in conjunction with a contact surface 15 which is provided on the other panel 2, whereby these contact surfaces 14-15 form a contact zone when coupled, whose center M1 defines a vertical plane, hereafter called plane V2;

- before the above-mentioned interlocking part 13, in the direction of the groove 9, is formed an open space 44 in the lower lip 11 which is open on the top side;
- in the coupled situation, there is a contact zone in the cross section in which the top side of the tongue 8 makes contact with the bottom side of the upper lip 10, whereby the point C3 of this contact zone which is situated most inwardly defines a first vertical plane, hereafter called plane V3, the most outwardly situated point C4 of this contact zone defines a second vertical plane, hereafter called plane V4, and both planes V3 and V4 define a vertical plane situated right in between, hereafter called plane V5;
- the top side of the interlocking part 13 defines a horizontal level, hereafter called level N1;
- the bottom side of the part 16 upon which the tongue 8 is provided and which extends from the tip 24 of the tongue 8 to the interlocking zone, defines a horizontal level, hereafter called level N2;
- the levels N1 and N2 define a horizontal level situated right in between, hereafter called level N3;
- the average height of the contact zone between the top side of the tongue 8 and the bottom side of the upper lip 10 define a horizontal level, hereafter called level N4;

- the distance between the planes V1 and V2 is at least half of the distance between the levels N3 and N4.

This floor covering 1 is special in that it provides at least in the combination of the following characteristics:

- that the panels 2, and basically also the above-mentioned lips 10-11, are made of fiberboard of the type MDF or HDF;
- that the coupling means 43 are made such that the panels 2 can be assembled by pushing them towards one another; and
- that the above-mentioned space 44 extends to beneath the upper lip 10, such that this space 44 is in conformity with at least one of the following two characteristics:

a) that the part of this space 44 which is situated under the level N3 extends inwardly to at least past the plane V1;

b) that the part of this space 44 which is situated under the level N1 extends inwardly to at least past the plane V5.

Thanks to this specific combination is obtained a space 44 which acts as an excavation in relation to the other dimensions extending over a relatively large distance in the direction R2, as a result of which the advantages mentioned in the introduction are obtained. In spite of the relatively large excavation and, consequently, the fact that the lower lip 11 is relatively thin, the rigidity remains nevertheless sufficient thanks to the use of MDF or HDF as a base material, which has a layered fibrous structure.

The distance between the levels N1 and N2 is preferably smaller than 1/3 of the distance between the levels N2 and N4. Thus, the obstruction formed by the interlocking part 13 while the panels are being pushed together, is restricted to a minimum, as a result of which the panels 2 can smoothly slide into one another.

Further, the intersection P4 between the plane V4 and the bottom side of the tongue 8 is situated beneath level N1, seen from a cross section, and better still beneath level N3. The tongue 8 thus obtains a relatively large thickness, which improves its rigidity. Further, it is even more indicated for the section P5 between the plane V5 and the bottom side of the tongue 8 to be situated beneath level N1, and better still beneath level N3.

In particular, the section P3 between the plane V3 and the bottom side of the tongue 8 will be situated beneath level N1, and better still beneath level N3.

According to a preferred characteristic of the invention, the part of the above-mentioned space 44 situated under the plane N3 extends at least inwardly up to the vertical plane V6 which is determined by the tip 24 of the tongue 8.

In the case where the panels 2 are rectangular and coupling means are formed on both pairs of edges 3-4 and 5-6 which provide for a vertical and a horizontal interlocking, whereby both edges 4 and 6 have a lower lip 11, 11A respectively, which is longer than the upper lip 11, at

least the above-mentioned space 44 is preferably made continuous up to the end of the panel 2, as represented in figure 18, in the angle 45, in other words it extends through the far end of the square lip 10A, in particular the interlocking part 13A thereof. As the space 44 is relatively large on the one hand, and this space 44 extends through the interlocking part 13A on the other hand, and the interlocking parts 13 and 13A are disconnected from one another, a particularly flexible angle is obtained, which makes it easier to assemble the panels.

Figure 19 illustrates the above-mentioned eight aspect of the invention, whereby an excavation 46 is provided in the bottom side of the tongue 8, such that in the mutual position of the two panels 2 as represented in figure 19, the tongue 8 is better positioned in front of the groove.

It should be noted that in all the above-mentioned embodiments, the contact surfaces providing for the horizontal interlocking are preferably directed slantingly in relation to the plane of the floor covering 1. This does not exclude, however, that according to a variant, one or both contact surfaces can also be directed perpendicular to the plane of the floor covering. The contact surfaces can also be bent as such, whereby the tangent line in the middle of the contact zone determines the above-mentioned gradient.

In the case where these contact surfaces, or their tangent line, are directed slantingly, they preferably extend in a direction which is tangential or almost tangential to a

circle, whose center is situated on a point of rotation around which the panels 2 can be turned apart. As indicated in figure 3, this means that the gradient or direction B1 of the contact surfaces deviates only little from the gradient of the tangent B2 onto the circle C.

In order to provide for a snap-in effect, the direction B1 pertaining to the contact surfaces preferably does deviate from the direction of the above-mentioned tangent B2 and is directed inwardly, such that a snap-in effect is created when the panels are rotated into one another, whereby the above-mentioned direction B1 deviates 30° at the most from the above-mentioned tangential direction B2.

What precedes can be applied in all the rotatable embodiments described above, also in the embodiments whereby the panels 2 are rotated apart by turning them down.

The coupling means which are realized according to one or several of the first eight aspects of the invention are all particularly suitable to be provided on edges 3-4 and/or 5-6, whereby it must be possible to assemble the panels 2 by shifting them.

In the case where the panels 2 are rectangular, in other words square or longitudinal, they are preferably provided with coupling parts on all four edges 3-4 and 5-6 which allow for a vertical and a horizontal interlocking, whereby coupling means as described in one or several of the above-

mentioned first eight aspects are then provided on at least two opposite edges 3-4 or 5-6.

In the case where the panels 2 are rectangular, the new coupling means are preferably provided at least on the short edges 5-6. Further, coupling means are then preferably provided on the long edges 3-4 which allow for an assembly, disassembly respectively by means of a movement of rotation, which can be of a known nature or which can also be made according to any of the above-mentioned eight aspects.

Figures 20 to 23 show an embodiment according to the ninth aspect of the invention. According to this ninth aspect, it concerns a floor covering 1, consisting of hard panels 2, whereby these panels 2 are provided on at least two opposite edges, in the case of elongated panels 2 preferably on the longitudinal edges 3-4, with coupling means 7 made in one piece with the panels 2, so that several of such panels 2 can be mutually connected to one another, whereby these coupling means 7 provide for an interlocking in a direction R1, perpendicular to the plane of the floor covering 1, as well as in a direction R2 perpendicular to the edges 3-4 concerned, and parallel to the plane of the floor covering 1, whereby the above-mentioned coupling means 7 are made such that two connected panels 2 can be turned towards one another with their bottom side, starting from a flat position, over at least a certain angle on the one hand, whereby this turning movement makes it possible for the two above-mentioned

panels 2 to be removed from between other adjacent panels 2D and 2E on the other hand.

Moreover, according to the embodiment of figures 20 to 23, the coupling means 7 are made such that, as represented in figure 22, they make it possible for the two panels 2 to be lifted with their coupled edges 3-4, from a flat position, such that there is a disconnection on at least one of the opposite edges which provide for the connection with the adjacent panels 2D and 2E. Thus, the panels 2 can be removed from an existing floor covering 1 by first lifting them as mentioned above and by subsequently turning the left panel 2 from figure 22 up, as represented by means of a dot and dash line, so that the left panel 2 of figure 22 can be removed. Next, also the right panel 2 can be removed. The initial lifting of the panels 2 can take place in any way whatsoever, for example by means of a suction cup or by sticking a hook or such through an opening made in the floor covering, for example a bore hole.

Figures 20 to 26 represent variants whereby the coupling means 7 are made such that they make it possible for the two panels 2 to be lifted, from a flat position, with their coupled edges 3-4, such that the connection, in particular the vertical connection on the edges 3-4 concerned is undone. In this case, it is not necessary to disconnect the panels 2D and/or 2E first in order to disconnect the two panels 2.

Both in the embodiment of figures 20 to 23 and in the one of figures 24 to 26, the coupling means 7 mainly consist of a tongue 8 and a groove 9, whereby the lip 11 which is situated on the bottom side of the groove 9 is longer than the lip 10 on the top side, and the interlocking is mainly obtained in the horizontal direction by means of an interlocking part 13 on the lip 11 and an interlocking part 47 on the bottom side of the other panel 2 working in conjunction with it, whereby these coupling means 7 make it possible for the panels 2 to be assembled by means of a turning movement, and whereby, in the coupled position, there are spaces 48-49 above the first-mentioned interlocking part 13, as well as under the second-mentioned interlocking part 47, which allow for a further turning.

Practically, the above-mentioned interlocking parts 13-47 are positioned such that a lateral play S is created during the above-mentioned further turning, as is schematically represented in figure 21, so that a certain freedom of movement is obtained which is desirable in order to remove the panels 2 from between the fixed panels 2D and 2E.

In the embodiment of figures 24 to 26, this lateral play S, as well as the design of the tongue 8 and the groove 9, are selected such that the right panel 2, in the situation of figure 26, comes loose so to say and can simply be removed from the left panel 2.

In particular, the distance Z1 between the tip of the tongue 8 and the interlocking part 47 situated on the same edge is smaller than or equal to the distance Z2 between

the tip of the lip 10 bordering the top side of the groove 9 and the interlocking part 13 situated on the lip 11 bordering the bottom side of the groove 9.

It should be noted that in the embodiments of figures 20 to 26, the tongue 8 is preferably made such that it can make a movement of rotation in the groove 9, as said tongue 8 is more or less round, as represented in figures 20 to 23, or because it is relatively short, as represented in figures 24 to 26.

As represented, coupling means are preferably provided both on the short edges and on the longitudinal edges which allow for an interlocking both in the vertical and in the horizontal direction, whereby they can all be made such that they allow for a connection and disconnection as described above by means of figures 20 to 26. It is also possible to apply the coupling means represented in these figures only on the longitudinal edges, whereas coupling means with another shape are applied on the short sides, for example as represented in figure 4.

The invention is by no means limited to the above-described embodiments represented in the accompanying drawings; on the contrary, such a floor covering can be made in different shapes and dimensions while still remaining within the scope of the invention.

CLAIMS:

1. A floor panel for forming a floor covering, wherein the floor panel is rectangular, square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in a given plane, the first coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in the given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in the given plane, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the floor panel in distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a flexible zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness

(D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein the edge provided with the flexible zone is bendable; and

wherein said second coupling elements comprise a tongue and a groove, and the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

2. The floor panel of claim 1, wherein said edge provided with the flexible zone is at least bendable in said flexible zone.

3. The floor panel of claim 1 or 2, wherein the minimum thickness (D1) of the flexible zone is smaller than 2/3 of the maximal thickness (D2) of the part with the contact surface.

4. The floor panel of any one of claims 1-3, wherein said part with the contact surface, at a side facing away from the floor panel, comprises a distal end surface, the distal end surface defining a vertical closing plane (V1).

5. The floor panel of any one of claims 1-4, wherein said groove is bordered by an upper lip and a lower lip, the lower lip being longer than the upper lip.

6. The floor panel of claim 5, wherein said lower lip comprises an interlocking part, the interlocking part being situated past a free end of the upper lip; wherein said interlocking part comprises a contact surface which, in a coupled condition of the floor panel with another of such floor panels, works in conjunction with a contact surface which is provided on the another such floor panel.

7. The floor panel of any one of claims 1-6, wherein said floor panel is rectangular and oblong; and wherein said first pair of opposite edges forms the short edges of the floor panel, whereas said second pair of opposite edges forms the long edges of the floor panel.

8. The floor panel of any one of claims 1-7, wherein the flexible zone is shaped as a local constriction.

9. A floor panel for forming a floor covering, wherein the floor panel is rectangular, square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in a given plane, the first coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in the given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in the given plane, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the floor panel in distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a connection zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces;

wherein said connection zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness

(D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein the minimum thickness (D1) of the connection zone is smaller than 3 mm; and

wherein said second coupling elements comprise a tongue and a groove, wherein the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

10. The floor panel of claim 9, wherein the minimum thickness (D1) of the connection zone is smaller than 2 mm.

11. The floor panel of claim 9 or 10, wherein the floor panel is made of medium-density or high-density fibreboard.

12. The floor panel of any one of claims 9-11, wherein said part with the contact surface, at a side facing away from the floor panel, comprises a distal end surface, the distal end surface defining a vertical closing plane (V1).

