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(72) Inventeur/Inventor:
RUHDORFER, HERBERT, AT

(73) Propriétaire/Owner:
KAINDL FLOORING GMBH, AT

(74) Agent: KIRBY EADES GALE BAKER

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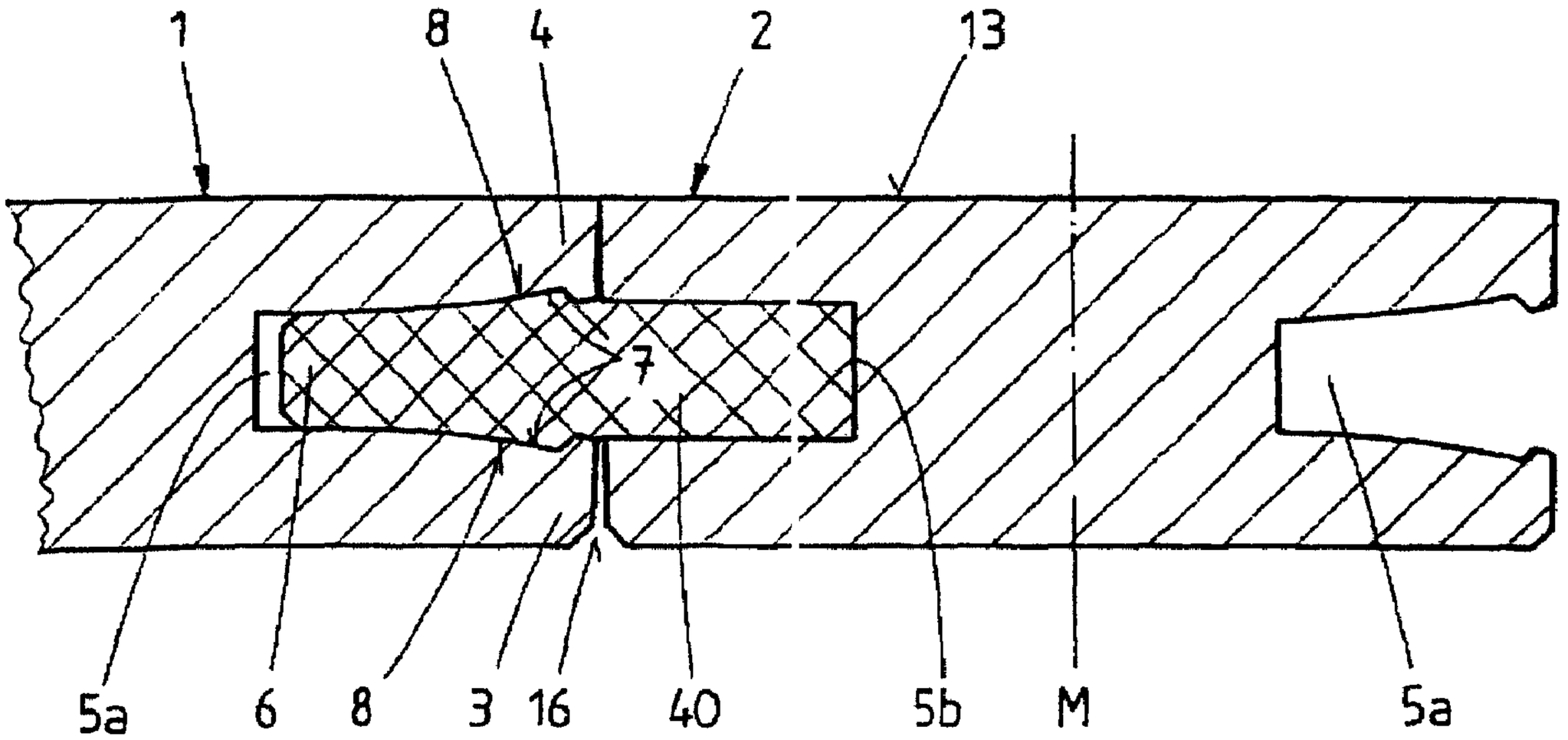

(57) Abrégé/Abstract:
An arrangement of parts that can be connected by means of connecting means, in particular connecting means that can be snapped together is provided. Due to the fact that, according to the invention, at least one of the two connecting means, in particular the tongue, consists of a different material than the respective part with which the connecting means, in particular the tongue, is non-detachably connected, it becomes possible to select optimum materials both for the structural elements and the connecting elements, in particular the tongues, independently from each other while taking the requirements and costs into account. The effort for production is reduced because only one groove and one tongue that are necessary for the detachable connection must be manufactured. In the working method, the part, in particular an MDF/HDF board, is at first milled out on its longitudinal and/or transversal sides and then provided with extrudates in the groove thus created or foamed out with extrudates in the groove thus created. Subsequently, the free ends of the extrudates are milled out so that they form tongue profiles. Alternatively or additionally, a groove can also be milled out of the extrudates.

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Arrangement of parts comprising connecting elements

Introduction to the Invention

The invention relates to an arrangement of parts comprising connecting elements.

Parts are understood to be, in particular, board-shaped parts, for instance panel boards, floor boards, covering boards, covering strips or the like, in particular for wall coverings, ceiling coverings or floor coverings of every kind of buildings. Such parts may be single-layer or multi-layer boards or strips which are made from derived timber products or are based on wood (laminates), in particular chipboards, MDF boards, HDF boards, OSB boards, fiberboard or boards made of plywood, that are coated on one or both outer surfaces, if necessary. The coating, the so-called wear layer, may be effected by means of plastic sheet, solid wood, veneer made of wood or plastic or paper, etc. A decorative paper, for instance with a solid-wood-look, is widespread in flooring panels that give the impression of a panel made of solid wood. Since floorings are subject to heavy strain during normal use, the surface of the decorative paper is sealed with a hard overlay that is, in particular, resistant to scratching and abrasion, and which is made, for instance, from alpha cellulose paper impregnated with resin whereby the surface is protected against scratching and denting. Thus, the invention is especially directed at flooring boards, so-called panels, which consist of derived timber products and which have relatively hard surfaces made of plastic laminates.

Background of the Invention

Embodiments of the present invention relate to the kind of design and manufacture of parts and connecting elements, in order to optimally keep the parts in position in the connected state but also to enable detaching the parts from each other if necessary.

Known arrangements of parts in the form of flooring panels have at their lateral edges grooves or tongues, in particular such tongues that can snap into the grooves. Such panels can be manufactured particularly economically since only the relatively soft middle layer of the panels that, in particular, consists of wood, must be specially processed in order to form the grooves and tongues that serve as locking elements, and not the relatively hard surfaces that consist of laminates. The middle layer is also called carrier layer or core. Therefore, in laminate floorings with a tongue that has been milled out of the middle layer, this mostly consists of chipboard, MDF, HDF, fiberboard, solid wood or plywood material. These materials have the disadvantage that the tongues, in particular, are relatively soft (as has already been explained above) and can therefore break off entirely or in part. A panel with, for instance, tongues that are squashed in places can only be introduced into the groove of another panels after the squashing has been treated prior to laying. This brings about extra work during laying and a decrease in strength of the connection between the two panels joined with each other.

The tongue that protrudes over at least one lateral edge of the panels is particularly vulnerable to damaging since it can knock against obstacles particularly hard, due to its small cross section and the large weight of the panel. This is true for manufacture, for transport and laying. The groove is also vulnerable because the panel has a reduced wall thickness in the area of the groove. The exterior walls of the groove may even be thinner than the cross section of the tongue.

