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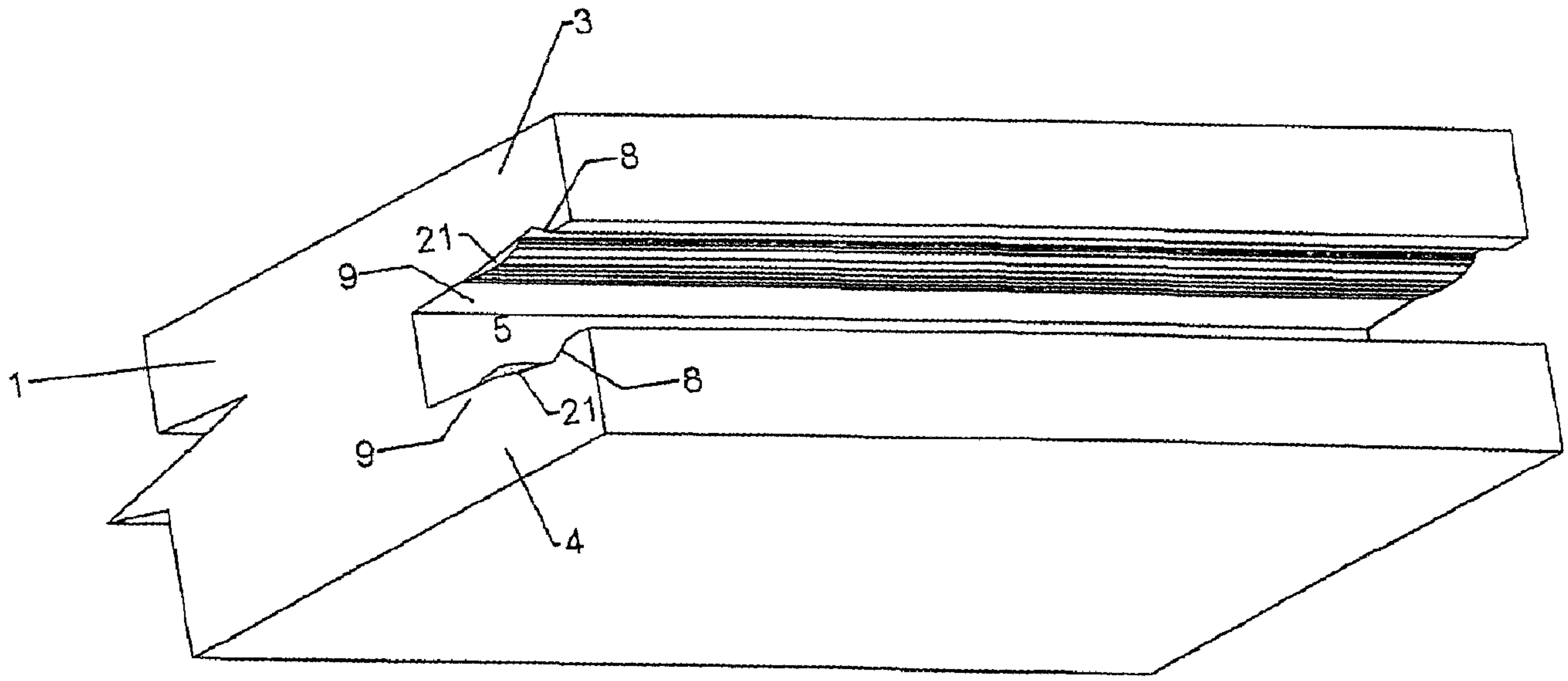

(57) Abrégé/Abstract:
The invention relates to an arrangement for connecting planar components of relatively low thickness along the narrow outer edge thereof, whereby connecting bodies, co-operating according to the tongue-and-groove principle are arranged on the bodies to be joined and clip bodies are provided on the tongue-and-groove connection for the pre-tensioned mutual fixing of adjacent components. Furthermore, the tongue and/or the groove, at least in the region of the surfaces thereof which face the other component, are provided with an adhesive layer or an adhesive with an activating substance, or one of the surfaces is provided with an adhesive layer to be activated and the other with the appropriate activator.

Abstract

The invention relates to an arrangement for connecting planar components of relatively low thickness along the narrow outer edge thereof, whereby connecting bodies, co-operating according to the tongue-and-groove principle are arranged on the bodies to be joined and clip bodies are provided on the tongue-and-groove connection for the pre-tensioned mutual fixing of adjacent components. Furthermore, the tongue and/or the groove, at least in the region of the surfaces thereof which face the other component, are provided with an adhesive layer or an adhesive with an activating substance, or one of the surfaces is provided with an adhesive layer to be activated and the other with the appropriate activator.

ARRANGEMENT FOR CONNECTING PLANAR COMPONENTS

BACKGROUND OF THE INVENTION

The invention relates to a system for connecting planar components of relatively slight thickness along their perimeter edges. This system is designed to be manufactured simply and durably, with the adhesive used in sticking together the invention's elements being pre-applied in the factory, so that no tedious application of adhesives to the connector elements is necessary during installation. This also ensures that exactly the right amount of adhesive is used each time.

STATE OF THE ART

On conventional tongue-and-groove connectors for panels, floorboards, ceiling coverings and the like, the factory application of an adhesive to areas running adjacent and perpendicular to the surface and designed for attachment to the next panel element is prior art from DE-29703962 U1. Joining the tongue-and-groove connectors that use these prior-art formations causes an adhesion of the individual elements along the areas adjacent to the surface, thus obtaining an impermeable surface. The disadvantage of this type of formation is that the two surfaces that meet to form the attachment must be pressed together with considerable force due to the adhesive used—namely, a contact adhesive—and subsequent adjustment, e.g. lengthwise along the adhesion joint for the purpose of closing a transverse joint, is no longer possible. There are also models known in the art in which the tongue-and-groove connection is equipped with notch elements for the purpose of attaining a bilaterally pre-stressed fixation of adjacent components without the introduction of adhesives. Also known in the art are both additional projections on the tongue flanks that combine with slots in the groove walls and clips and the like on the back side of the panels.

In particular, there are, for example, connections are known from the AT patent 405560 featuring two adjacent plate- or strip-shaped components that lock together, the connections act according the tongue-and-groove principle. The groove flanks, or one of the flanks, diverge(s) away from the bottom of the groove and converge(s) near the outer end of the groove at an angle greater than the angle of divergence. Here, the width of the groove's opening is greater than the protruding end of the tongue that is inserted first. Starting from this protruding tip, the tongue is equipped with the same angle as the wedge surfaces that diverge the groove walls or a wedge surface adapted to the shape of the groove, matching the groove cross-section at the base of the tongue (the part inserted last) and each having an undercut whose outer edges adjacent to the wedge surfaces converge at the same angle as the groove walls to a connector bridge adjacent to the component. After insertion of the tongue into the groove, the projection of the groove walls equipped with the converging groove wall surface snaps into the undercut of the tongue. The converging groove wall area slides along on the wedge surfaces leading to the connector bridge, pulling the tongue into the groove.