13. The floor panel of any one of claims 9-12, wherein said groove is bordered by an upper lip and a lower lip, the lower lip being longer than the upper lip.

14. The floor panel of claim 13, wherein said lower lip comprises an interlocking part, the interlocking part being situated past a free end of the upper lip; wherein said interlocking part comprises a contact surface which, in a coupled condition of the floor panel with another of such floor panels, works in conjunction with a contact surface which is provided on the another such floor panel.

15. The floor panel of any one of claims 9-14, wherein said floor panel is rectangular and oblong; and wherein said first pair of opposite edges forms the short edges of the floor panel, whereas said second pair of opposite edges forms the long edges of the floor panel.

16. A floor panel for forming a floor covering, wherein the floor panel is rectangular, square or oblong, and comprises a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panel is provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in a given plane, the first coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panel is provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panel, so that two of such floor panels can be mutually coupled in a given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in a given plane, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the floor panel in distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a flexible zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces and, at a side facing away from the floor panel, comprises a distal end surface, the distal end surface defining a vertical closing plane (V1); wherein the lowermost point of the contact surface of said part defines another vertical plane;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness

(D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein said part with the contact surface comprises, between the vertical closing plane and the vertical plane defined by the lowermost point of the contact surface of said part, at least two other surfaces, the two other surfaces having a different inclination with respect to each other; and

wherein said second coupling elements comprise a tongue and a groove, the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement.

17. The floor panel of claim 16, wherein said two other surfaces are located at a lower side of said part with the contact surface.

18. The floor panel of claim 16 or 17, wherein said two other surfaces are substantially flat.

19. The floor panel of any one of claims 16-18, wherein one of said two other surfaces is substantially horizontal, while the other of said two other surfaces is more inclined with respect to the horizontal than said substantially horizontal surface, the uppermost point of said more inclined surface is located above the substantially horizontal surface.

20. The floor panel of claim 19, wherein said substantially horizontal surface forms the lowermost surface of said part with the contact surface.

21. The floor panel of any one of claims 16-20, wherein said interlocking part comprises an upper surface that runs downwardly inclined in distal direction.

22. The floor panel of claim 21, wherein said downwardly inclined upper surface is substantially flat.

23. The floor panel of any one of claims 16-22, wherein said groove is bordered by an upper lip and a lower lip, the lower lip being longer than the upper lip.

24. The floor panel of claim 23, wherein said lower lip comprises an interlocking part, the interlocking part being situated past a free end of the upper lip; wherein said interlocking part comprises a contact surface which, in a coupled condition of the floor panel with another of such floor panel, works in conjunction with a contact surface which is provided on the another such floor panel.

25. The floor panel any one of claims 16-24, wherein said floor panel is rectangular and oblong; and wherein said first pair of opposite edges forms the short edges of the floor panel, whereas said second pair of opposite edges forms the long edges of the floor panel.

26. A method for installing floor panels, the floor panels being rectangular, square or oblong, and comprising a first pair of opposite edges and a second pair of opposite edges;

wherein the floor panels are provided, at said first pair of opposite edges, with first coupling elements made in one piece with the floor panels, so that two of such floor panels can be mutually coupled in a given plane, whereby the first coupling elements provide for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein the floor panels are provided, at said second pair of opposite edges, with second coupling elements made in one piece with the floor panels, so that two of such floor panels can be mutually coupled in the given plane, said second coupling elements providing for an interlocking in a direction perpendicular to the given plane, as well as in a direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements comprise contact surfaces which, in a coupled condition of two of such floor panels in the given plane, cooperate with each other and provide for the interlocking in the direction perpendicular to the edges concerned and parallel to the given plane;

wherein said first coupling elements further comprise a lip with an interlocking part, the lip belonging to one of the edges of the first pair of opposite edges and, seen in a cross-section perpendicular to the first pair of opposite edges, extending from a lower part of the floor panel in a distal direction; wherein said interlocking part, at a side facing towards the floor panel, comprises one of the contact surfaces;

wherein said first coupling elements further define a part which is connected to the floor panel via a flexible zone, the part belonging to the edge opposite the edge with the lip; wherein said part, at a side facing towards the floor panel, comprises another one of the contact surfaces;

wherein said flexible zone, seen in a cross-section perpendicular to the first pair of opposite edges, is situated at a top side of the floor panel and has a minimum thickness (D1), according to a direction perpendicular to a plane defined by the floor panel, which is smaller than half the thickness of the floor panel;

wherein said second coupling elements comprise a tongue and a groove, the second coupling elements are configured such that two of such floor panels can be assembled by means of a turning movement; and

wherein the method comprises at least the following steps:

coupling a newly to install floor panel to one of the edges of the second pair of opposite edges, to edges of the second pair of opposite edges of already laid floor panels in a preceding row by means of the turning movement; and

coupling the floor panel to one of the edges of the first pair of opposite edges, to an opposite edge of the first pair of opposite edges of a preceding floor panel in the same row, such that bending of said flexible zone and the part with the contact surface snaps down behind the contact surface of the interlocking part when coupling the floor panel to the preceding floor panel.

27. The method of claim 26, wherein the flexible zone is shaped as a local constriction.

28. The method of claim 26 or 27, wherein said groove is bordered by an upper lip and a lower lip, the lower lip being longer than the upper lip.

29. The method of claim 28, wherein said lower lip comprises an interlocking part, the interlocking part being situated past a free end of the upper lip; wherein said interlocking part comprises a contact surface which, in a coupled condition of one of the floor panels provided with the contact surface at the interlocking part, and another one of the floor panels, works in conjunction with a contact surface which is provided on the another one floor panel.

30. The method of any one of claims 26-29, wherein said floor panels are rectangular and oblong; and wherein said first pair of opposite edges forms the short edges of the floor panels, whereas said second pair of opposite edges forms the long edges of the floor panels.