Furthermore, damaged tongues or such tongues made of water-permeable or water-absorbing material make the tongue-and-groove-connection more permeable to water. Water spilt on the area of the joint thus penetrates more easily into the often liquid-absorbing middle layers (core) of the panels which therefore swells up and becomes unsightly. The moisture may also penetrate the tongue-and-groove-connection and may stay on the bottom of the panels over a long period of time. Here, the moisture cannot be seen or removed and in the long term can cause the secondary damage typical for moisture such as, for instance, mould, bacteria, efflorescence, wash-out.

EP 1 024 234 discloses such panels with a tongue-and-groove-connection, wherein locking means for engaging are provided at the grooves and tongues. Since the grooves and tongues, together with the locking means, are milled in one piece out of the core which consists of HDF or MDF, the strength properties of the grooves and the tongues are determined by the properties of the material of the panel's core. Thus, because the strength of the connecting means and locking means necessary for a secure connection is taken into account, the core of the panel is harder, stronger, heavier and more expensive than would be necessary, e.g. for a floor covering.

US 5,295,341 discloses panels in which the fastening means are connected in a strip-like manner with the edges of the panels, so that the materials for the panels and the connecting means can each be optimized. In order to be able to connect the connecting means with the panels, barb-like anchors are formed at the connecting strips which engage in undercuts in the panels. Such a geometry comprising undercuts is very complicated to produce.

WO-A-00/20706 and WO-A-00/20705 disclose flooring panels that can be connected with each other via separate connecting profiles by moving the lateral edges towards each other horizontally or by vertically lowering the lateral edges. Thus, the locking elements must interlock on both sides, i.e. with the lateral edges of two profiles that are to be interlocked. Thus, production complexity is increased because the separate connecting means must be attached on one lateral side of a profile in the factory. Otherwise, the amount of work for the person installing the panels on site increases because, immediately prior to the installation, he has to connect the connecting means with a panel on one side at first, and later, with the panel that is to be connected on the other side. Therefore, the connecting means on both sides are not firmly connected with the panel so that the risk of unlocking doubles, and the connection is less rigid and firm. In addition, more steps per connection must be executed, namely for two tongues and two grooves. One groove and one tongue normally suffice for the establishment of a connection.

Therefore, it is the object of the present invention to provide an improved arrangement of parts comprising connecting means which eliminates the above-mentioned disadvantages.

Summary of the Invention

In accordance with one aspect of the present invention there is provided arrangement of parts with parts, in particular panels, that can be detachably connected by means of connecting means, wherein at least one of the connecting means is non-detachably connected to the one part and can be detachably connected with the other part.

An arrangement of parts that can be connected by connecting means, in particular connecting means that can be snapped into each other, is provided by the invention.

Because at least one of the two connecting means, in particular the tongue, consists of a different material than the part with which the connecting means, in particular the tongue, is connected non-detachably, it becomes possible to select independently from each other materials for the components as well as for the connecting elements, in particular the tongues, that are optimal with respect to requirements and cost. The production complexity is reduced because only one groove and one tongue that are necessary for the detachable connection must be manufactured.

In order to be able to produce a connection without adhesives between flooring elements and other parts, the relevant carrier materials, i.e. parts, of the state of the art had to have high mechanical strengths because so far, the corresponding positive and frictional connections had been manufactured from the carrier materials. Known panels are formed in one piece with the tongue or the groove, whereas in the invention, there is a design in two parts. Therefore, it is now possible to form the middle layer of the panels particularly cheap or light as regards weight by unit area, for instance by using the materials already

mentioned. In contrast, the connecting means having tongues and/or grooves can be manufactured from strong or heavy materials because this is only a marginal influence on the total weight of the arrangement of panels. The connecting means can,

for example, consist of PVC, plastics or the like, which are harder than the core of the panels and are manufactured on a special milling machine (e.g. pencil milling machine). In this manner, the particularly heavy and/or sturdy material is only processed in the area where needed while the core of the panel consists of light and much cheaper material. The weight of the panel is an essential economic factor because it has an influence on transport costs and on the price of the product as well as on the acceptance by the consumer. Thus, there is a great potential for saving costs in providing only the positively or frictionally fitting part with high mechanic strength.

If at least one of the connecting means, for instance, in the form of a groove or tongue consisting of a different material than the respective component, is connected non-detachably with the respectively associated part, mistakes during assembly are avoided. For instance, the connecting means cannot slip or shift along the longitudinal side, and liquid that gets into the joint between two parts is prevented from penetrating deeper into the part or underneath the part and cause further damage there.

Such a non-detachable connection can, in particular, be accomplished by positive fit. Such a connection can be manufactured particularly economically and is very strong if the connecting means are brought into contact with the respective part in a liquid or soft state. The liquid connecting means penetrates openings and pores of the part so that a connection by positive fit is present. A similar strength can also be accomplished by gluing.

The positive fit is brought about particularly effectively if the connecting means which is still liquid or soft is introduced into grooves with or without undercuts of the part, in particular along the end faces or long sides of a board-shaped part. Grooves without undercuts are particularly easy and fast to manufacture, for example, coming from the end face over the entire length of the end face. Grooves with undercuts are more complicated to manufacture but retain the connecting means introduced into them particularly strongly.

The inner contour of the grooves also can be shaped in any other way, for example, by milling, breaking or more inexact methods. In this way, processing becomes simpler, cheaper and faster, and the strength of the fit is increased. Therefore, particularly exact processing tools can be done without.

If the grooves that are provided for the detachable connection with the connecting means are formed with unequal legs, i.e. protrudingly, this results in a simpler assembly. For such a leg protruding on the underside of a part may serve as a guide when moving the parts towards each other.

If the grooves that are provided for the non-detachable connection with the connecting means are formed with unequal legs, i.e. protrudingly, this results in a higher stress capacity of the connecting means in the direction of the protruding leg. Such a leg protruding on the underside of a part can, for instance, absorb the stresses occurring when the part is stepped on.

This can be done particularly economically when the connecting means is manufactured from extrudate, wherein said extrudate, during the exit from the extruder, can be brought in contact with the part in the still-soft state in order to bond with it.

Usually, extrudates are shaped parts manufactured by means of an extruder. While such shaped parts usually harden in their final form at first, before they are connected to other parts, it is advantageously intended to connect them with the part in the still soft or liquid state. It is not necessary in this case that the extruder has a specific profile. It is much more important that the liquid or soft extrudate is introduced into the groove of the part and connects with it by filling. If the end face, i.e. the longitudinal or transversal side, of the part into which the groove has been inserted lies horizontally, the extrudate can flow downwards into the groove during which an excess of material accumulates at the end face without forming an exactly defined profile. Rather, this is the task for the subsequent process step. Therefore, a device from which a material that has not yet completely hardened can egress in a controlled manner, without the extruder giving it a concrete shape, can also serve as an extruder within the sense of the invention.

Advantageously, however, the form is adapted to the final form so that less material has to be removed during the fina process stage.

A connection is detachable within the sense of the invention if, on the one hand, it is strong enough so that it cannot be detached inadvertently and, on the other hand, it can be detached without any damage if necessary. With respect to flooring panels, this means that panels that are installed and connected with each other will not come loose unintentionally during use, i.e. stepping on the floor and shifting loads on the floor. However, the connection is to be easily detachable if necessary, for instance in the case of mistakes during laying, repairs and dismantling, for example by the two parts being moved away from each other or pulled apart in the plane they span. Supportingly or alternatively, a detachable locking is also understood to be such a locking in which the individual parts can be detached if necessary by twisting or tilting.