ABSTRACT OF THE INVENTION

The invention is based on a pre-gluing of those tongue or groove surfaces of notched tongue-and-groove connectors that are pressed together by the automatic pulling of the tongue into the groove and that are fixed in this position by the snap-in connection. This eliminates the need for additional bonding aids to hold the components together during the setting phase, automatically yielding a secure connection.

BRIEF DESCRIPTION OF THE DIAGRAMS

Figure 1 is a schematic rendering of an initial design variant of the system according to the invention, namely: Figure 1A shows a formation prior to joining where the adhesive has been applied to the groove; Figure 1B shows a design with the adhesive applied to the tongue flanks; and Figure 1C shows both components joined together, there being no difference in this position between the formation shown in Figure 1A and that shown in Figure 1B.

Figure 2 is a view analogous to Figure 1 of a design variant modified with regard to the shape of the tongue-and-groove cross-section.

Figure 3 represents a design variant also modified with regard to the shape of the tongue-and-groove cross-section, this time with the components joined.

Figure 4 represents a larger scale of the design variant from Figure 2.

Figure 5 provides a perspective illustration of a grooved component with a pre-applied adhesive bead.

DETAILED DESCRIPTION OF THE DIAGRAMS

Figures 3 and 4 show two components (1, 2) that are joined together. The one component (1) features a groove (5), into which a tongue (6) protruding from the other component (2) can be inserted. The components (1, 2) abut each other firmly with their front ends in the area proximate to the surface of use while forming a gap (16), if necessary, in the area facing the ground. This gap represented in the diagram is not mandatory but provided only in case it is needed. The components (1, 2)—made primarily of wood, wood products or plastic—can be equipped with coatings (23, 24) to obtain the appropriate surface value or appearance.

Matching locking elements (7, 8) are provided on the tongue (6) or on the wedged tongue edges (11) and in the groove (5) or on the grooved surface or edges (9) of the groove (5). These locking elements can be formed from projections and/or impressions that work together and can be snapped into place. The shape of the cross-sections of the impressions and their respective elevations (7, 8) match, so that they fit snugly and can be locked together.

When the components (1, 2) are joined, the locking elements (7, 8) are meshed. In particular, the locking elements (7, 8) are formed across the entire length and/or breadth of the components (1, 2).

As depicted in Figure 3, at least one of the tongue's wedge surfaces features a projection (7) that fits into an impression (8) in the abutting groove wall surface (9). When inserting the tongue (6) into the groove (5), the two groove walls (3, 4) of the groove (5) are moved apart elastically.

The cross-section of the projection (7) or the impression (8) is triangular. The angle of the triangle side (17) closer to the groove opening is shorter and steeper than the triangle side (18) closer to the bottom of the groove (10). When the tongue (6) is inserted into the groove (5), the longer side (18) of the projection (7) slides on the inner edge or on a sloping of the front edge of the groove wall (3) formed in this area until the projection has cleared this inner edge (25) and snaps into the impression (8).

It is advantageous for the connection if the triangle side (18) proximate to the bottom of the groove is some 4 to 8 times—preferably 5 to 7 times—as long as the triangle side (17) farther from the bottom of the groove and if the angle between the two triangle sides (17, 18) is in the range of 100° to 140°, in particular from 100° to 130°.

To facilitate insertion, it is advantageous if the inner edges of the tongue (6) are sloped and/or the inner edge of the notch- or locking-element-free groove limb (4) is sloped.

For formation of a defined mutual position for the components (1, 2), it's helpful if the angle to the use or upper surface resp. of the longer triangle side (18) of the projection (7) on the tongue (6) matches the angle or the inclination, in particular of the front area, of the tongue wedge surface (11) whose front area maintains a gap to the groove wall surface (9). The locking-element-free tongue surface (see Figure 3) can abut along most of its length against the groove wall surface (9) and both surfaces approach the useful or upper surface of the two components (1, 2) relative to the bottom of the groove (10). In this manner, these two surfaces (9, 11) serve as sliding or guiding surfaces and support the spreading out of the groove flanks (3, 4) when sliding the projection (7) over the outer edge or sliding surface of the flank (3).

An advantageous design in keeping with Figures 1, 2 and 4 provides for the formation of matched impressions and projections on the two opposite tongue surfaces (11)—in particular symmetrically placed projections (7) or impressions (8)—and on both adjacent groove surfaces (9) at these projections (7) or impressions (8), or for the dovetail formation and matching of groove (5) and tongue (6). These designs enable a double locking of the two components (1, 2).

In this design, the longer triangle side (18) or the surface formed by this triangle side on the tongue (7) forms a bend (19) to merge into the frontal area of the tongue's wedge surface. The longer triangle side (18) and this frontal area of the tongue's wedge surface (11) abut snugly. This makes it possible to attain a very precise connection of the components (1, 2), ensuring at the same time that the components (1, 2) are adjoined with pressure. This, together with the combination effect of the triangular surfaces (17) with the respective opposite surfaces, prevents the formation of a gap at the surface of use (13) or, alternately, a separation of the components (1, 2) during usage.

Number 20 in Figures 1 and 2 suggests the application of an adhesive, whereas the adhesive, as will later be demonstrated in detail, can be applied either on the groove flank wall (9) (Figure 1A or Figure 2A) or on the tongue's wedge surfaces (11) (Figure 1B or Figure 2B). The respective opposite surface can then be treated with an adhesive activator or the like. If a two-component adhesive is used, the one component can be applied to the one surface and the other component to the respective opposite surface.

Figure 5 shows a schematic illustration of the adhesive application in the form of an adhesive bead (21).

Panels with a pre-applied adhesive—whether it is an adhesive active from the outset or one activated only when the panels are joined during installation—have the overwhelming advantage of significantly reducing the number of manual steps required during installation of the panels. This also eliminates the installation step—regarded as unpleasant and time-consuming both by professional installers and do-it-yourselfers—of applying as evenly as possible the appropriate quantity of a sticky substance, using enough but not too much, across the entire length of the sides of the panel's tongue and/or groove, which might be up to 6 m in length. This eliminates the problem of a premature setting of the adhesive when delays occur in the course of the installation process, which can make seamless joining virtually impossible. Also eliminated is the unpleasant squeezing out of excess adhesive, which must be removed as soon as possible after extrusion from the joints so as to avoid staining the decorative surface.