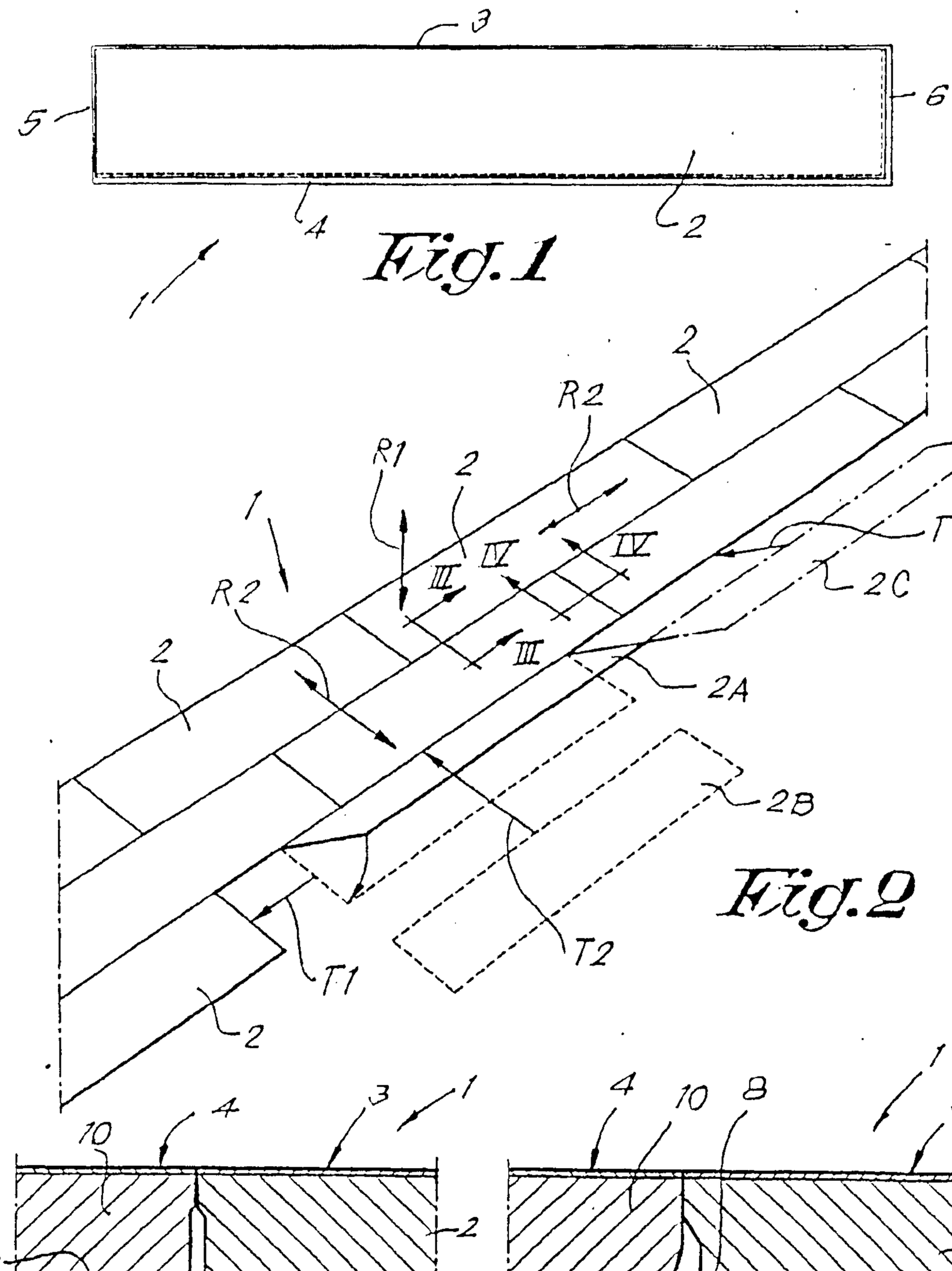


Fig.1

Fig.2

Fig.4

Fig.5

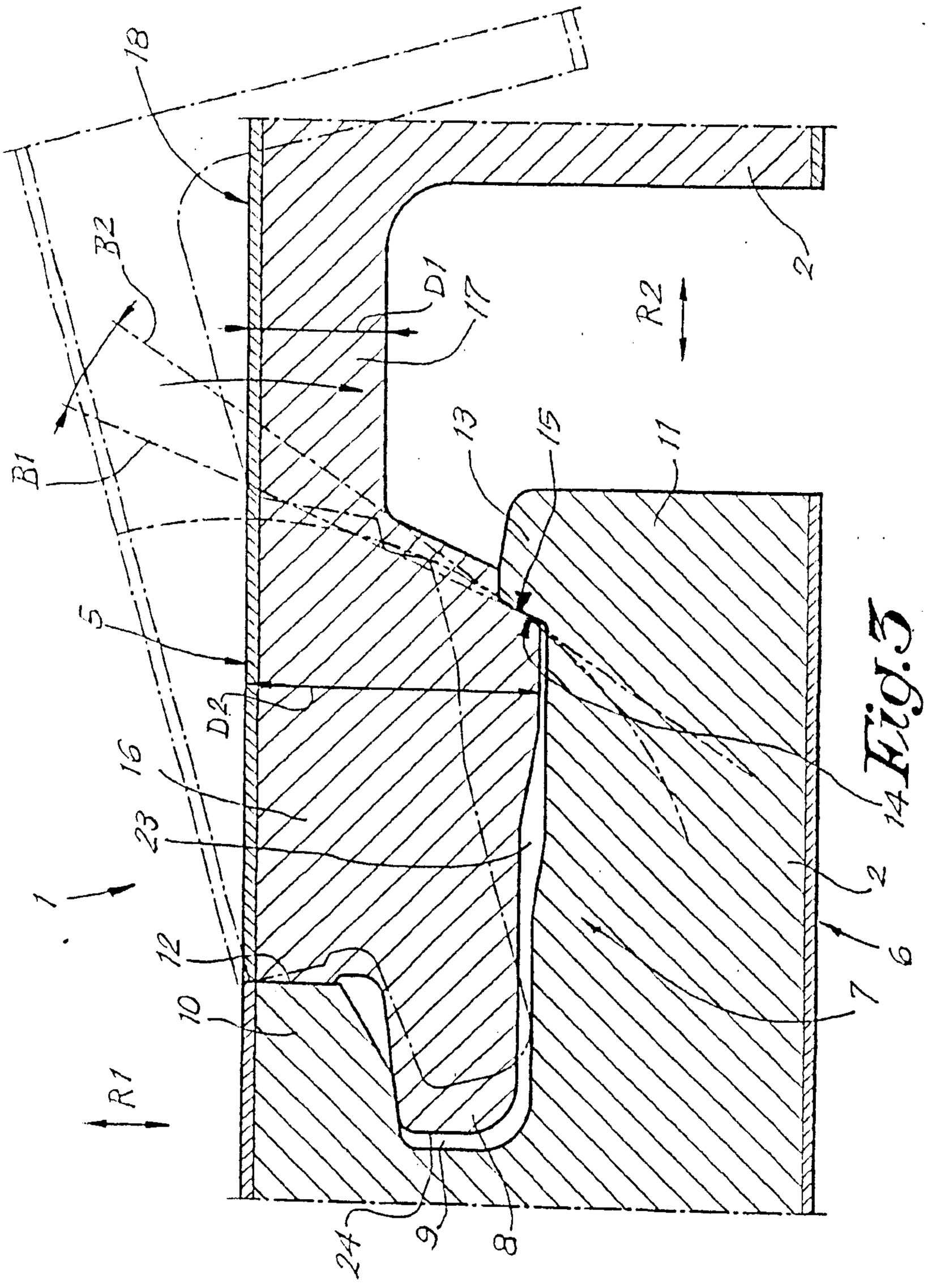


Fig.3

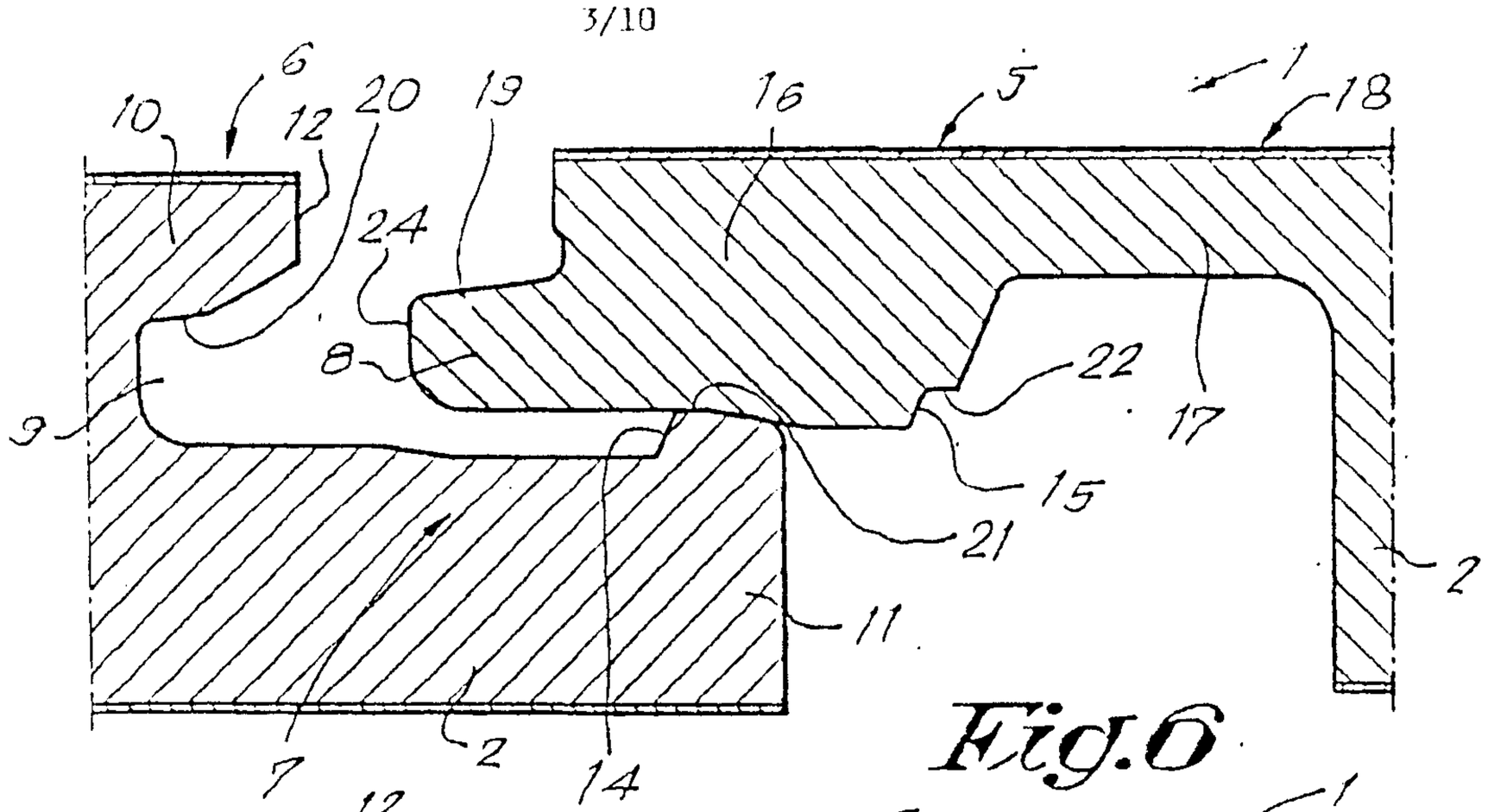


Fig.6

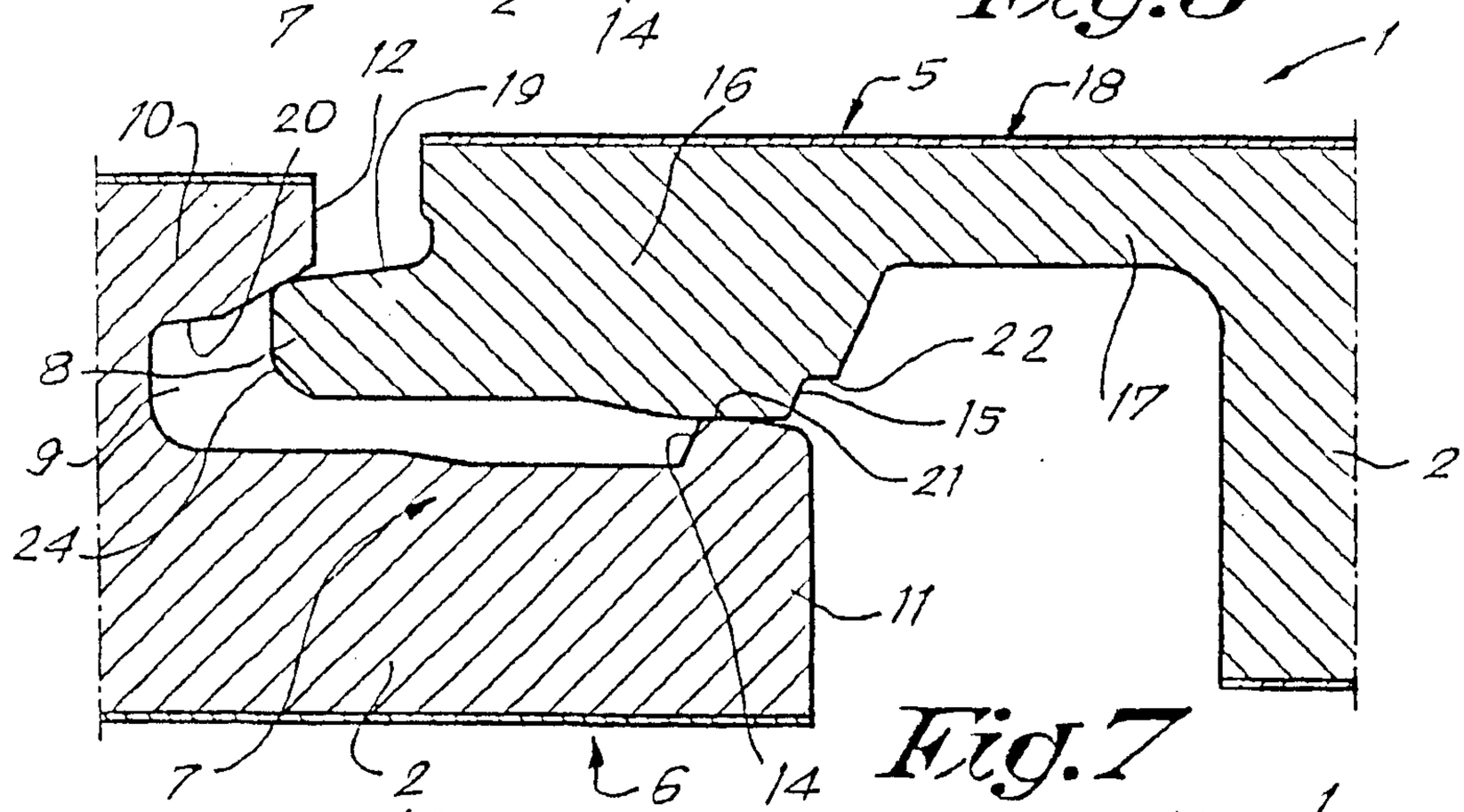


Fig.7

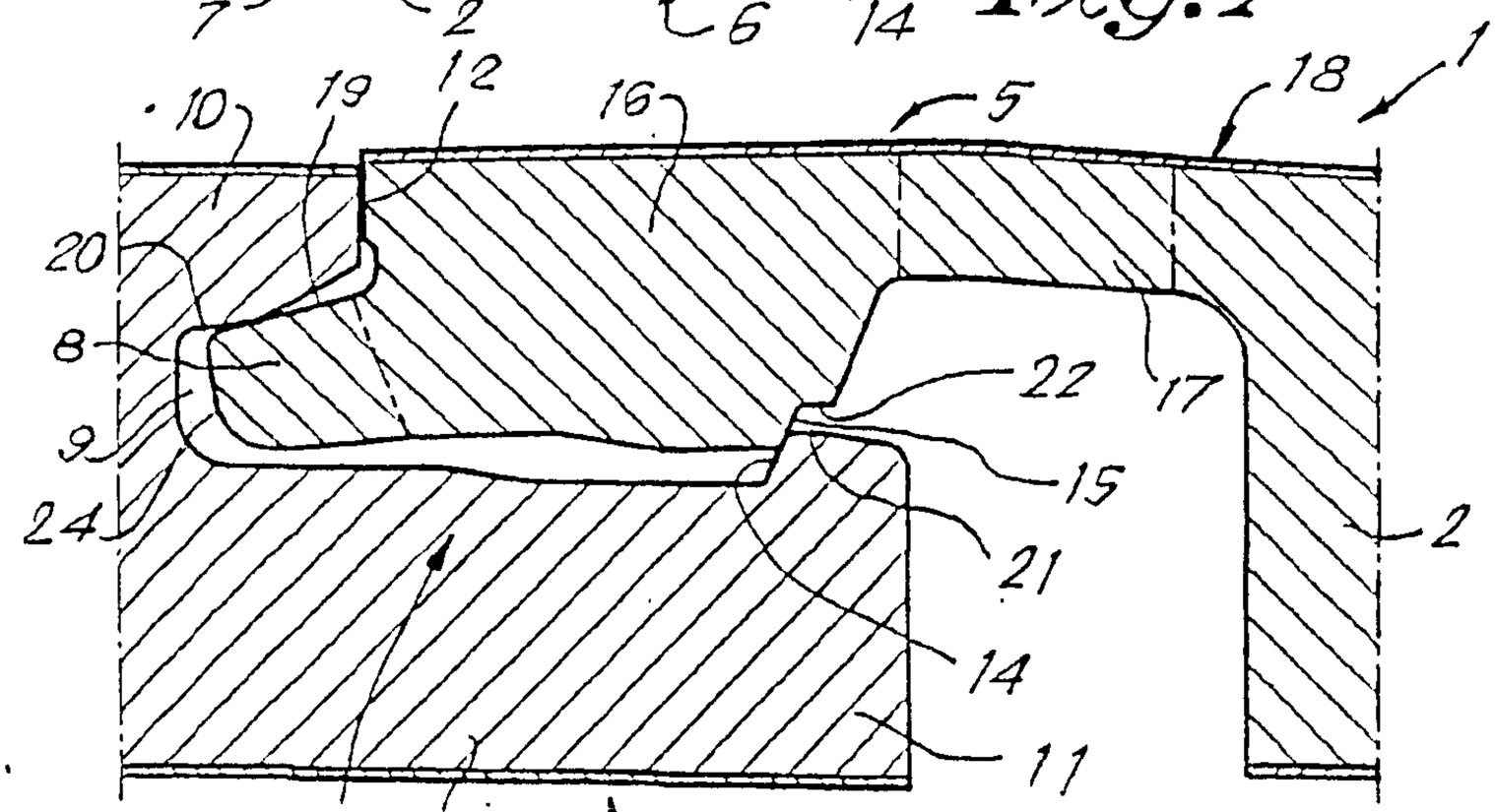


Fig.8

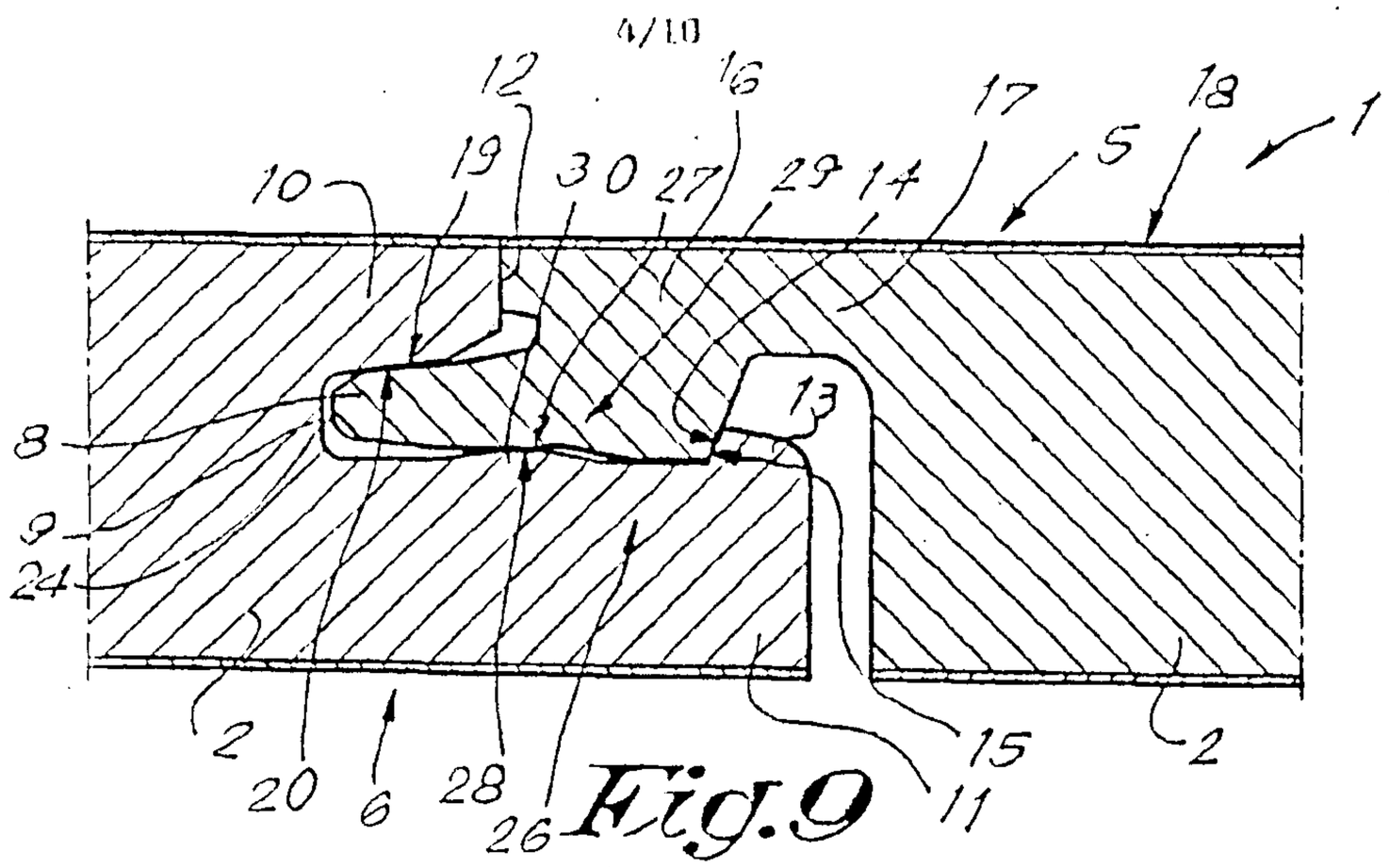


Fig.9