A particularly strong and cheap connection can be carried out if the connecting means have the ability to foam up and thus fill up the groove which is intended to be filled (filling groove) of the part completely, whereby the contact area between the connecting means and the filling groove increases.

The introduction of the extrudate into the filling groove therefore takes place in one process step together with the manufacture of the floor, making it possible to save costs.

The connecting means which is connected non-detachably with the part furthermore has the advantage that the connecting means cannot slip and have their final position during the final processing, for example the milling out of a groove or tongue. Thus, the groove or tongue is formed more exactly and fits more accurately. In this manner, the parts can be connected with each other more easily, strongly and securely. This is not the case when using a finished tongue which is subsequently firmly connected with the part.

A snapping-in is existent when a positive-fit connection is established by means of elastic parts that yield during connection, for instance, the spreading legs of the groove, or a compressible tongue. So-called snap-in connections can be established particularly easily and securely by the user, and also particularly exactly.

As long as the maximum thickness of the connecting means is smaller than the thickness of the panels, the connecting means are not noticed and do not interfere with the appearance. The connecting means can be manufactured economically in terms of material processed when their maximum thickness is equal to the maximum thickness of the tongues.

When the end faces of two adjoining panels abut in the area of the top side, for instance in the area of the decorative paper or the overlay, the ingress of dirt and moisture into the core is impeded.

The plane undersurface of the panels has a positive effect upon the appearance, can be manufactured more easily than a contoured undersurface and insulates footfall noise because cavities are avoided.

Coated top and undersides render the surface more resistant against scratching, denting, moisture and provide an appealing appearance.

Grooves and tongues with locking elements in the shape of recesses or depressions that can be snapped in, and which extend over the entire length of the groove and tongue, make a particularly simple and economic manufacture possible. The joining or separcting of connecting means that are formed thus takes place with little stress on the material, quickly and reliably, although it is secured that the panels are optimally held in position relative to each other in a connected state

If the locking means are already glued to or connected with the panels in the factory, nothing changes with regard to the installation of the panels as compared to the installation of known tongue-and-groove-panels. By joining the parts formed according to the invention, a strong and stable but

detachable connection is established that copes with all stresses that occur and which connects the part with each other within a stable position.

It is advantageous that the groove is made, in particular milled, out of the part directly, which facilitates the manufacture of such panels. This is true especially for parts that have legs of equal length and can therefore be manufactured in one step by means of a symmetric milling head. The two legs of the groove are essentially of equal length except for slight differences in length that arise from the fact that it could be intended that the parts lie close to each other in the area that is close to the surface, and are arranged at a distance from each other, forming a small gap, in the areas close to the floor. This a secure abutting of the two top sides of the panels even when the subsurface is uneven to a certain degree.

Subsequently, the person installing must only push the elements together in the same way as before; there is no change of the product discernible to him. He only profits from the improved properties of the material of the connecting elements, of which only the tongue protruding over the panels or the interior of the groove is visible. Panels that have been thus manufactured may also be combined with existing panels having tongues or grooves that have been milled out of one piece with the core, resulting in a certain downward compatibility of the product according to the invention with known products. Thus, new areas of application are opened up and the system is more flexibly applicable.

The breadth of the groove which increases from the inside towards the outside, and the thickness of the tongue which decreases in the direction of its free end, are made to match each other, so that in parts connected with each other, the surfaces of the grooves and tongues fit snugly, i.e. positively. Thus, the parts are being held in a defined mutual position.

A contribution towards the detachable connection is the fact that the surface that is close to the part, of the protrusion formed on the tongue, and the surface that is close to the opening of the groove, of the depressions formed on the groove run obliquely or inclinedly, respectively, towards the part or opening of the groove, respectively, so that an

extraction of the tongue from the groove is possible. The introduction and extraction becomes possible because at least one of the legs of the groove can be elastically widened or moved away relative to the other leg; in particular, as regards strength of the material, the two legs of the groove are formed such that an elastic bending towards the outside is possible in order to make it possible for the tongue to penetrate into the groove, wherein the at least one protrusion formed on the tongue is able to overcome the inner edges located at the opening of the groove, precisely by slipping along the inner edges and thus pushing apart the legs of the groove.

The locking elements provided for the connection of the parts in a stable position which are formed by protrusions and depressions that are made to match each other, are provided at the groove and at the tongue. These locking elements can be provided in sections on the groove and the tongue; however, a better purchase and simplified manufacture are achieved if these locking elements extend over the entire length of the grooves and tongues provided.

One embodiment of the arrangement according to the invention is particularly advantageous in which corresponding protrusions on both sides of the tongue and corresponding depressions on both surfaces of the groove are formed because in this way, a doubled engaging effect can be achieved and thus a firm cohesion is accomplished.

The breadth of the parts can be freely selected. Parts of equal breadth or parts of different breadth can be connected with each other, for example, to achieve a particular design of the floor.

It is advantageous for pushing the parts into each other or detaching them from each other, if one proceeds according to an embodiment of the present invention.

A cross section of a tongue with at least one protrusion located thereon and at least one correspondingly formed depression in the groove makes a good

slip possible of the surfaces of the tongue, and/or of the protrusion supported on the tongue along the surfaces of the groove, and/or of the surfaces of the grooves directly adjoining the opening of the groove, when the tongue is introduced into the groove.

A further embodiment of the present invention results in a firm engagement of the two parts to be connected.

It is particularly advantageous for the introduction of the tongue of the one part into the groove of the other part, as well as for detaching. Though in this method of proceeding, a higher resistance is put up against detaching or extracting the tongue from the groove, compared to the resistance put up against an introduction of the tongue into the groove; however, the tongue is given a firm purchase in the groove, even though detaching this snap-in connection is easily possible.

Forming an elastically yielding, for instance slotted, tongue or of tongue sections is not necessary because the legs of the groove are sufficiently elastic to widen correspondingly during the introduction of the tongue.

A defined form of tongue and groove is provided in one embodiment of the present invention which can be easily manufactured and which makes it possible that the tongue and groove adjoin each other well.

An embodiment of the present invention defines the position of the tongue in the groove because the protrusion comes to lie exactly in the depression and thus, the protrusion and the depression or the surfaces of the tongue and the surfaces of the groove lie next to each other exactly and snugly and flatly.

A forming of the cross section of the triangular protrusion or of the protrusion of the tongue that is received by the depression in the groove according to an embodiment of the present invention facilitates pushing the tongue in to the groove or gives the tongue firm purchase in the groove and nevertheless makes

possible an extraction of the tongue from the groove with little stress on the material.

A further embodiment of the present invention is advantageous for the introduction of the tongue into the groove in order to avoid them becoming wedged. Furthermore, various features contribute, by the engaging of the protrusions of the tongue in the depressions of the groove, to the surfaces of the parts that are to be connected adjoining closely or being brought close to each other at the end faces and the formation of gaps being prevented.

In practice it became evident that further features of the present invention entail additional advantages, namely a gentle widening of the grooves during the pushing together, an automatic fixing of the panels when snapped together, and a very firm fit of the connection which is free of play when established. In addition, the manufacture of the groove and tongue is simplified and the transmission of force takes place with little stress on the material.