Connections with notch elements also eliminate the need for a possible fastening of abutting panels, since the notch elements introduce a pre-stressing that holds together the panels while the adhesive sets. The shape and formation of the notch elements is not crucial here.

The adhesive, in whichever basic form it is now present in the grooves and/or on the tongues of the panels, has been applied by machine and therefore with the proper dosage in or on the panel, board, etc. brought to the installation site. Thus, no excess adhesive is squeezed out onto the decorative surface when the panels are joined together. The danger of "premature" setting of the adhesive, as described above, is also no longer present. The following applies to the various adhesives that could generally be considered:

First we will consider the glues most commonly used. Glues are adhesives made up of water-soluble animal (glutine, casein), vegetable (starch, dextrin, cellulose ether) or synthetic (polyacrylic acid derivates, polyvinyl alcohol, polyvinyl pyrrolidone, etc.) polymers together with water as a solvent. They belong to the class of single-component, cold-setting adhesives with which the solvent (water) is absorbed, escapes, etc. during the adhesion process. The applied glues solidify into a jelly-like substance when cooling and usually become transparent when dry. When they come into contact with water, they dissolve into a gel with a strong tack.

Glues used specifically in the context of the invention are named in the following: Suitable are fully synthetic glues (synthetic resin glues, e.g. polyvinyl acetate wood glue), those of vegetable origin (dextrin, starch, sago or manihot glue), and those of animal derivation (leather, bone and casein glues). In addition to the aforementioned physically setting glues, chemically setting glues can also be used, such as those based on aminoaldehyde, melamin, phenolic or cresol resins.

So-called all-purpose glues can also be considered. These are typically solutions or dispersions of polymers, e.g. cellulose nitrate, polyvinyl acetate, polyacrylates, and the like, with (alcohol containing) esters and/or ketones or, alternately, water as a solvent or dispersing agent. All-purpose glues when the solvent or dispersing agent is exposed to the atmosphere (evaporation) or to the (porous) substrates to be glued. For the panels as outlined in the invention, the glues are applied into or onto the grooves and/or tongues of the panels in a "wet" or gelatinous state. The respective solvent or dispersing agent is then extracted, effecting the conversion to a lasting form for storage.

Other adhesives that can be used are contact adhesives, which are applied to the appropriate substrates as a solution or dispersion and which—after extensive evaporation of the solvent, i.e. when the adhesive films seem to be dry—develop their adhesive effect through the influence of pressure when they are joined. Basic polymers of contact adhesives are largely polyacrylates, polychloroprenes, nitrile or styrine-butadiene rubbers and polyurethanes. They may also contain tackifying resins such as colophony, hydrocarbon or phenolic resins.

So-called anaerobic adhesives may also be used under circumstances. Such adhesives may harden when hermetically sealed ,for example, while retaining unlimited flowability and bonding in the presence of oxygen. They are based, for example, on monomeric dimethacrylic acid esters of diols, e.g. polyethylene glycols.

In an initial, more affordable design of the invention, the mold-clamping elements, i.e. the panel grooves and/or tongues, feature the application of a latent adhesive coating that is converted to a sticky or ready-to-stick state through the appropriate activation during installation. This might be a simple conversion from a dry or permanent form of a fully prepared adhesive by dampening with a solvent, particularly water, or it may be the activation of a latent adhesive material by an activation agent that initiates the setting and hardening of this material.

A preferred sub-form of the design just described is a (floor) covering with panels whose mold-clamping elements feature the activating adhesive just described. According to this claim an adhesive—prepared originally with water, be it a gelatinous adhesive dissolved therewith or therein, or an adhesive dispersed therein—a corresponding glue or the like is applied in a fresh, "wet" state as a coating and then "dried" there. Applying water—be it directly onto the dried adhesive layer or through indirect, intensive contact with water applied to a(n) (opposite) mold-clamping element of an adjacent panel to be joined—will activate the "dry" adhesive when the panels are joined and convert it back into its ready-to-stick state. Application of the preferably aqueous activator can be carried out through a simple dosed spraying, for example, or through application of the activator using a rubber sponge or the like onto the respective surface(s) of the panel's form-fitting elements.

A second advantageous way of activating latent adhesive coatings of the panels' tongues and/or grooves for coverings, especially floor coverings, using polymer-chemical processes is for the individual components of a two-component adhesive system to be applied into or onto the form -fitting elements in a form in which their adhesive, setting and hardening properties are not realized prior to the joining of the panels during installation of the coverings that are the subject of this invention. Only during the joining process itself are the said components activated, the actual adhesive generated and finally, the adhesive set and hardened, forming a mechanically stable adhesive connection.

There is thus an advantageous variant of the invention in applying the two individual components, which together ultimately constitute the active bonding agent, in their inert form into or onto the form-fitting element and/or opposing form-fitting elements, in other words, into the grooves and/or onto the tongues of the panels.

Another variant could be the introduction or application of only one of the two components during the manufacture of the panels and the application of the other component at the installation site just prior to installation and joining of the panels to a planar cover. Especially favored is this type of adhesive precursor coating of at least one of the mold-clamping elements with a so-called hardening lacquer, i.e. with a painted-on film consisting of or containing the hardening component of a two-component adhesive, while the resin component, for example, can be applied just before installation to the hardening lacquer or onto a mold-clamping element that comes into contact with the hardening lacquer during joining.

The following remarks must be added to the palette of adhesives mentioned: Acrylate adhesives are adhesives based on acrylic monomers, in particular on acrylic and methacrylic acid esters. Acrylate adhesives in the more narrow sense consist of (meth-) acrylic monomers, a polymer that functions as a thickening and elastification agent, and an initiator that triggers its polymerization, preferably an oxidation-reduction initiator; they are used as two-component adhesives in combination with an activator. Today, less volatile and odorous (meth-) acrylates such as oligomer polyurethane dimethacrylates are used in place of methylmethacrylate, which is especially favorable when applying these resin components prior to installation for work safety reasons.

Adhesive components of the acrylate adhesives can also be polymers based on ethyl and/or butyl acrylates, whose properties, e.g. hardness and elasticity, can be specifically adjusted by also using suitable co-monomers, e.g. methacrylates, during polymerization and which contain additional functional groups, such as carboxy and hydroxy groups, to improve the adhesive properties; they have wide areas of application, for example as solutions or dispersions, but also as pressure-sensitive adhesives. Adhesive bonds made with acrylate adhesives are characterized by high mechanical strength properties.

According to a variant that is expensive and thus an option in particular for higher-quality coverings, the coating or layer of the mold-clamping elements of the panels of new (floor) coverings is formed with an adhesive, a comparable glue or a similar product encapsulated in microspheres or the like but in a state as to be immediately, permanently sticky. When the panels are joined, i.e. when the tongues are inserted into the grooves, the effect of the shearing action and pressure destroys or tears the mantle of the microcapsules, releasing the ready-to-stick glue.