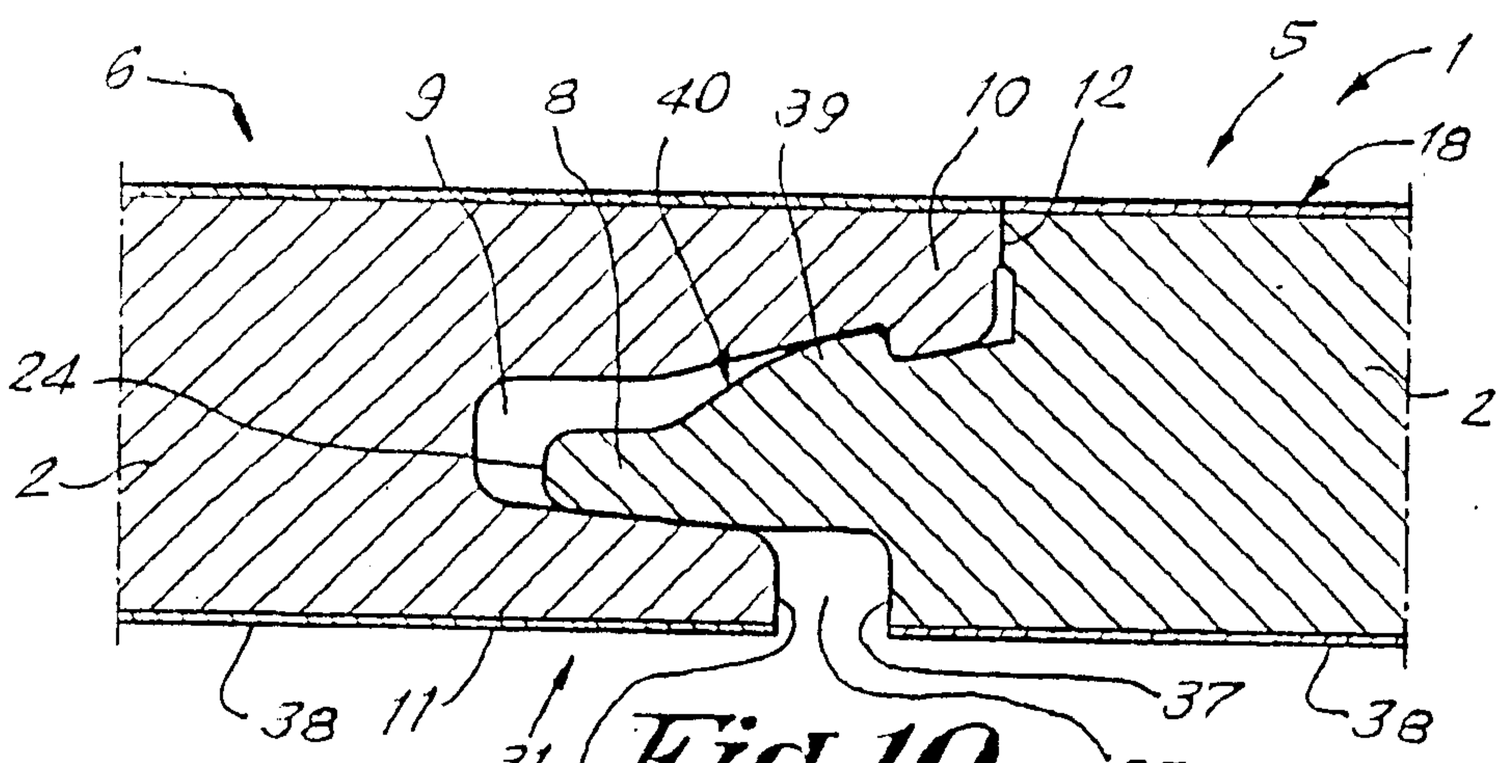


Fig.10

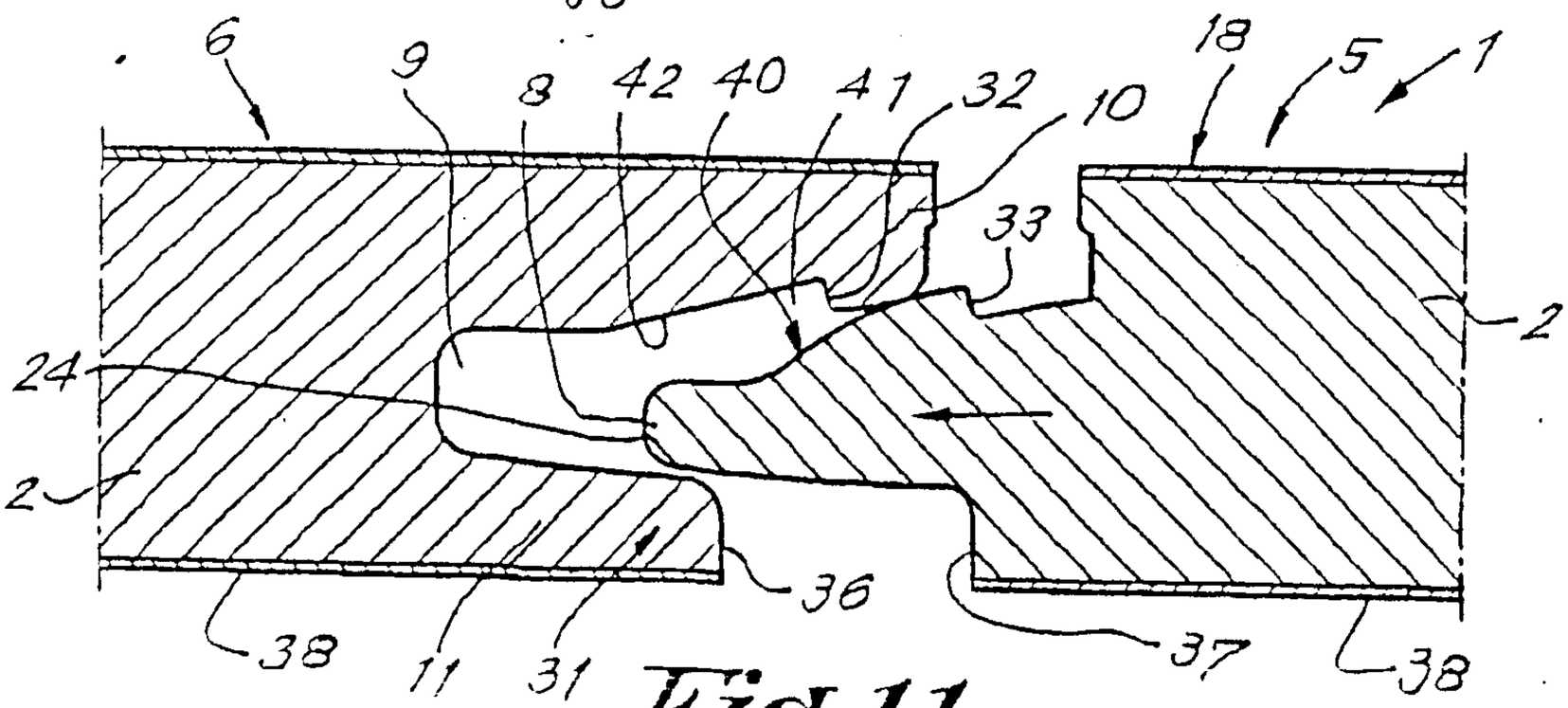


Fig.11

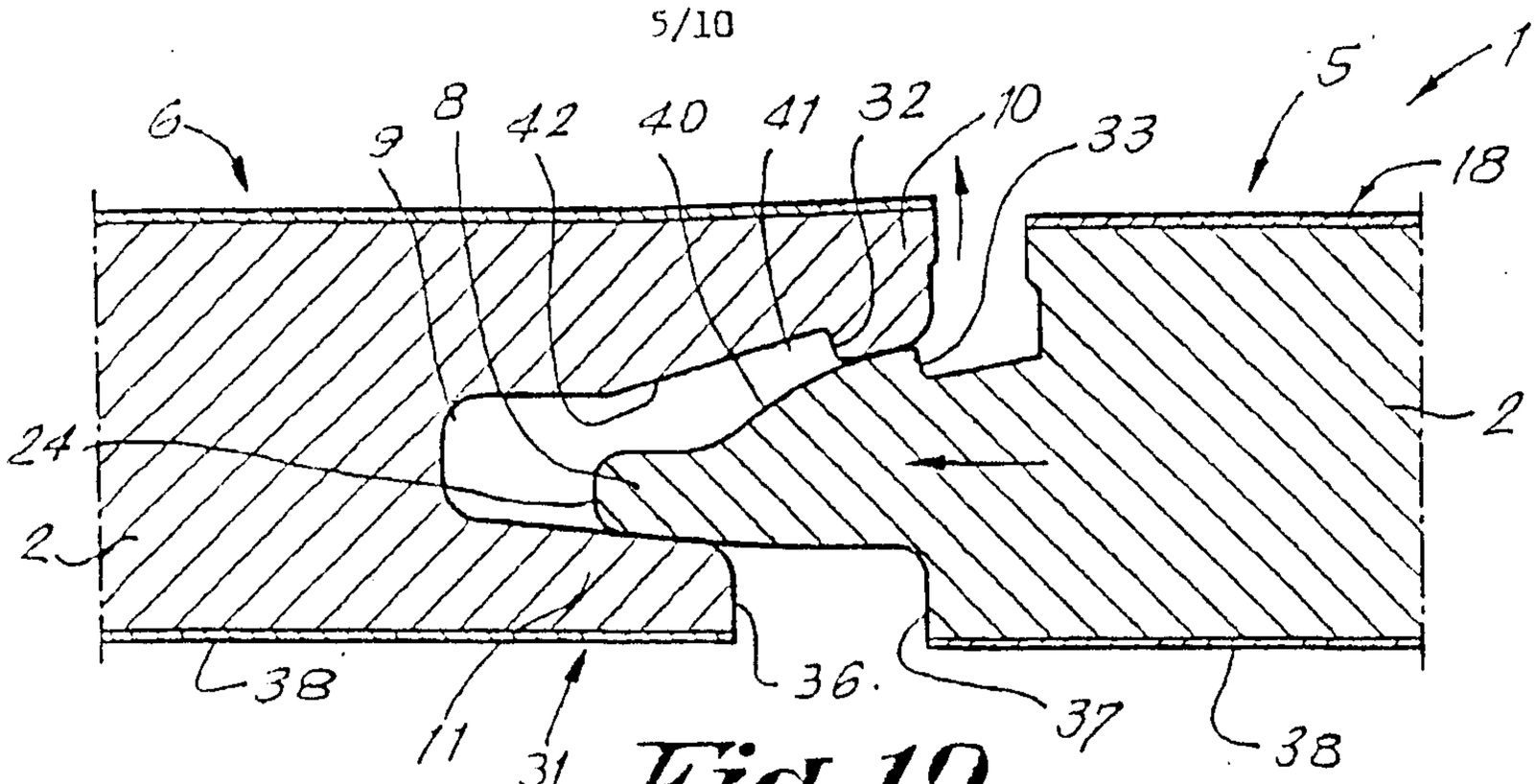


Fig. 12

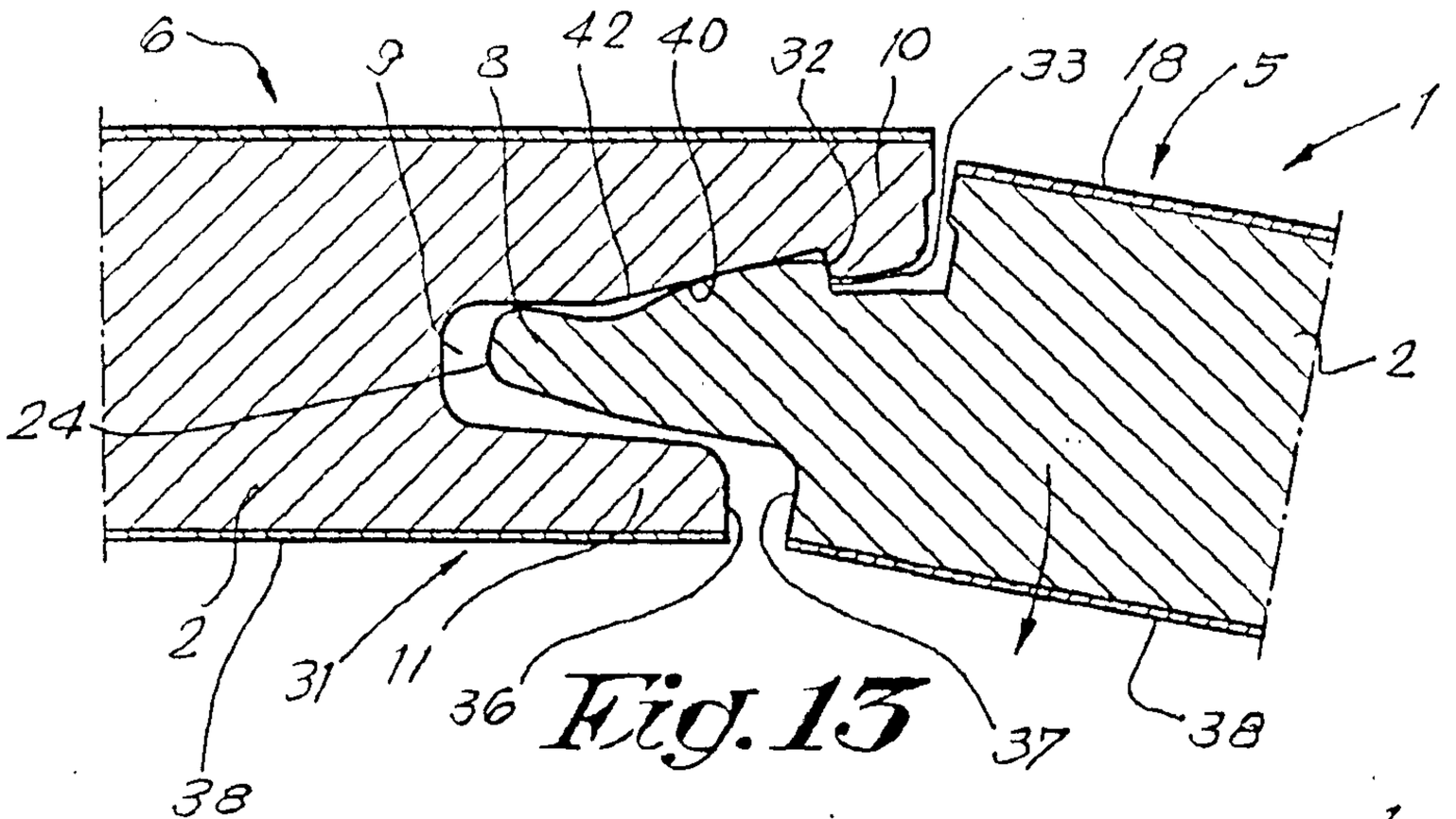


Fig. 13

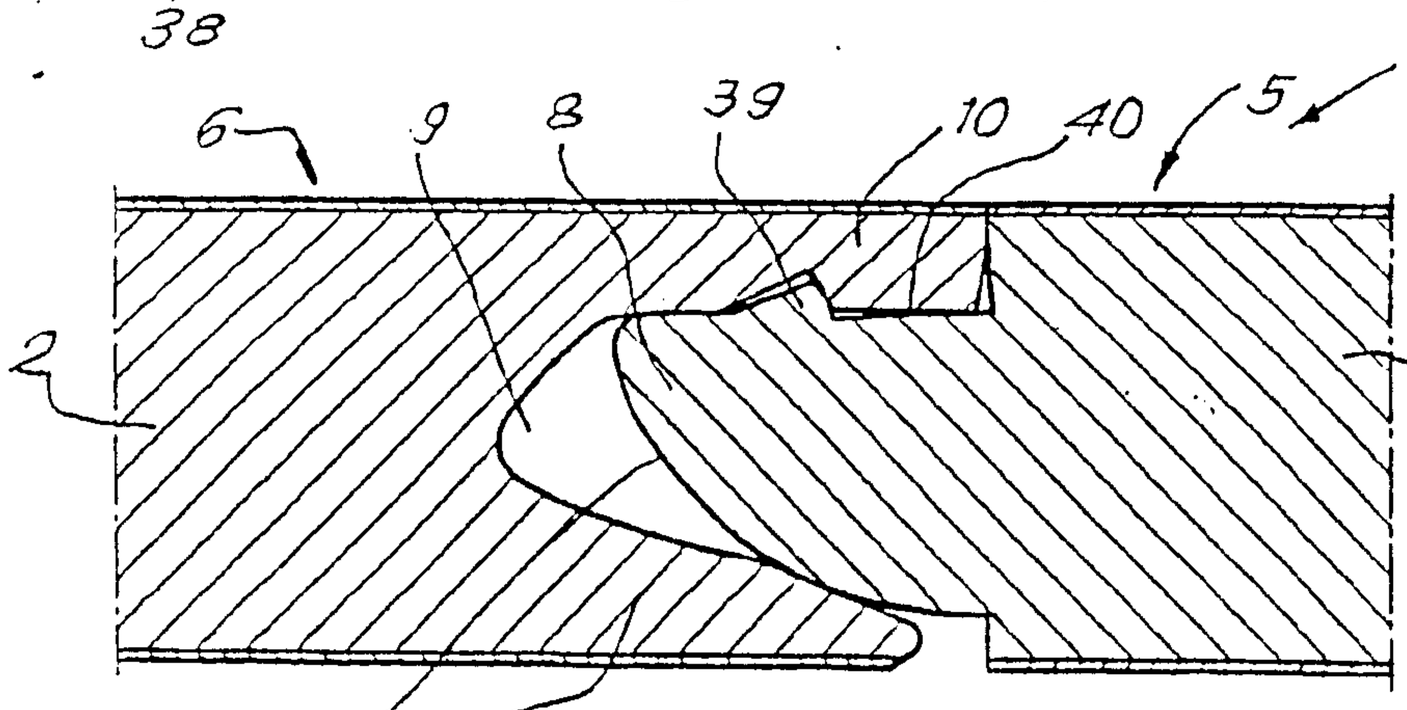


Fig. 14

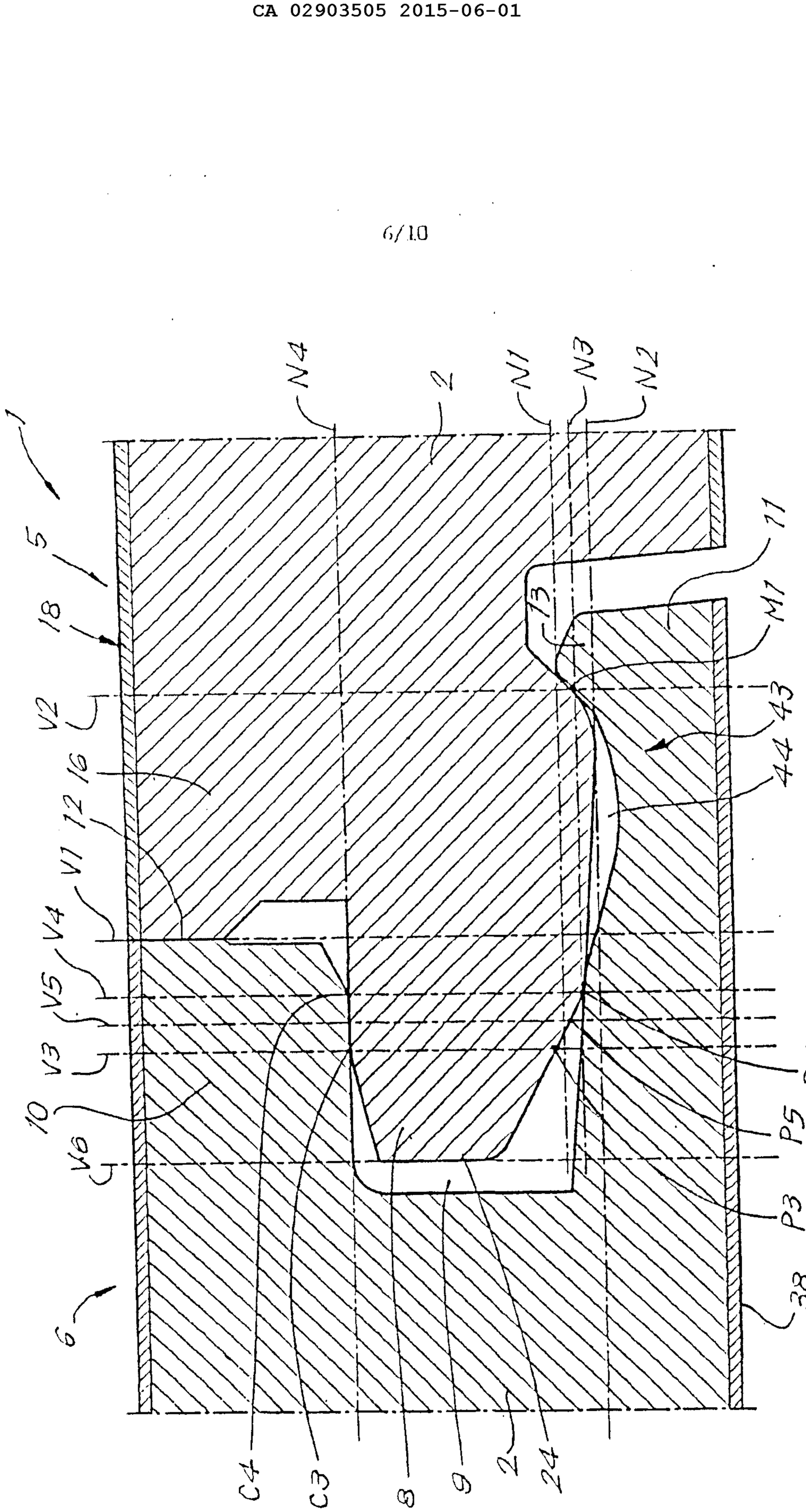

N4
N2
N1
N3
N2
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5
18
V2
16
12
V1
14
V4
V5
V3
10
V6
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M1
13
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P4
P5
P3
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C4
C3
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9
2
24