With respect to installation, it is easy, and, at the same time aesthetic as regards appearance if one proceeds according to the various embodiments of the present invention. In this manner, relatively broad, board-shaped parts that do not necessarily have to be oblong but can also be, e.g., rectangular or square, are held together by means of relatively narrow strip-shaped parts, resulting in a pleasing pattern as well as in a simple laying technique.

Advantageously, the following working method results for producing the arrangement of parts according to the invention. At first, the part, in particular a MDF/HDF board, is milled out at the longitudinal and/or

transversal sides, and then provided with extrudates or filled with foam in the grooves thus created. Subsequently, the free ends of the extrudates are milled out so that they form tongue profiles. Alternatively, however, a groove can also be milled out of the extrudates.

A corresponding profiling can also be carried out already during the extrusion process of a quickly hardening extrudate, whereby time and material and money are saved. Profiling can take place by reshaping or cutting. Therefore, a corresponding one-step method can be realized in addition to the working method described.

The use of plastics as extrudate is preferrec because this can be milled in the most exact manner.

The advantage of the invention compared to the state of the art consists, among other things, of the fact that the introduction of the extrudate can take place in one process step with the manufacture of the parts, that the profiles have a very firm purchase with the core material, that the profiles can be milled much more precisely, thus making them better lockable, that the extrudates are cheap materials, that an elastic property of the grooves and tongues is given independent of the material properties of the core material, and that one can dispense with sealing the connecting surfaces because the absorption of water and moisture is reduced or prevented by the extrudates or the plastic.

Potentials for saving material and its transport result if the milled-out material, i.e. the material that has been extracted from the board during the milling of the grooves, is mixed with other ingredients and can subsequently be injected back into the groove in order to mill the groove and/or tongue with sharp edges out of it. Therefore, the wood material need not be procured and transported. Storing the waste products from milling as well as their disposal can be dispensed with.

According to the invention, it is furthermore intended that the extrudate can also extend up to the surface of one or both parts. Thus, with respect to mechanics and appearance, it forms an intermediate piece along the

edges of the parts. Thus, it performs a double function, namely, it serves as a connecting means and furthermore, it performs aesthetic, protective and stabilizing functions, whereby, within the sense of the patent, the extrudate does not necessarily also have to serve as a connecting means.

When the extrudate forms the end face of the parts this edge can be processed more exactly and precisely, resulting in a more exact fit. This prevents an inadvertent release of the connection and the ingress of dirt into the connection. In addition, the joint becomes less visible. Normally, the edges of derive timber products are provided with upwardly directed cracks in the area of the surface that is vulnerable to impacts. But such upwardly directed cracks also arise during the processing of the edges and are easily seen along the edges in back lighting, particularly in laid panels. The extrudate which, according to the invention, extends up to the surface is able to avoid or cover these edges.

If the extrudate is waterproof, the part which, as a rule, is moisture absorbing, is protected against soaking up water. As is known, moisture leads to swelling, making the part unsightly. An impregnation of the edges which is otherwise common practice for this reason becomes superfluous.

The extrudate working as an intermediary part can be manufactured from many different materials, and in many different structures and colors. In particular if they are dyed, such intermediary parts therefore form particularly decorative elements and influence the appearance so that it can range from classy to rustic.

The extrudated intermediary parts can be milled in any way, even if they are part of the tongues or grooves. Thus, edges and elements can also be given any profile. For instance, depressions and/or elevations can milled at the joints. Depressions and/or elevations can camouflage differences in height between individual surfaces of the parts and /or upwardly directed cracks. For example, a V-joint thus produced makes for particularly rustic highlights. In contrast, metal-colored intermediary parts appear classy and create the impression of elaborately bordered timber planks. Because the extrudate is first connected with the part and then the processing of the extrudate takes

place, the accuracy of the fit is increased as well as the strength of the connection, and water cannot penetrate into the part due to the excellent border seal.

Brief Description of the Drawings

In the following, the invention is explained more closely by means of the drawings, wherein

Fig. 1 shows an MDF/HDF board in the area of the longitudinal or transversal side in cross section before being provided with extrudate,

Fig. 2 shows the board from Fig. 1 after being provided with extrudate,

Fig. 3 shows the board from Fig. 2 after the processing of the extrudate that is connected with the board,

Fig. 4 shows two parts connected according to the invention in a first embodiment,

Fig. 5 shows a detailed view for explaining the profile of a tongue that is suitable for snapping-in,

Fig. 6 shows the profile of a tongue in an asymmetric design,

Fig. 7 shows two parts connected according to the invention in a second embodiment, and

Fig. 8 shows an MDF/HDF board in the area of the longitudinal or transversal side in cross section before being provided with extrudate with a different design of the groove.

Detailed Description of the Drawings

Fig. 1 shows the left free end of an MDF/HDF board in the area of a longitudinal or transversal side in cross section. The left end face 42 of the board 2 has a groove 5b that, for example, has been produced by milling. The inner surfaces of the groove 5b are therefore formed by the two legs 3 and 4 of equal length, as well as by the bottom of the groove 11.

Fig. 2 shows the board from Fig. 1 after the extrudate 40 has been introduced into the groove 5b. The extrudate 14 was introduced into the

groove in a liquid or soft state and fills it completely, i.e. up to the bottom of the groove 11. Via the legs 3,4 and the bottom of the groove, the extrudate is firmly connected to the board because the extrudate has penetrated the pores of the board or has filled up irregularities within the groove. The extrudate may also be such that it has the property of foaming up. If the extrudate is particularly flowable it should be introduced from above into the upright groove 5b. This corresponds to a Fig. 3 that has been rotated by 90° to the right. An excess of extrudate remains on the end face 42 which forms a projection 41. In Fig. 3, a tongue 6 has been formed from the excess of extrudate 40 which forms the projection 41 by means of suitable methods, e.g. milling, which tongue comprises, for example, the locking means 7 for connecting a correspondingly formed groove 5a (not shown).

The method of proceeding shown in Figs. 1 to 3 for forming a tongue is exemplary. It is possible by employing the same process steps to introduce extrudate into the groove 5b and subsequently work an inner groove into this extrudate for connection with a tongue. According to the invention, the following possibilities result: forming only the tongue from foreign material, forming only the groove from foreign material, and forming the groove and the tongue from foreign material.

Fig. 8 shows additionally that the inner contour of the groove 5b can also be formed in any way, for example by milling, breaking or more inexact methods than milling. The filling 40 therefore lines up particularly well to the inner contour of the groove 5b which increases the strength of the connection.

Fig. 4 shows two board-shaped parts 1, 2, for instance panels, that are connected to each other, wherein grooves 5a and 5b are formed in each part. The groove 5b of the right-hand pane 1 is connected firmly with the extrudate 40 shaped as a tongue 6, wherein the extrudate 40 fills out completely the groove 5b. In the embodiment from Fig. 4, the extrudate 40 is connected in a positive fit with the interior of the groove 5b of the right-hand panel 1, for example, by gluing or filling in the still-warm extrudate. In the embodiment, the free end 6 of the extrudate 40 has been processed by

milling so that it establishes a positive-fit connection with the correspondingly formed groove 5a of the adjoining left-hand panel 2. According to the invention, however, a frictional, detachable connection (not shown) of the end of the extrudate which makes up the tongue 6 with the panel 2 may be provided. The parts 1, 2 adjoin with their end faces in an area close to the wear surface (e.g. flooring surface) and, towards the side of the floor, form a gap 16.