Another advantageous type of micro-encapsulation of the adhesive layer applied to the groove and/or tongue of the panels is to provide one of the form-fitting elements with a coating in which one of the two components of the named two-component adhesive system is contained in micro-encapsulated form. Its (opposite) form-fitting element on the panel to be attached is coated with the other component of the named adhesive system, possibly also in micro-encapsulation.

When the panels are joined, the mantles of the microcapsules tear, allowing resins and hardening components to mix, whereby the adhesive converts to its finished form, adhesion is introduced and the adhesive sets and hardens.

There is also a provision for a coating with a two-component adhesive system based on microcapsules with only one component, e.g. the more sensitive one, contained in the microcapsules, while the other system component, preferably the less sensitive one, forms a matrix for the microcapsules of the first component.

Another method for sticking together the panels of the new floor coverings proved advantageous based on positive test results and experimental values. Here the grooves and/or tongues of the panels are covered or coated with a pressure-sensitive adhesive, specifically with a hot-melt pressure-sensitive adhesive. Pressure-sensitive adhesives are elastic-viscous adhesives that in solvent-free form remain permanently sticky and adhesive at room temperature and bond immediately under light pressure to nearly all substrates with a low substrate specificity. Basic polymers for modern pressure-sensitive adhesives are natural and synthetic rubbers, polyacrylates, polyester, polychloroprenes, polyisobutenes, polyvinyl ethers and polyurethanes, which are used in combination with supplements such as other resins, softeners and/or anti-oxidants. Pressure-sensitive adhesives are generally applied as solutions or dispersions into or onto the form-fitting elements.

Hot-melt pressure-sensitive adhesives, on the other hand, are applied as a melted gel. This can be in the form of a coating, layer, strand or by means of a hot spray application of the molten adhesive. Pressure-sensitive adhesives differ from so-called structural adhesives—that is, from chemically reacting adhesives, for example—in that they remain permanently sticky and bonding. Through mere pressure on the surface of the elements to be joined, these adhesives bring about a moistening of their surfaces, producing sufficient adhesion force. The critical parameters in the adhesion of the tongue-and-groove panels are the pressure and the applied amount of adhesive. The amount of adhesive to be applied should be given special attention here—which presents no problem in the context of the production of the panels—as an insufficient amount of adhesive will not provide sufficient moistening. If the amount of adhesive is too great, too large of a gap remains after the panels are joined, since the adhesive can not be displaced. This is a disadvantage, however, that is eliminated through factory application of the adhesive. Pressure-sensitive adhesives that are applied in a molten state, i.e. so-called hot-melt pressure-sensitive adhesives, have the advantage of also being applicable in a layer of sufficient thickness, avoiding the problem described above of insufficient thickness of the adhesive layer. Another advantage is that such adhesives can be dosed very precisely.

One more thing that should be noted for pressure-sensitive adhesives and hot-melt pressure-sensitive adhesives is that the mechanical strength and bonding properties that come about through pressure are somewhat lower those of, for example, chemically reacting adhesives but are more than sufficient for floor coverings.

A great advantage of hot-melt pressure-sensitive adhesives for a tongue-and-groove adhesion of the panels is that they maintain their tack even after long periods of storage, that is, they don't harden. Further advantages are their environmental friendliness, being water- and solvent-free; the small amount of space and investment required for the appropriate production facilities, and the relatively small energy consumption required for their production.

Finally, two commonly available hot-melt pressure-sensitive adhesives should be mentioned that are especially advantageous in particular for heavily used floor surfaces and that assure strong panel connections. The Dorus PS 534/5® hot-melt pressure-sensitive adhesive is a low-viscosity hot-melt pressure-sensitive adhesive with a relatively high softening point and excellent resistance to shearing for this type of adhesive. This adhesive can be specially stabilized for use in hot glue guns and small application devices, so as to prevent cracking at low consumption levels and high working temperatures. The recommended working and application temperature is between 140° and 170° C. For concrete gluing of wood product laminate-based panels, an application temperature of about 150° C has proven successful. The shelf life of tongue and/or groove adhesive coatings produced in this manner is at least one year under normal and dry storage conditions.

The viscosity of the other hot-melt pressure-sensitive adhesive, Dorus PS 576/6®, is lower than that of the aforementioned adhesive Dorus 534/5®. It possesses high free tack. The fusion point is about as high as for Dorus PS 534/5®. The working temperature and shelf life is also basically the same as for that of the hot-melt pressure-sensitive adhesive Dorus PS 534/5®. The shelf life of the latent adhesive coating produced with Dorus PS 576/6® is also at least one year. As has already been briefly mentioned, the problem with panels for all varieties of coverings that have already been factory-treated with an adhesive coating is for the adhesive to be deposited, applied, etc. in a form in which, after it is prepared, it will not change automatically or through external influences over long periods of time. The adhesive must, however, immediately convert to its ready-to-stick state when the panels are joined to the coverings, in particular floor coverings.

Extensive research has shown that ready-to-stick adhesives, glues, etc. for panel coverings do not need to be micro-encapsulated, as was described in detail above, but can also exist in the form of a somewhat tube-like integral strand deposited or applied on or in the panels' interlocking elements—"macro-encapsulated," if you will.

In a variant based on an especially preferred design of the invention's ready-to-install, ready-to-stick panel covering using the principle of an adhesive application, the applied adhesive in its ready-to-stick state is enclosed as a core strand within an endless tube mantle that surrounds and seals it. This mantle adheres right away when applied on the one hand into or onto the respective groove or tongue of the panel or on one of its surfaces or flanks.

Said adhesive mantle tube keeps external influences away from the adhesive substance that is envelops, thereby preventing its alteration. At the same time, however, the mantle tubing is so sensitive that it tears when the panels are joined, releasing the ready-to-stick adhesive that it kept fresh. The adhesive can now set and harden. The fragments of the torn mantle are so thin that they do not hinder the precise "jointless" assembly of the panels discussed above with extremely narrow, barely visible joints and seams.

With the aid of the adhesive mantles/core endless strands and their precise dimensioning as just outlined, the adhesive can be present in exact doses in its quantity per unit of length for the respective interlocking element, customized to the geometric proportions and tolerances of the respective tongue-and-groove connections. This ensures a high consistency of the adhesive application and will definitely prevent the unpleasant squeezing out of excess adhesive and the consequences thereof as described above.

The proper polymers and adhesives for the mantles of the innovative adhesive strands have the advantage of setting quickly after their extrusion, preventing any escape of the core adhesive during introduction or application of the integral adhesive strand. Polymers suited to this purpose should be compatible with the core adhesive. For example, they should draw little or no water from a core wood glue. They also shouldn't permit any further diffusion of water from the core adhesive to the exterior following the application process.