Fig.15

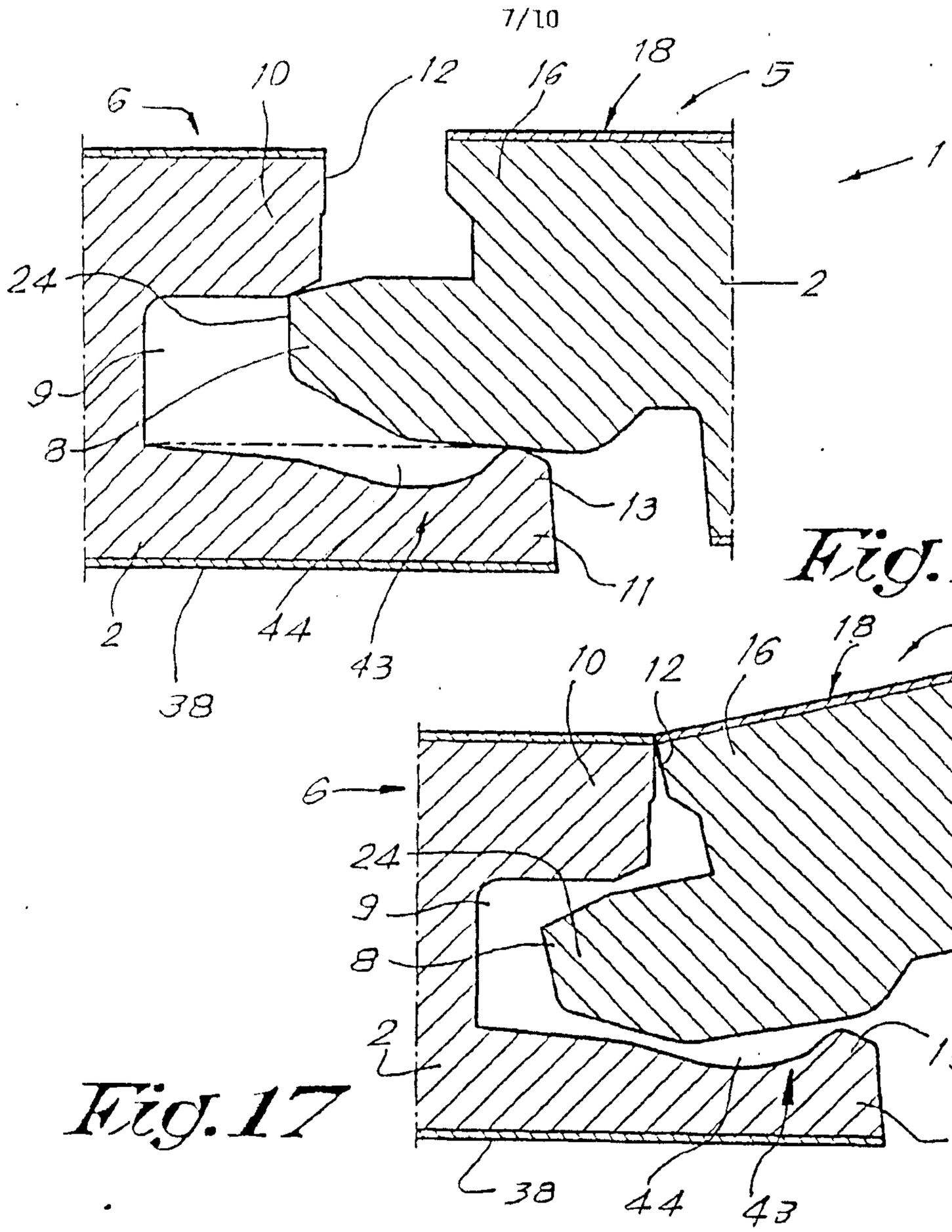


Fig. 16

Fig. 17

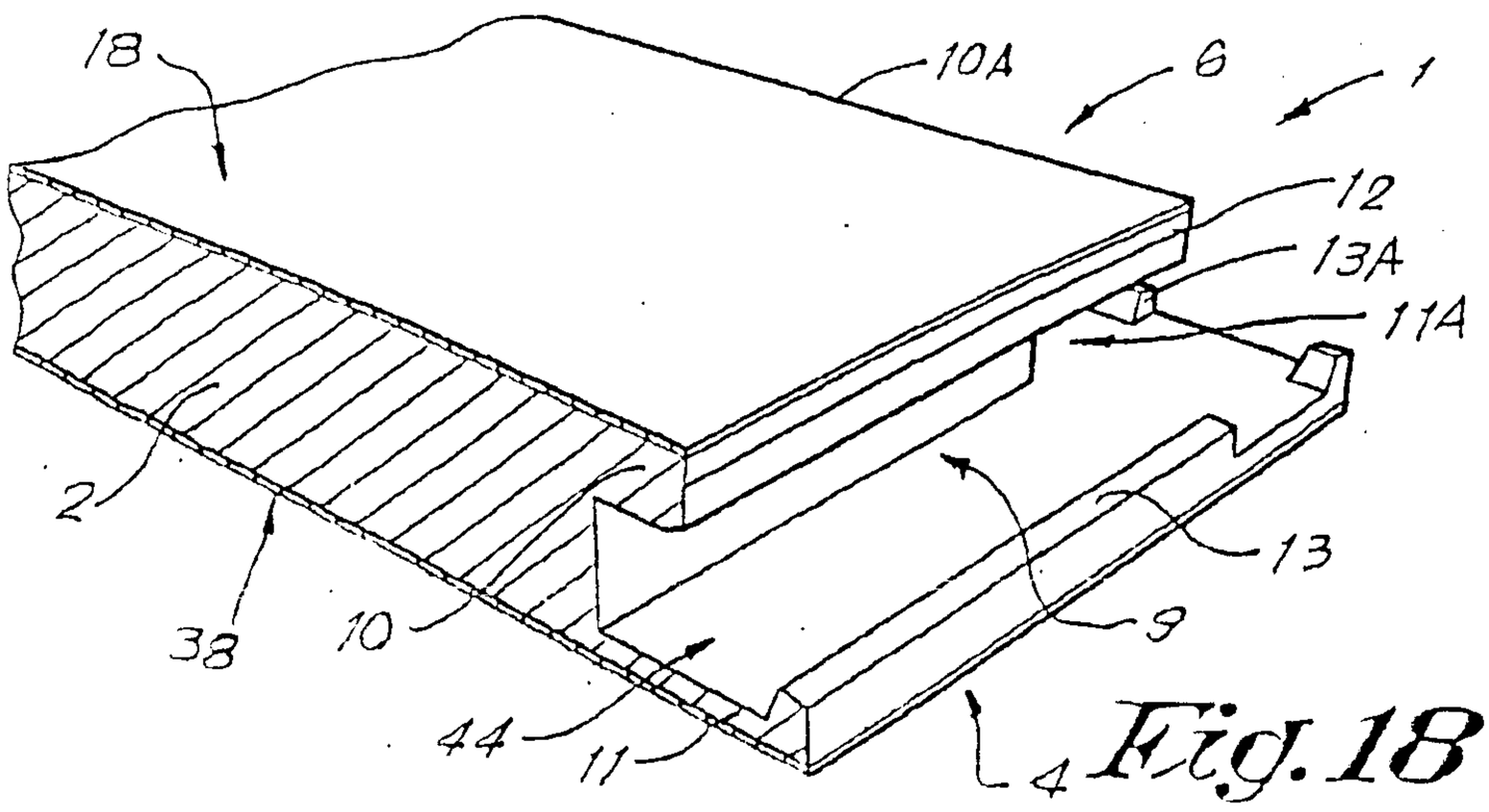


Fig. 18

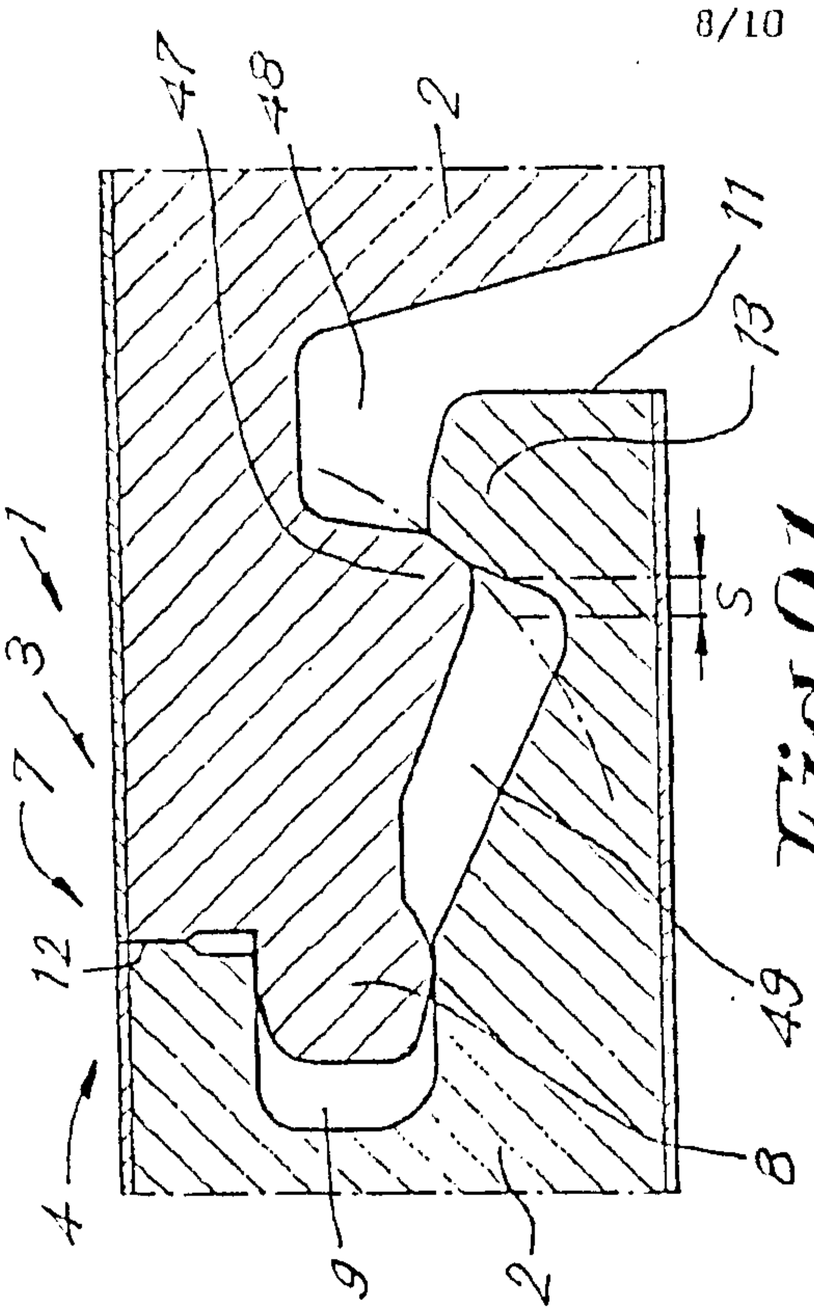


Fig.9A

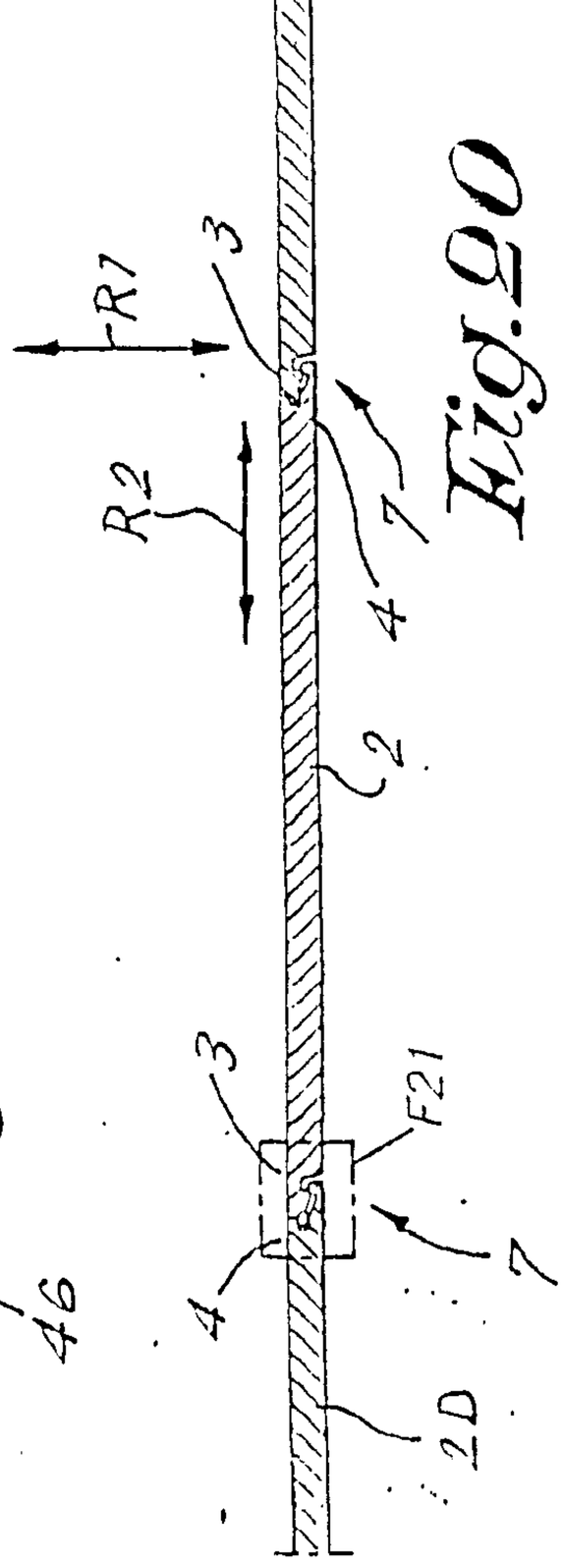


Fig.9C

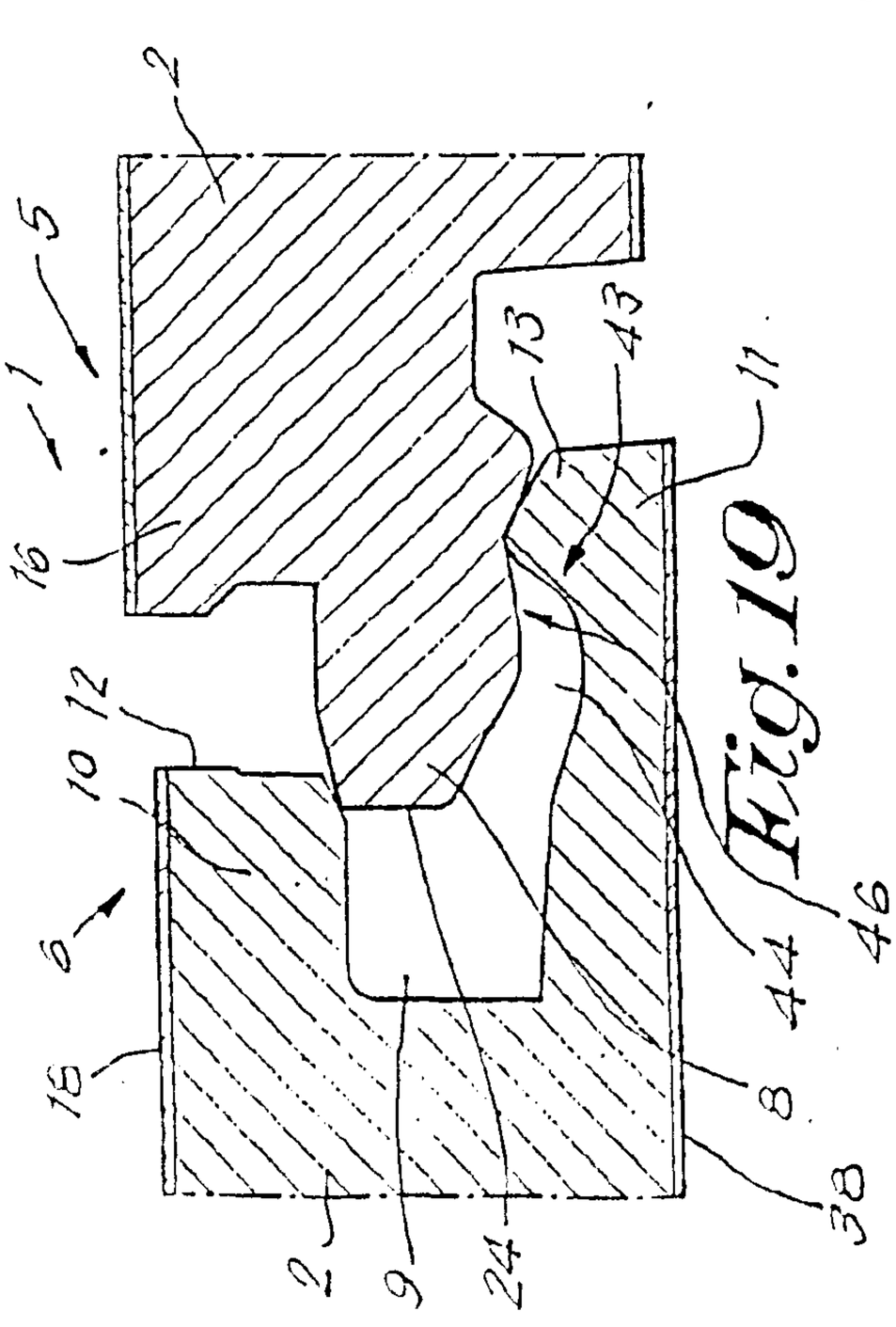