In Fig. 4, an embodiment of the invention is shown in which each of the individual parts 1, 2 is provided with grooves 5a and 5b at its two facing end faces or at all its four end faces. Thus, the parts 1, 2 are built symmetrically relative to their schematically shown middle plane.

The formation of the grooves 5a and 5b as well as of the tongue 6 of the connecting means 40 takes place in the same manner described in connection with Figs. 5 and 6 or in the following description. As can be seen from Fig. 4, the protrusions 7 and depressions 8 that are engaged with each other and serve as locking elements are made to fit each other and correspond, as regards their cross sections, to the protrusions 7 and depressions 8 from Figs. 5 and 6. However, it is possible in principle to choose other similar shapes for the cross sections for the locking elements 7, 8 or to select other angles of inclination than shown of the surfaces of groove and tongue relative to the surface 3 of the parts 1, 2. The elasticity of the legs 3, 4 is important in order to ensure the engagement of the locking means 7, 8, i.e. the desired snapping-in.

If it is necessary or desired, from a technical standpoint, the locking elements 7, 8 can also engage if the legs 3, 4 of the left-hand panel 1 are not elastically designed. The groove 5a of the left-hand panel 1 may, for example, have been manufactured from extrudate or the like in the same way as the tongue 6, i.e. by filling up or forming up of a groove with a suitable, preferably elastic material and subsequent milling of the groove geometry into the material that was introduced into the original groove 5a. In this case, it is not necessary that the legs 3, 4 of the panel, i.e. the core material, yield elastically, which gives the connection a better appearance and makes it harder for dirt and water to ingress the connection.

It is also conceivable that the free end, i.e the tongue 6 of the extrudate 40, is provided with a gap in such a manner that the top side and the bottom side of the tongue 6 can be brought together from the outside by pressure, whereby a snap-in connection with the groove 5a can also be realized, that is, the locking means 8 and 7 can engage.

The relatively broad parts 1, 2 that are shown compressed in their breadth in Fig. 4 have dovetail-shaped grooves 5a on one of their facing end faces, in particular at two end faces that are perpendicular relative to each other.

Figs. 5 and 6 serve the illustration of the profile of tongue 6. They are to be understood as details of Fig. 4, with only the free end of the tongue 6 being shown in Fig. 6.

As can be seen in Fig. 5, the parts 1, 2 which, in particular, consist of wood or plastic, can be provided with coatings 23, 24 in order to attain the appropriate values for the surfaces or an appropriate appearance.

Locking elements 7, 8 that are made to fit each other are provided on the tongue 6, and/or the surfaces 10 of the tongue and in the groove 5a, and/or in the surfaces of the groove, and/or the side surfaces 9 of the groove 5a. These locking elements are formed by the protrusions 7 and depressions 8 that cooperate or are engageable. The shapes of the cross sections of the depressions 8 and associated protrusions 7 correspond to each other so that the locking elements engage each other snugly, i.e. they establish a snap-in connection in a positive fit.

In an assembled state of the parts 1, 2, the locking elements 7, 8 engage each other. In particular, the locking elements 7, 8 are formed over the entire length of the longitudinal and/or narrow sides of the parts.

In Fig. 6, a protrusion is formed only on the bottom surface 10 of the tongue which protrusion is received by a depression 8 in the surface 9 of the groove adjoining this surface 10 of the tongue. During the introduction of the tongue 6 into the groove 5, the two legs 3, 4 of the groove 5 are pushed

apart elastically; an elastic spreading of the legs 3, 4 of the groove takes place also during the extraction of the tongue 6 from the groove 5.

In the embodiment of the invention shown in Fig. 6 a protrusion 7 is formed only on one side of the tongue 6. The protrusion 7 is formed so that the surface 10 of the tongue runs levelly from the front free end area of the tongue 6 up to a sharp bend located at the thickest part of the tongue which leads into a rear short surface 17 which in turn leads into a surface 31 leading towards the part 2. Only a partial area 30 of the surface 10 of the tongue is received in the depression 8 in the surface 9 of the groove; this partial area of the surface of the tongue, however, adjoins the surface 18' snugly within the depression; the rear shorter surface 17 also adjoins snugly the surface 17' of the depression 8 that is located in the direction of the opening of the groove.

The surface 10 of the groove or its partial area 30 is inclined at an angle α relative to the surface 13 of the two parts 1, 2; the rear shorter section of the surface 17 is inclined at an angle β relative to the surface 13 of the two parts 1, 2. The same is true for the two surfaces 17' and 18' of the depression 8 in the leg 3 of the groove. The area of the surface 9 of the groove that lies outside of the depression 8 of the leg 3 of the groove, or is near the bottom of the groove, is inclined at an angle γ relative to the surface 13 of the two parts. That surface 10 of the tongue 6 that does not have a protrusion and adjoins snugly the surface 9 of the groove that faces it, is inclined at the same angle γ.

It can be expedient for forming a defined mutually-influenced position of the locked parts 1, 2 if the angle α to the wear surface or surface 13 of the longer side 18 of the triangle of the protrusion 7 on the tongue 6 corresponds to the angle or the inclination, in particular in its front area, of the surface 10 of the tongue, which in its front area runs at a distance from the surface 9 of the groove. The surface 10 of the tongue that is free of locking elements, for a large part of its length adjoins the inner surface 9 of the groove and, seen from the bottom 11 of the groove, the two surfaces approach the surface or wear surface 13 of the two parts 1, 2 at an angle γ.

For practical application it is advantageous if the depression or the groove is provided in the surfaces of the grooves or tongues that are close to the surface. It is particularly advantageous if corresponding locking elements are provided in both surfaces of the tongues and in both surfaces of the grooves. The connection then centers automatically, which makes installation easier, and is self-locking in the final position.

From Fig. 6, one can see that the legs of the groove 3, 4 are spread during the introduction of the tongue 6 into the groove 5, i.e. they are pushed apart, in particular, the surface 25' which is close to the groove and the surface 10 of the tongue, in particular its area 30, slip on each other so that a widening of the legs 3, 4 of the grooves is accomplished without damaging them. During the extraction of the tongue 6 from the groove 5 a spreading of the legs 3, 4 of the groove is accomplished by the surfaces 17 and 17' slipping on each other.

A particularly advantageous embodiment of the invention is shown in Fig. 5, in which the groove 5 and the tongue 6 are advantageously formed symmetrically relative to a middle plane M' that is perpendicular relative to the plane of the drawing and runs through the parts 1, 2.

The cross section of the protrusion 7 or of the depression 8 according to Fig. 5 is triangular in shape, wherein the sides 17, 17' of the triangle that are closer to the opening of the groove are shorter and more steeply inclined than the sides 18, 18' of the triangle that are closer to the bottom 11 of the groove. During the introduction of the tongue 6 into the groove 5a, the longer side 18 of the protrusion 7 glides on the inner edge or on a bevel 25', formed in this area, of the leg 3 of the groove, until the protrusion 7 has overcome the surface 25' of the inner edge and is received by the depression 8. In this manner, a locking of the parts is effected by snapping together.