The "butyl adhesives," especially suited for heavy-duty floor coverings, are, as has been shown, capable of protecting the core adhesive over long periods of time—several weeks or months, for example—from "drying out." But polyurethane rubber-based adhesives are also an option for the mantle strand.

Figure 5 shows a preferred form of the cross-section of the mantle/core adhesive strand in the groove and/or on the tongue of the panel of the new ready-to-install, ready-to-stick floor coverings. An adhesive film coating of consistent thickness, particularly as provided in various other designs of the invention described above, is not present here.

One requirement of the polymers and adhesives for the described co-extrudate strand is, of course, that the skin forming their mantle be sealed against diffusion. Should the protective mantle be disturbed through blebs, contamination or damage, there would be a danger of local hardening of the core strand's glue. This would result in the entire tongue-and-groove geometry no longer joining properly, i.e. "jointless."

As far as regulating the skin thickness of the mantle strand, the mantle strand material itself should not be an obstacle to the aim of "jointless" assembly or to the pressing together of the panels. It must be capable of opening up the way for the core adhesive to reach the wood or wood product and it should not take up too great an area between the wood and glue. Changes in the geometry of the groove might provide a supporting role in this context.

As far as the viscosity of the mantle and core strand materials is concerned, the requisite simultaneous, consistent extrusion of the mantle and core polymer should be realizable with the lowest possible technical effort and in the consistent, desired quantitative proportion to each other. Viscosities that are too high lead to relatively high feed pressures; viscosities that are too low would negatively affect both the transport stability and the formation of the mantle skin and the core strand/overall strand during co-extrusion. An actual adjustment of the viscosities of both substrates to each other during the application process proved to be unnecessary.

As far as the feed pressure is concerned, it should be noted here that commonly available isobutene-isoprene rubbers or moisture cross-linking polyurethanes typically have high viscosities, so that feed pressures of up to 20 bar proved to be favorable for the co-extrusion of the adhesives. As regards the temperature differences between the core and mantle strand polymer materials when outputting the integral adhesive strand, it is of advantage if in the metering system each of the two components (if applicable) for mantle and core can be heated all the way until the co-extrusion It is also favorable if both adhesive polymers can be extruded at more or less the same temperature. Excessive temperature difference between the core and mantle strand when applying or introducing the integral strand would necessitate special precautions for thermal insulations and separate heaters.

As far as measuring or dimensioning of the adhesive strand is concerned, for example, it should be clearly specified that for laminate panels with groove widths of approximately 3 mm, the adhesive beads or strand diameter must be accommodated within this dimension. The manufacture of core mantle adhesive strands with diameters of at least 1.5 mm and strand mantle thicknesses of at least 0.15 mm has been shown to be cost-effective and present no technical challenge.

Particularly simple systems are tongue-and-groove click systems of a third type that have only an undercut groove that can be forced apart during assembly when a tongue with an enlarged edge from the adjacent panel penetrates it. The tongue enlargement snaps and locks into the undercut zone of the groove, resulting in a mechanical latching or hooking. Extensive tests have shown that the addition of an adhesive coating is especially helpful in enhancing the cohesion of the panels in such self-adhering snap-in systems. It is understandable (see the beginning of this section) that the installer cannot be expected to apply an adhesive to the interlocking elements during installation of coverings that use panels with side interlocking snap elements. For such superior and accordingly expensive panel systems, therefore, the present invention with the glue or adhesive applied during production is of particular value.

Among the adhesive systems described up to this point for panels with a prepared adhesive application, the preference, understandably enough, is for adhesives that do not require any application during installation of either an activator for a previously applied glue or the second component of a two-component adhesive onto the factory-applied coating of the first component.

As far as the application of the adhesive in or on the click-locking elements is concerned, all methods for applying adhesives are an option, including brushing, rolling, thin-layer pouring and the like. Care must be taken, however, that on the one hand the applied adhesive film is sufficient to withstand the shearing stress during the interlocking of click-lock elements and that its bonding is not lost on the panel substrate, while on the other hand, it should be applied in an even coating thickness of about only 0.3 mm, or better yet, 0.2 mm or less. Otherwise, the adhesive has too much inherent volume and thus takes up too much space, so that an interlocking and, more importantly, proper latching of the tongue and groove are no longer possible.

It is therefore particularly preferable not only for the clicking tongue-and-groove panels just described but also for panels with any other type of interlocking elements to apply the adhesive by spraying a molten hot-melt pressure-sensitive adhesive into or onto the groove and/or tongue. Spray application thicknesses of a maximum of 0.25 mm have proven successful for one-sided applications, i.e. application either in the groove or on the tongue only. In the case of two-sided applications to the groove and tongue surfaces, the thickness of the film must be reduced correspondingly, as interlocking is otherwise no longer possible without the use of force.

Coverings made of panels with a snap-in interlocking system could achieve up to twice the cohesion power between panels through application of an adhesive. The typical value was about +70%.

As already mentioned at the outset, another basic subject of the present invention is the interlock-friendly ready-to-install, ready-to-stick panels, plates, boards, slats, fillets, etc. for the formation of the coverings, paneling and the like already described. The aforementioned are equipped with the adhesive(s) in exactly the way described above in detail for the coverings constructed using them and for their preferred variants.

CLAIMS:

1. System for connecting together panel components which have interlocking tongue and groove connector elements along their opposed sides, said groove connector element including groove flanks which diverge away from a bottom of a groove and converge near a outer end of the groove at an angle greater than an angle of divergence, wherein a width of a groove's opening is greater than a protruding end of a tongue in said tongue connector element that is inserted first, wherein starting from said protruding end, the tongue has the same angle as wedge surfaces to that of said diverging groove flanks and undercuts whose outer edges adjacent to the wedge surfaces converge at the same angle as said converging groove flanks and whose inner edges end at a connector bridge adjacent to the tongue component, and wherein one of said groove in an area of its diverging flanks and said tongue in an area of its wedge surfaces has an adhesive applied to it, and the other of said groove in said area of its diverging flanks and said tongue in said area of its wedge surfaces has an activating substance applied to it and which activates said adhesive when the said area of the diverging flanks contacts the said area of the wedge surfaces.

2. System according to claim 1, wherein one of said groove flanks and said tongue wedge have a surface coating made of a latent adhesive material ready-to-stick after appropriate activation and the other of said groove flanks and said tongue wedge have a surface coating of an adhesion-inducing adhesive activator which has been applied or is to be applied just before connecting said panel components.

3. System according to claim 1, wherein said groove flanks have a surface coating of at least one of a stabilized adhesive or glue capable of reactivation upon contact with a solvent, and said tongue wedge has applied to it said solvent in order to reactivate said adhesive or glue.