Fig.9B

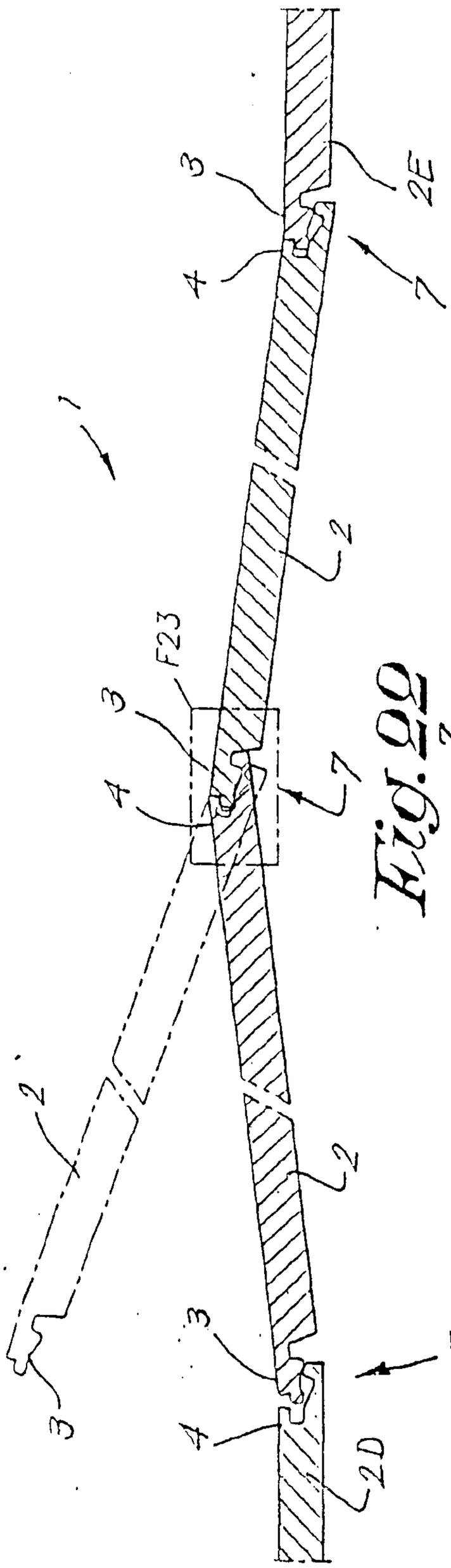


Fig.2a

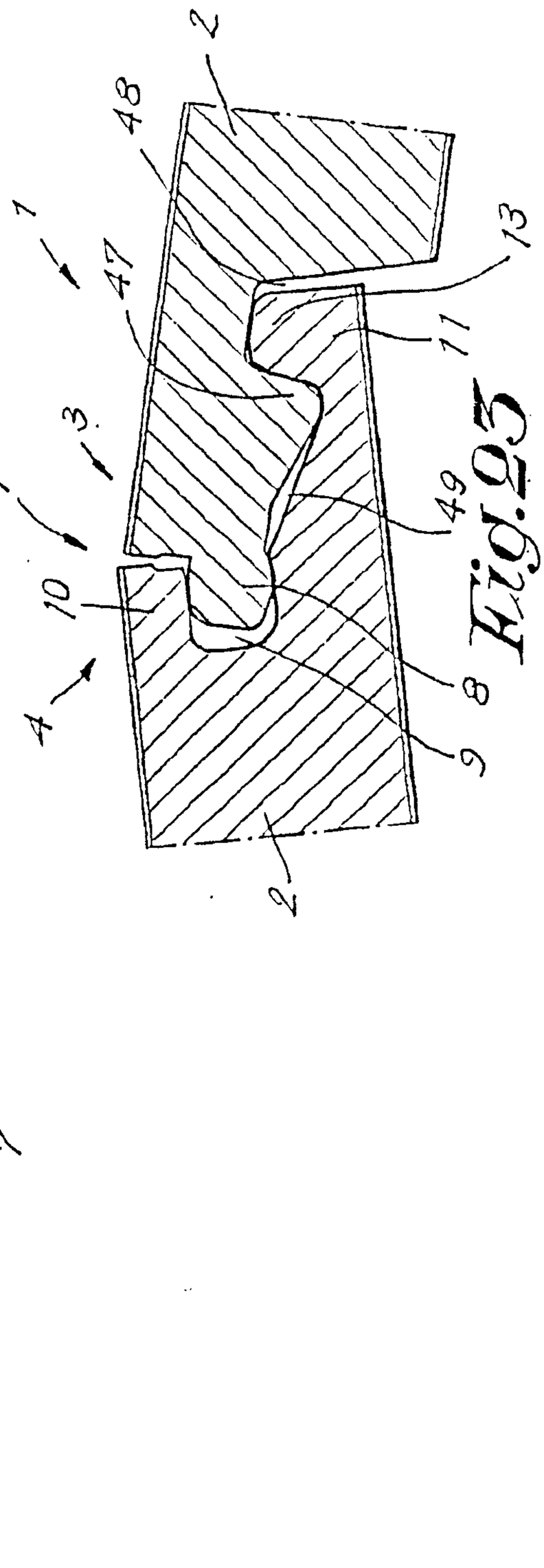


Fig.2b

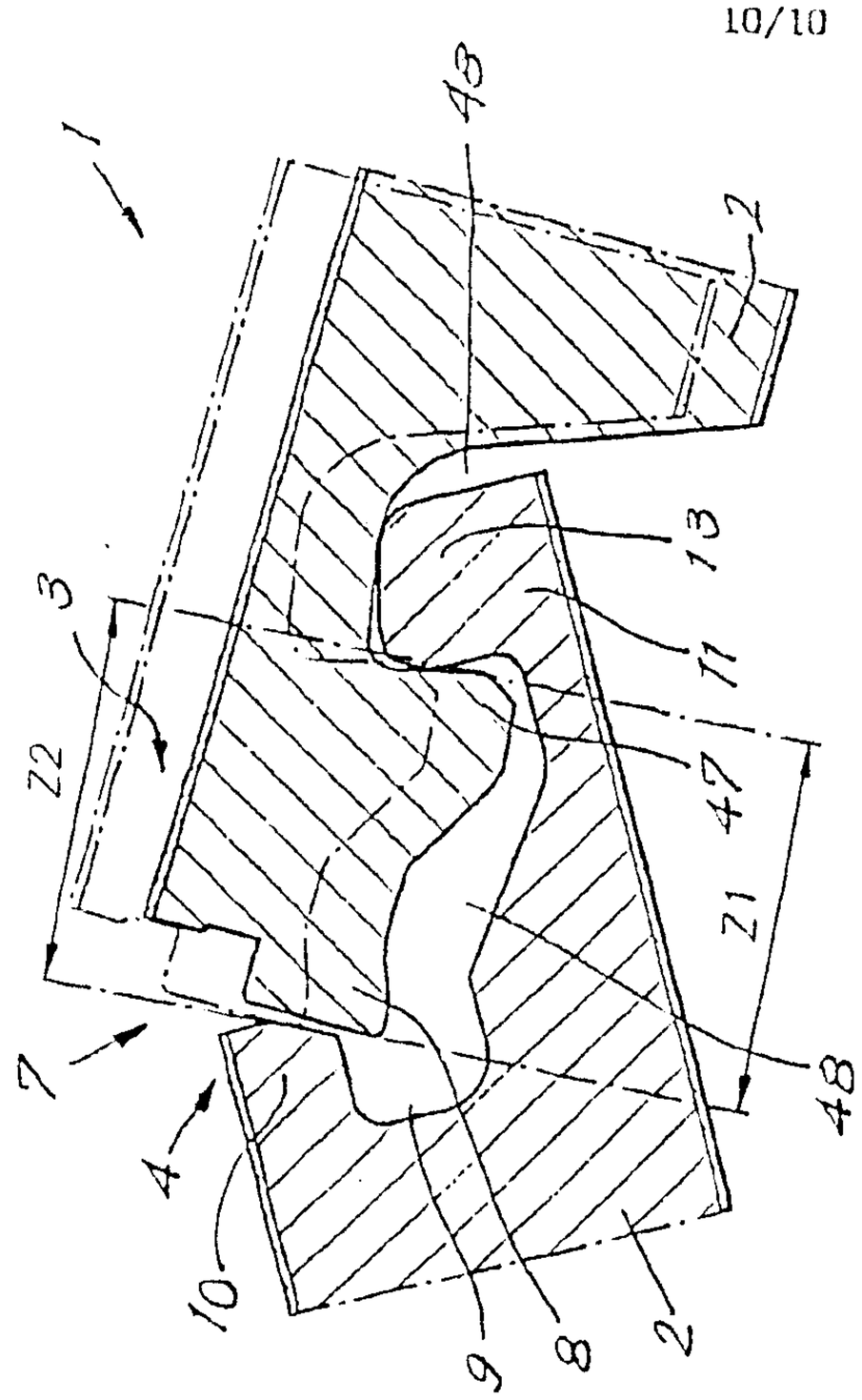


Fig.06

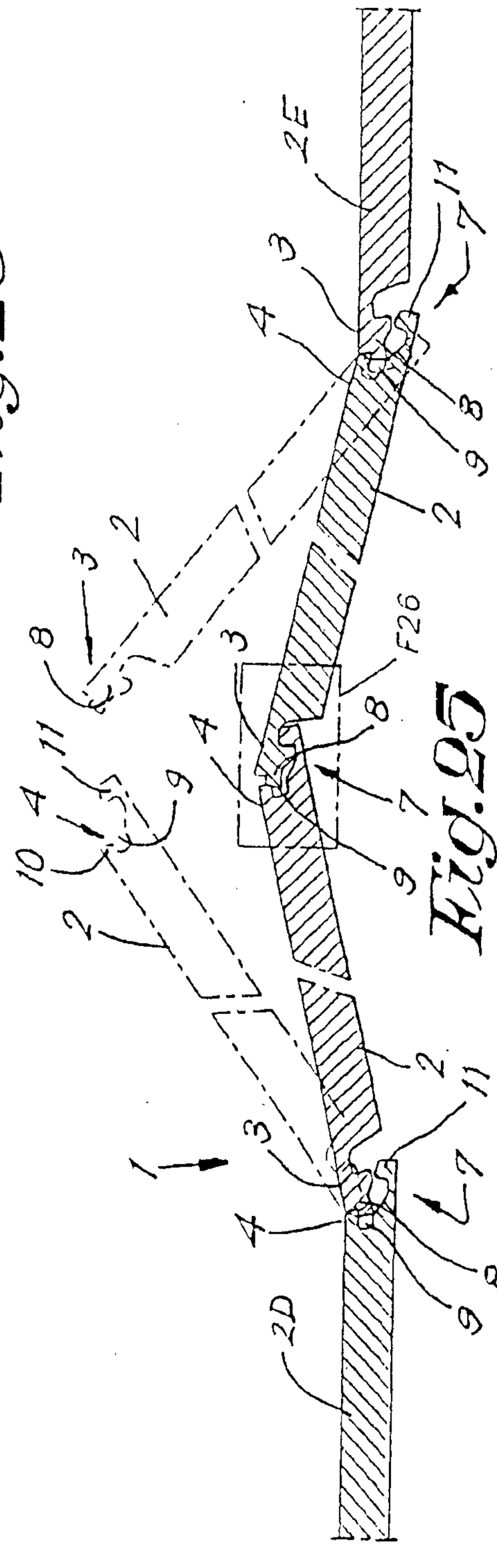


Fig.05