In the advantageous embodiment according to Fig. 5, it is intended that, at the two facing surfaces 10 of the tongues, protrusions 7 or depressions 8 are located, in particular symmetrically, and on the two adjoining surfaces 9 of the grooves, protrusions and depressions fitting these protrusions 7 or

depressions 8 are formed; or that groove 5a and tongue 6 are formed in the shape of a dovetail and so that they fit each other. This embodiment makes a double locking of the two parts 1, 2 possible, whereby such a lock is also easily detachable by pushing or pulling apart the two parts 1, 2 in the plane that is spanned by them. The widening of the legs 3, 4 can also be aided by twisting the parts relative to each.

In this embodiment, the longer side 18 of the triangle or the surface of the protrusion 7 formed by that side leads into the front area of the surface 10 of the tongue while forming a sharp bend 19; the area of the surface 9 of the groove that is close to the bottom of the groove and this front area of the surface 10 of the tongue, just like the protrusion 7 and the depression 8, adjoin each other snugly; in this manner, a very exact connection of the parts 1, 2 can be accomplished and, at the same time, it is ensured that the end faces of the parts 1, 2 adjoin under pressure or are brought closer to each other under pressure, so that a gap is avoided between the parts 1, 2 at the wear surface 13 or that a pulling apart of the parts 1, 2 during use is averted.

The area of the surfaces 9 of the groove that is close to the bottom of the groove and the area of the surfaces 10 of the tongues that is close to the free end of the tongue have the same angle of inclination γ. The angle α that is included by the surfaces 18 of the protrusion or the surfaces 18' of the depression and the surface 13 of the parts 1, 2, is larger than the angle γ. The area close to the opening of the groove of the surface 25' of the inner edge is also inclined at this angle α relative to the surface 13 of the two parts 1, 2.

The angle β at which the shorter sides 17, 17' are inclined is larger than the angle α and preferably includes an angle of 25° to 65° with the surface 13 of the parts 1, 2.

It is advantageous for connecting and detching if the sides 18, 18' of the triangle that are close to the bottom of the groove are four to eight times, preferably five to seven times, as long as the sides 17, 17' of the triangle that are distant from the bottom of the groove, and if the angle between

the two sides 17, 18 or 17', 18' of the triangle amounts to 100° to 140°, in particular 110° to 130°.

In order to facilitate introduction it is advantageous if the interior edges of the end of the tongue 6 are provided with bevels 12 and/or if the interior edge of the end of the groove's leg 4 that is free of engaging or locking elements is provided with a bevel 29.

With the manner of connection according to the invention, it becomes possible, and is intended, that the parts 1, 2 that are to be connected with each other lie in one plane with their undersurfaces 15.

In principle, several protrusions and/or depressions can be formed on one surface of a groove or tongue, whereby the self-locking property of the connection in the final position is increasec further.

Fig. 7 illustrates the parts 1, 2 in which, according to the invention, extrudate 40, 43 also extend up to their surface 13. Thus, as regards mechanics and appearance, it forms a V-shaped joint 43, 44 between the two end faces 42 of the parts along the edges of the parts. The intermediary parts 43, 44 serve as connecting means, protection and decoration. The right-hand intermediary part is non-detachably inserted into the groove 5b and at the same time makes up the tongue 6, while the left-hand intermediary part is only applied to the edge 42 of the left-hand part and only partially makes up the groove 5a, thus partially serving as a connecting means 17', 18'.

Because the extrudate makes up the end face of the parts 1, 2, this edge can be processed more exactly and precisely.

In the following, the manufacture of the part according to the invention is explained with the example of a floor covering. A chipboard of derived timber product, MDF/HDF or OSB of a customary production size, for example, 1,040 mm x 2,825 mm, is coated with decorative paper on its top side and with counteracting paper on the bottom side by means of a short

cycle press or throughfeed press. After coating, the large-format is divided into element size, for example 195 mm x 1,250 mm.

By means of milling machines, the parts thus obtained are now provided with a milled groove at their longitudinal and transversal sides. Then, the pre-milled parts arrive at an extrusion machine where extrudate is brought into the milled-out grooves. The extrusion machine may also work immediately behind the milling machine, so that the extrudate can be brought into the form directly behind the milling head.

In a final step, the panels that are equipped, according to the invention, at the end faces of the longitudinal and transversal sides, again arrive at the milling machine in order to form the desired shape of groove or tongue. This step can alternatively also be carried out immediately behind the milling head and/or the extruder.

In the same way, normal end faces without a groove can be provided with extrudate so that a process step can be dropped in the area of this end face.

It is particularly economical at first to provide all end faces with a groove that is suitable for the tongue to engage in. Only one tool is necessary for this, and it cannot happen that a wrong side is processed. The extrudate is now filled into the grooves at the end faces that later are to carry the tongues. Then, the extrudate is processed into tongues.

The invention is not limited to connecting elements in the form of grooves and tongues. Rather, the groove-and-tongue-connection serves as an example for a kind of connection that can optionally be realized frictionally or positively.

Claims

1. An arrangement of building elements having a flat surface comprising:

a) a plurality of building elements capable of separable connection to one another using a tongue, a first groove, and a connecting means;

b) wherein the tongue comprises a different material than the building elements;

c) wherein the tongue is inseparably connected to the connecting means; and

d) wherein the tongue via the connecting means is inseparably connected to a first one of the building elements by a form-fit connection and the tongue is connected in a separable manner to a second one of the building elements, said connecting means contacts a second groove of the first one of the building elements and penetrates and hardens in openings and pores in the second groove in the first one of the building elements.

2. The arrangement according to claim 1, wherein the first groove and tongue are provided for connecting the building elements to one another.

3. The arrangement according to claim 1, wherein the first one of the building elements provides a second groove with or without undercutting, into which the connecting means is introduced in an inseparable manner.

4. The arrangement according to claim 1, wherein the connecting means is manufactured from an extrudate.

5. The arrangement according to claim 1, wherein the connecting means is connected to the first one of the building elements by foam-filling.

6. The arrangement according to claim 1, wherein the connecting means fills the second groove of the first one of the building element by foam-filling.

7. The arrangement according to claim 1, wherein the tongue is formed by milling, after being inseparably connected through the connecting means to the first one of the building elements.

8. The arrangement according to claim 3, wherein the connecting means consists substantially of synthetic material and/or comprises wood obtained from the manufacture of the groove.

9. The arrangement according to claim 1, wherein the connecting means consists substantially of a combination of synthetic material and wood.

10. The arrangement according to claim 1, wherein the connecting means consists substantially of a combination of wood and starch-containing products.

11. The arrangement according to claim 1, wherein the connecting means consists substantially of a combination of wood, starch-containing products and hydrophobing agents.

12. The arrangement according to claim 1, wherein the connecting means consists substantially of a combination of wood, starch-containing products, hydrophobing agents and natural or synthetic binding agents.

13. The arrangement according to claim 1, wherein the connecting means consists substantially of a combination of wood and organic, synthetic binding agents.

14. The arrangement according to claim 1, wherein the building elements are connected in a separable manner by the connecting means using form-fit connection.

15. The arrangement according to claim 1, wherein the first groove is defined by two arms designed to be resilient and that the tongue can be inserted into the first groove.

16. The arrangement according to claim 15, wherein especially in order to achieve a strong but separable connection of the building elements:

a) the first groove is formed directly in the second one of the building element;

b) the width of the first groove increases from the inside to the outside;

c) the thickness of the tongue decreases towards its free end;

d) the tongue having a front surface enclosing an angle α relative to the large flat surface of the building elements and having a shorter rear surface adjoining the latter surface and enclosing an angle ß, which exceeds the angle α relative to the large flat surface of the building elements thereby forming a kink;

e) the groove provides a contact surface close to the base of the groove, which, in the locked position, is at least partially in contact with the front surface, and a shorter rear surface, remote from the base of the groove, which, in the locked position, is in contact with the shorter rear surface of the tongue; and

f) at least one of the arms of groove being bendable outwards in a resilient manner relative to the other arm of the groove in each case, so that the tongue is held in the resting position by the arms of the groove subject to a clamping effect.