4. System according to claim 1, wherein the flank surfaces of said groove has a coating of adhesive stabilized by dehydration but able to be reactivated through contact with water or water moisture, said adhesive comprising a polyvinyl acetate-based glue or a starch or protein based wood glue.

5. System according to claim 1, wherein at least one of the flank surfaces of said groove is coated with a first component comprising a not fully hardened resin component of a two-component polymerization adhesive; and at least one corresponding surface of said tongue wedge is coated with a second component, comprising a hardening component for said two-component adhesive; or vice versa.

6. System according to claim 1, wherein said surfaces of said groove flanks and said tongue wedge are coated with said adhesive and said activating substance during production of the panel components.

7. System according to claim 1, wherein one of the surfaces of said groove flanks and said tongue wedge has a coating of micro-encapsulated resin component of a two-component adhesive, and the other of said surfaces has a coating of micro-encapsulated hardening component of the said two-component adhesive.

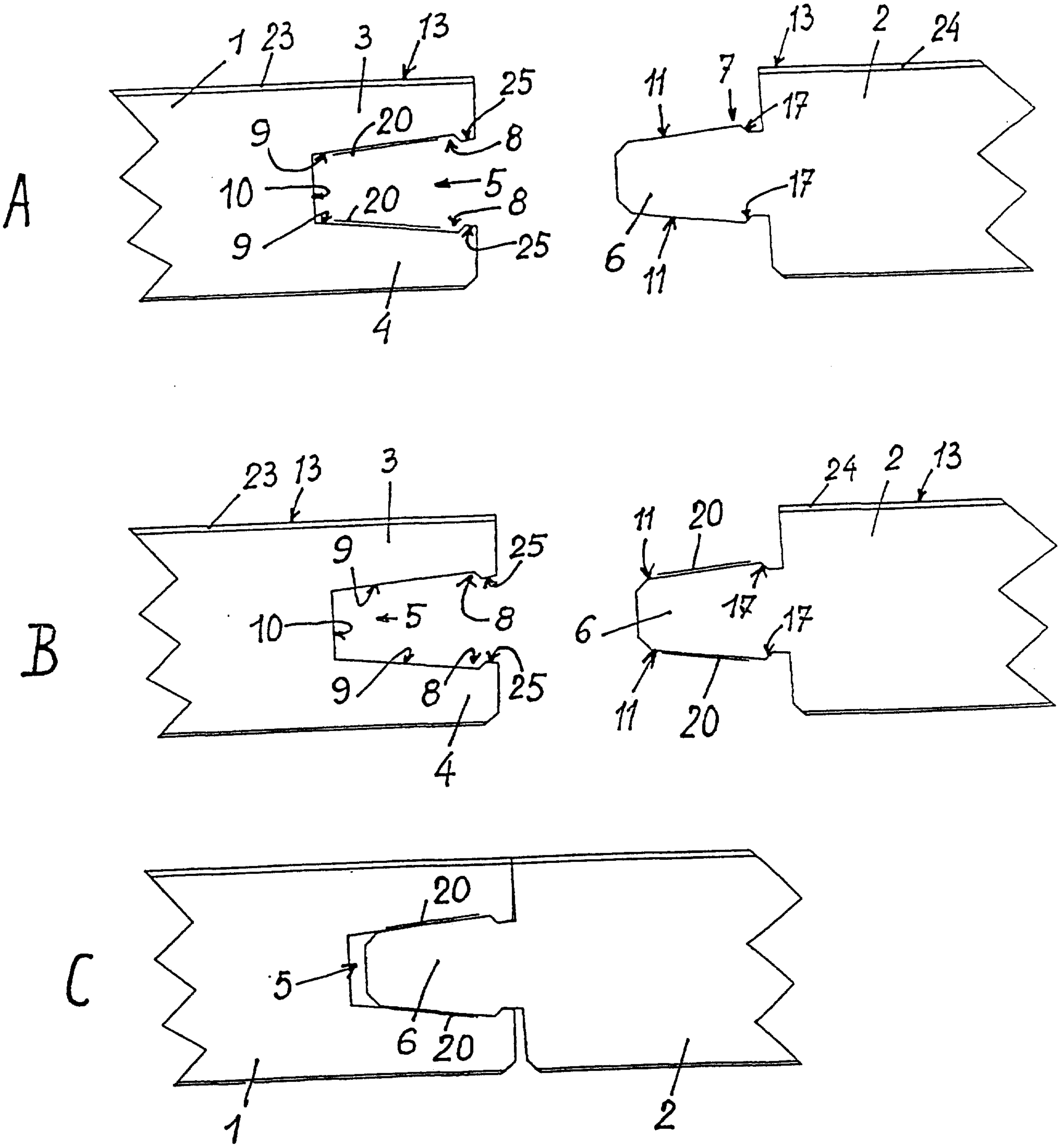
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Fig. 1