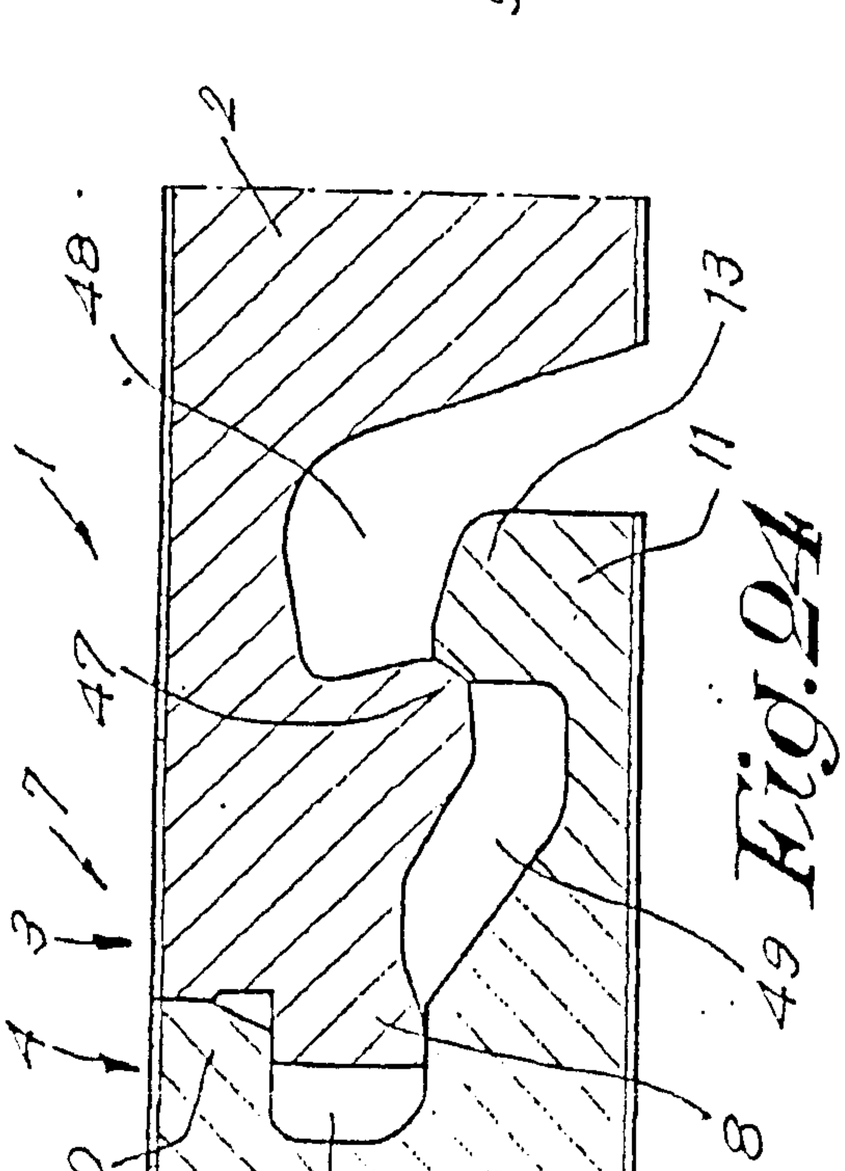
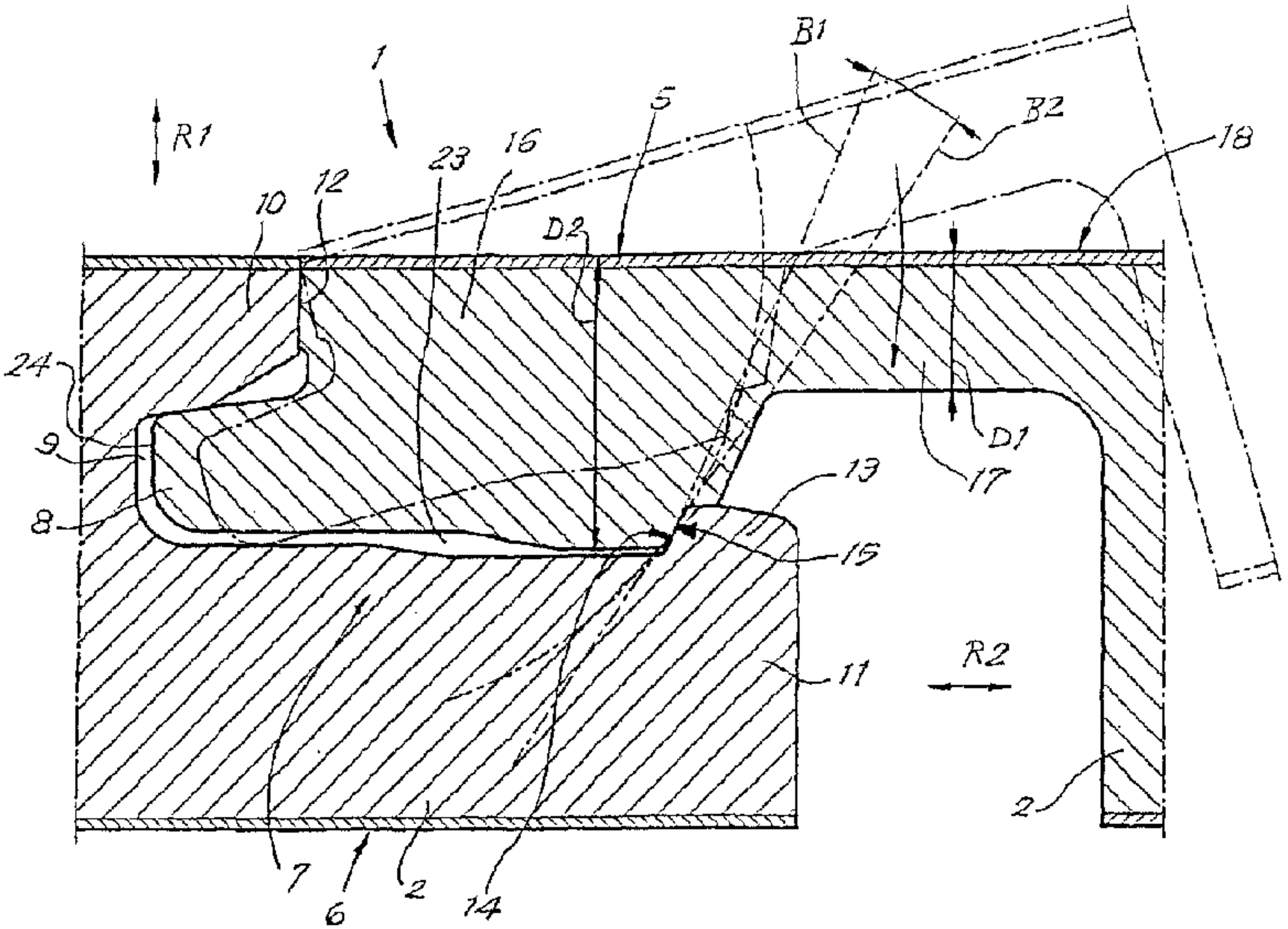


Fig.04

Fig.07


B1
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R1
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R2
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