17. The arrangement according to claim 16, wherein the angle of the tongue front surface α enclosed relative to the large flat surface of the building elements is greater than an angle γ, enclosed by a region on the first groove close to the base of the groove relative to the large flat surface of the building elements.

18. The arrangement according to claim 15, wherein the groove arm of the one building elements close to the surface is in contact with a region provided close to the surface of the other building element.

19. The arrangement according to claim 15, wherein the arms of one groove are designed to be of equal length.

20. The arrangement according to claim 1, said connecting means having a maximum thickness and wherein the maximum thickness of the connecting means is less than the thickness of the building elements perpendicular to the flat surface.

21. The arrangement according to claim 20, said connecting means and tongue having a maximum thickness, wherein the maximum thickness of the connecting means is the same as the maximum thickness of the tongue.

22. The arrangement according to claim 1, wherein the connecting means are designed in such a manner that the end faces of two adjacent building elements, can, at least partially, butt against one another, especially in the region of the upper surface.

23. The arrangement according to claim 1, wherein the building elements provide a flat under-surface to be supported on a level base.

24. The arrangement according to claim 1, wherein the building elements are panel-shaped or strip-shaped.

25. The arrangement according to claim 1, wherein the building elements are coated on the upper and/or lower side with synthetic-material laminates.

26. The arrangement according to claim 1, wherein the building elements are selected from the group comprising wooden materials.

27. The arrangement according to claim 1, wherein in the case of two interconnected end faces of two adjacent building elements, one end face provides a first groove formed by two arms of the same length.

28. The arrangement according to claim 1, wherein the tongue can be connected to the first groove in a separable manner.

29. The arrangement according to claim 1, wherein the connecting means inseparably connected to the first one of the building elements consists of a water-resistant material.

30. The arrangement according to claim 1, wherein the connecting means provides greater strength than the material of the building elements.

31. The arrangement according to claim 1, wherein the building elements can be interconnected by the connecting means with a snap-fastening.

32. The arrangement according to claim 1, wherein mutually matching locking elements, in the form of an indentation and a projection, are provided on at least one side of the first groove and on at least one side of the tongue, preferably extending over the entire length of the first groove and the tongue in order to achieve a strong but separable connection between the building elements and also in order to hold the connected building elements in the connected position.

33. The arrangement according to claim 32, wherein the projection is disposed in the first groove and/or in the region between arms adjacent the first groove.

34. The arrangement according to claim 32, wherein the angles α, at which the sides of the projection close to the base of the groove and of the indentation are inclined, are of the same magnitude.

35. The arrangement according to claim 1, wherein the tongue is designed to be solid.

36. The arrangement according to claim 1, wherein the first groove and the tongue are formed in a middle region of the relevant end faces of the building elements.

37. The arrangement according to claim 1, wherein the arrangement comprises building elements which provide the first groove on one of their end faces and a tongue on the other end face in each case, and also comprises building elements which provide first grooves and/or tongues on both opposing end faces or on all end faces, and/or that the building elements are designed symmetrically and/or in an identical manner with reference to a plane perpendicular to their surface and extending through the longitudinal and/or transverse middle axis.

38. The arrangement according to claim 1, wherein each building element has lateral edges and an upper surface one or more of the lateral edges of at least one building element being provided in an inseparable manner with extrudate extending up to the upper surface of the building element which is visible.

39. An arrangement of building elements having a flat surface comprising:

a) a plurality of building elements capable of separable connection to one another using a tongue, a first groove, and connection means;

b) wherein the tongue comprises a different material than the building elements;

c) wherein the first groove is defined by two arms designed to be resilient and that the tongue can be inserted into the first groove

i) the first groove is formed directly in a second one of the building elements;

ii) the width of the first groove increases from an inside to an outside;

iii) a thickness of the tongue decreases towards a free end

iv) the tongue having a front surface enclosing a first angle relative to a large flat surface of the building elements and having a shorter rear surface adjoining a latter surface and enclosing a second angle, which exceeds the first angle relative to the large flat surface of the building elements, thereby forming a kink;

v) the first groove provides a contact surface close to a base of the first groove, which, in a locked position, is at least partially in contact with the front surface, and the shorter rear surface, remote from the base of the first groove, which in the locked position, is in contact with the shorter rear surface of the tongue; and

vi) at least one of the arms of the first groove being bendable outwards in a resilient manner relative to the second arm of the first groove in each case, so the tongue is held in a resting position by the arms of the first groove subject to a clamping effect;

d) wherein the tongue is inseparably connected to the connecting means; and

e) wherein the tongue via the connecting means is inseparably connected to a first one of the building elements by a form-fit connection and the tongue is connected in a separable manner to the second one of the building elements, said connecting means contacts a second groove of the first one of the building elements and penetrates and hardens in openings and pores in the second groove in the first one of the building elements wherein the angle of the tongue front surface enclosed relative to the large flat surface of the building elements is greater than an angle enclosed by a region on the first groove close to the base of the groove relative to the large flat surface of the building elements.

40. The arrangement according to claim 39, wherein in forming a projection only on one side of the tongue and an indentation only on the side of the first

groove facing towards the latter side, the surfaces of the tongue and first groove without projections or indentations are in tight and close contact with one another and enclose the same angle γ relative to the large flat surface of the building elements.

41. The arrangement according to claim 40, wherein in the connected condition of the building elements, the tongue surface disposed in front of the projection towards the front end of the tongue is in contact with a surface of the groove.

42. The arrangement according to claim 41, wherein the side of a triangle forming the indentation is disposed in the plane of the groove surface, wherein a side of the triangle, which is closer to the opening of the groove, is shorter and more steeply inclined at an angle ß relative to the large flat surface than a side of the triangle, which is disposed closer to the base of the groove and inclined at an angle α relative to the large flat surface,

that the longest side of the triangle of the projection is disposed in the plane of the tongue surface, wherein the side of the triangle disposed remote from the distal end of the tongue is shorter and is more steeply inclined at an angle ß relative to the surface than a side of the triangle close to the distal end of the tongue and inclined at an angle α relative to the surface, and

that the projection formed on the tongue provides a cross section corresponding to the triangular form of the indentation.

43. The arrangement according to claim 42, wherein a surface region of the groove surface between the groove opening and the shorter side of the triangle of the indentation encloses an angle relative to the surface of the building elements which corresponds to the angle α of the longer side of the triangle, wherein this surface region of the groove is designed as a sliding surface for the longer side of the triangle of the projection provided on the tongue.

44. The arrangement according to claim 43, wherein the region close to the distal end of the tongue and also the region close to the proximal end continues in each case into a side of the triangle of the projection, in each case forming a kink.

45. The arrangement according to claim 42, wherein the side of the triangle disposed close to the base of the groove is approximately four-times to eight-times as long as the side of the triangle remote from the base of the groove, and that the angle between the two sides of the triangle is 100° to 140°.

46. The arrangement according to claim 42, wherein the sides of the triangle of the projection or of the indentation continue into the front and/or rear region of the groove surface and tongue surface respectively, thereby forming a kink.