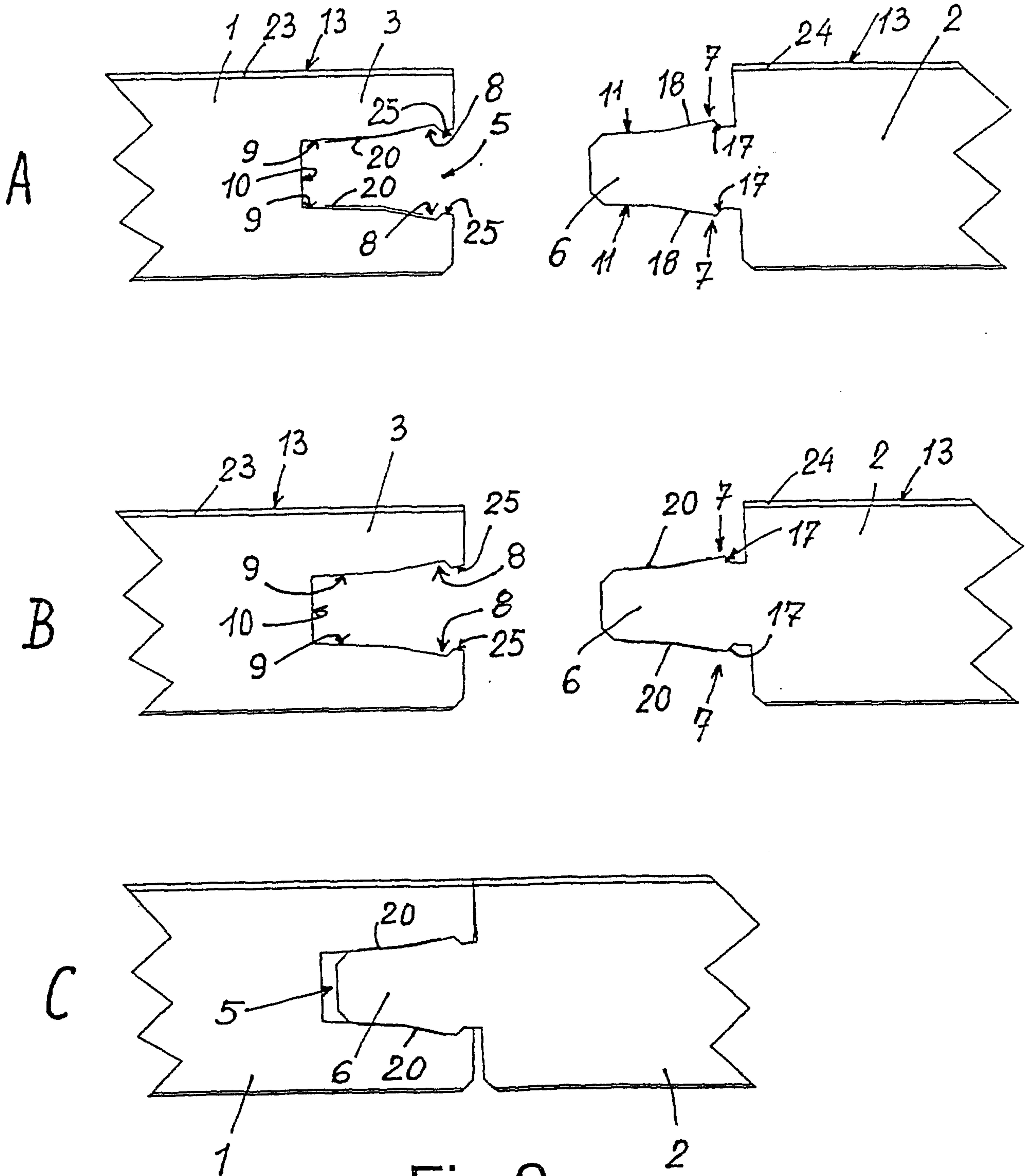
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Fig.2

Fig.3

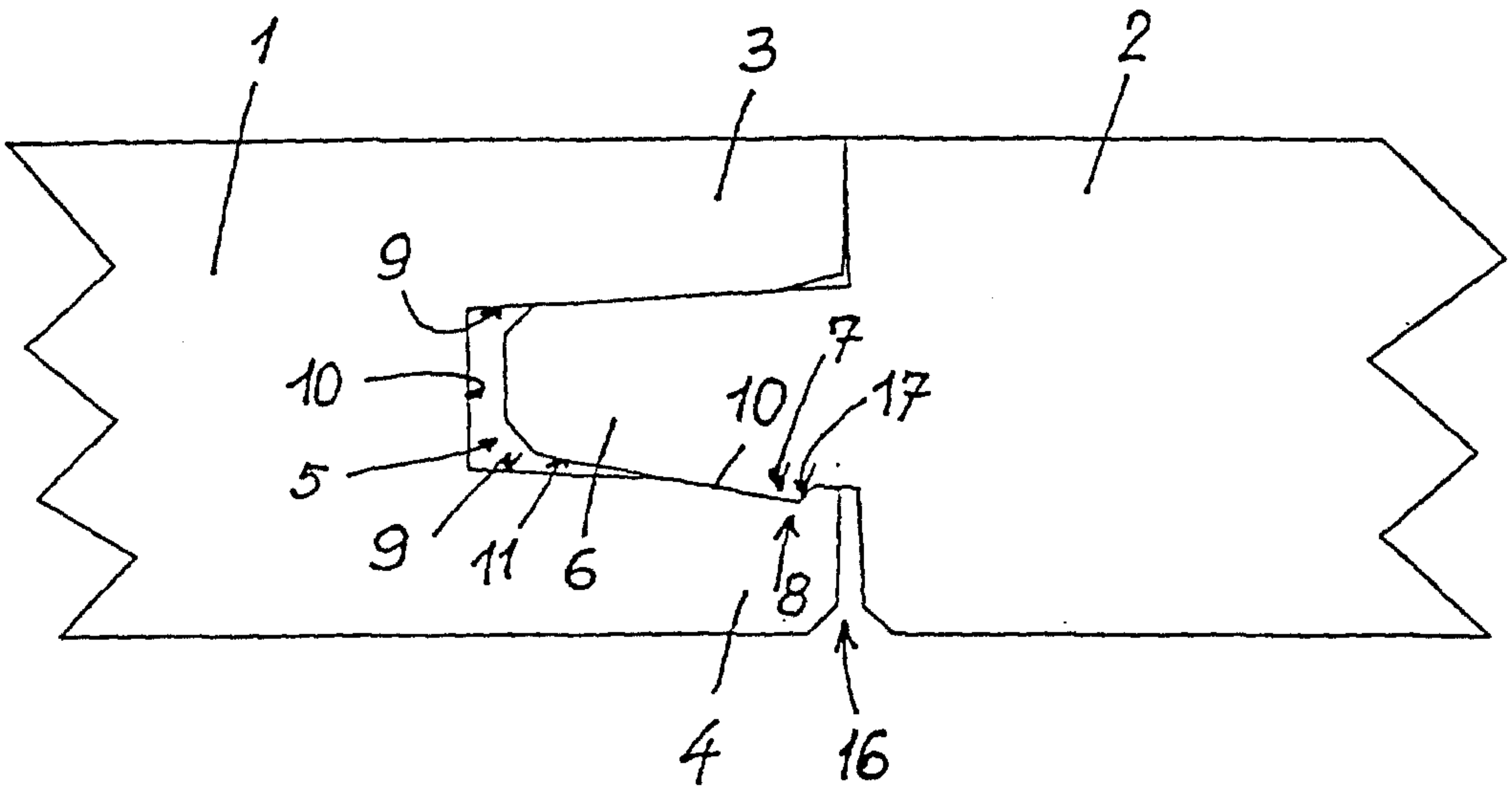
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Fig.4

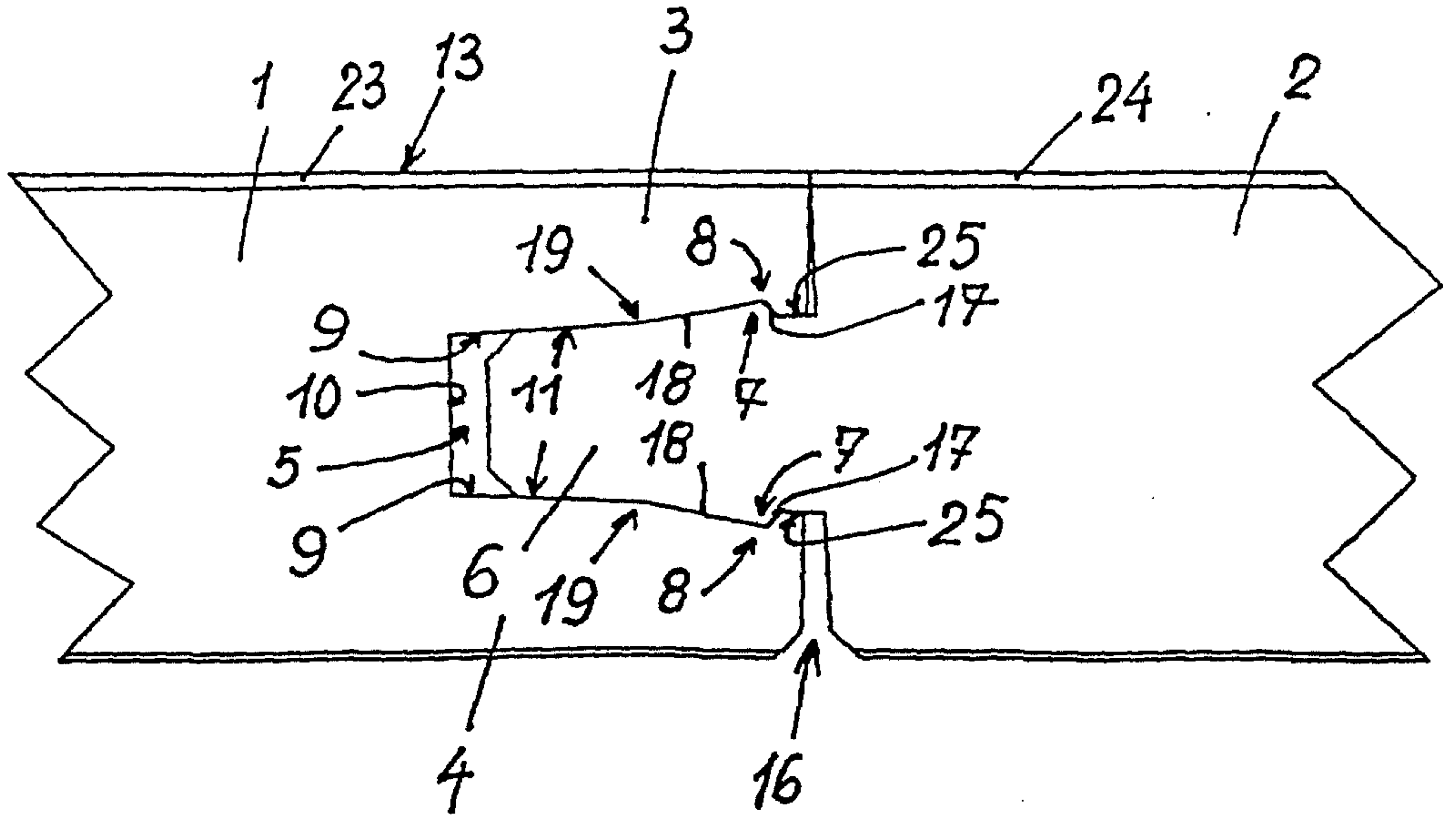
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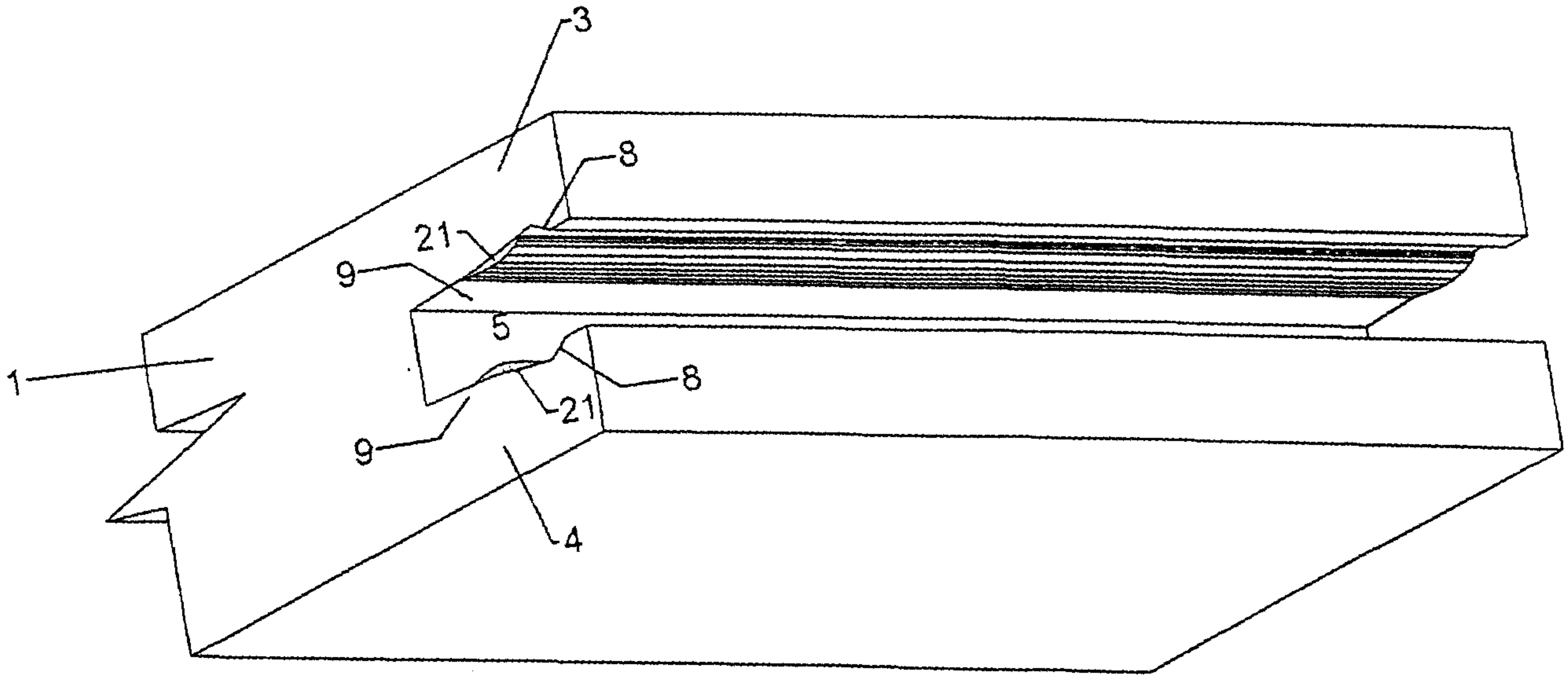
Fig. 5

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