47. The arrangement according to claim 42, wherein the angles ß at which the sides of the projection remote from the base of the first groove and of the indentation are inclined, are of the same magnitude.

48. The arrangement according to claim 39, wherein:

a) the first groove has surfaces and the tongue has surfaces provided with the same angle of inclination γ relative to the large flat surface of the building elements, regions of the tongue surfaces and the first groove surfaces being in contact in the connected condition of the building elements;

b) an indentation with a triangular form in a cross section perpendicular to the direction in which the building elements are joined, is provided as a locking element along the course of at least one groove surface;

c) a projection with a triangular form in a cross section perpendicular to the direction in which the building elements are joined is provided along the course of at least one tongue surface; and

d) in the connected condition of the building elements, the projection and the indentation are in contact with one another along their contours in a tight, close and play-free manner.

49. The arrangement according to claim 48, wherein the triangular projection on the tongue is disposed between said regions on the surface of the tongue which provide the same angle of inclination γ relative to the surface of the building elements.

M. Kaindl Holzindustrie, Wals, AT 37

PCT/EP03/05139

FIG.1

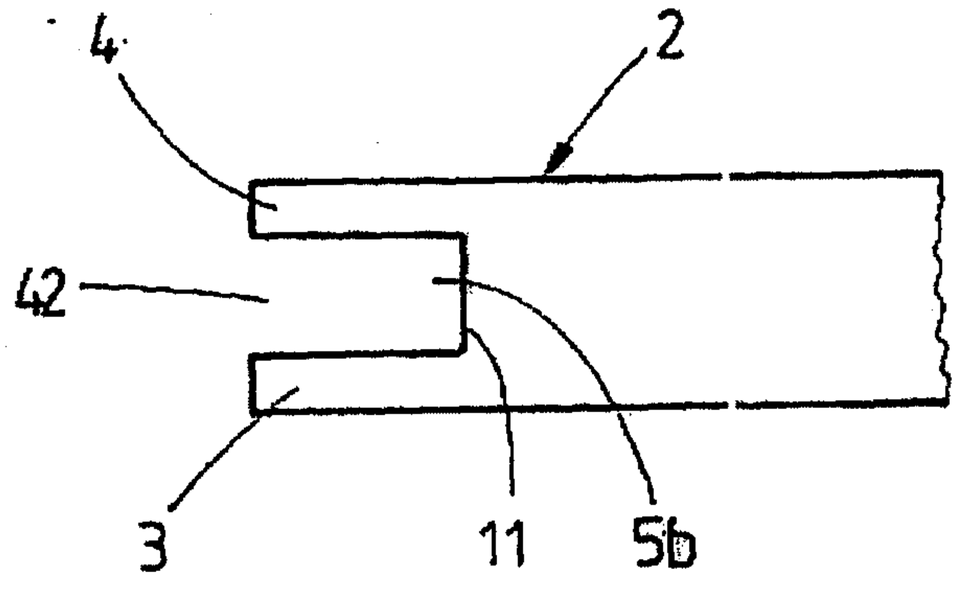

FIG.2

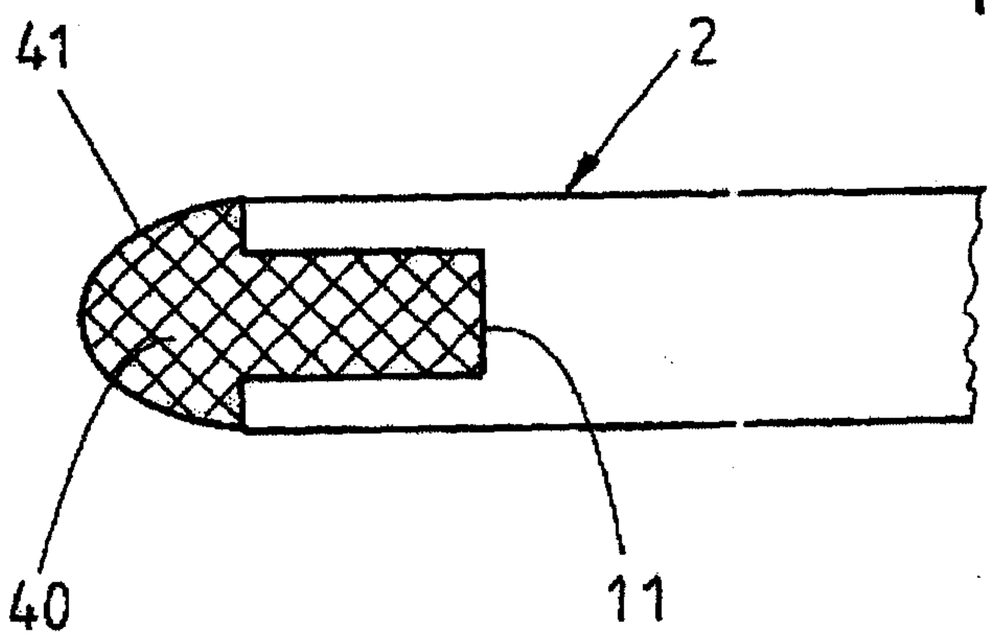

FIG.3

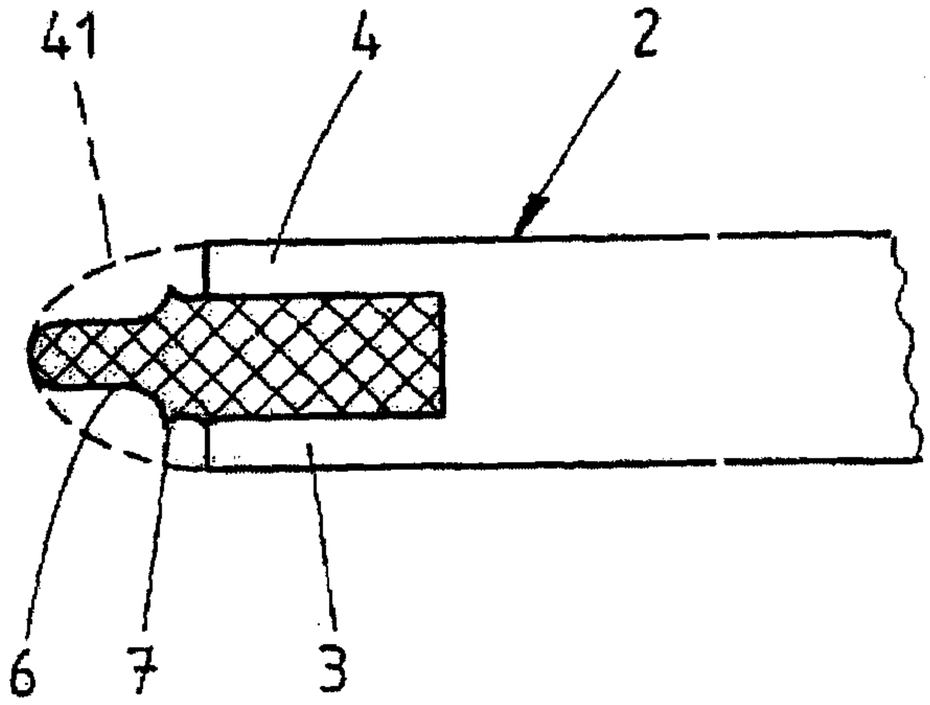

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FIG.4

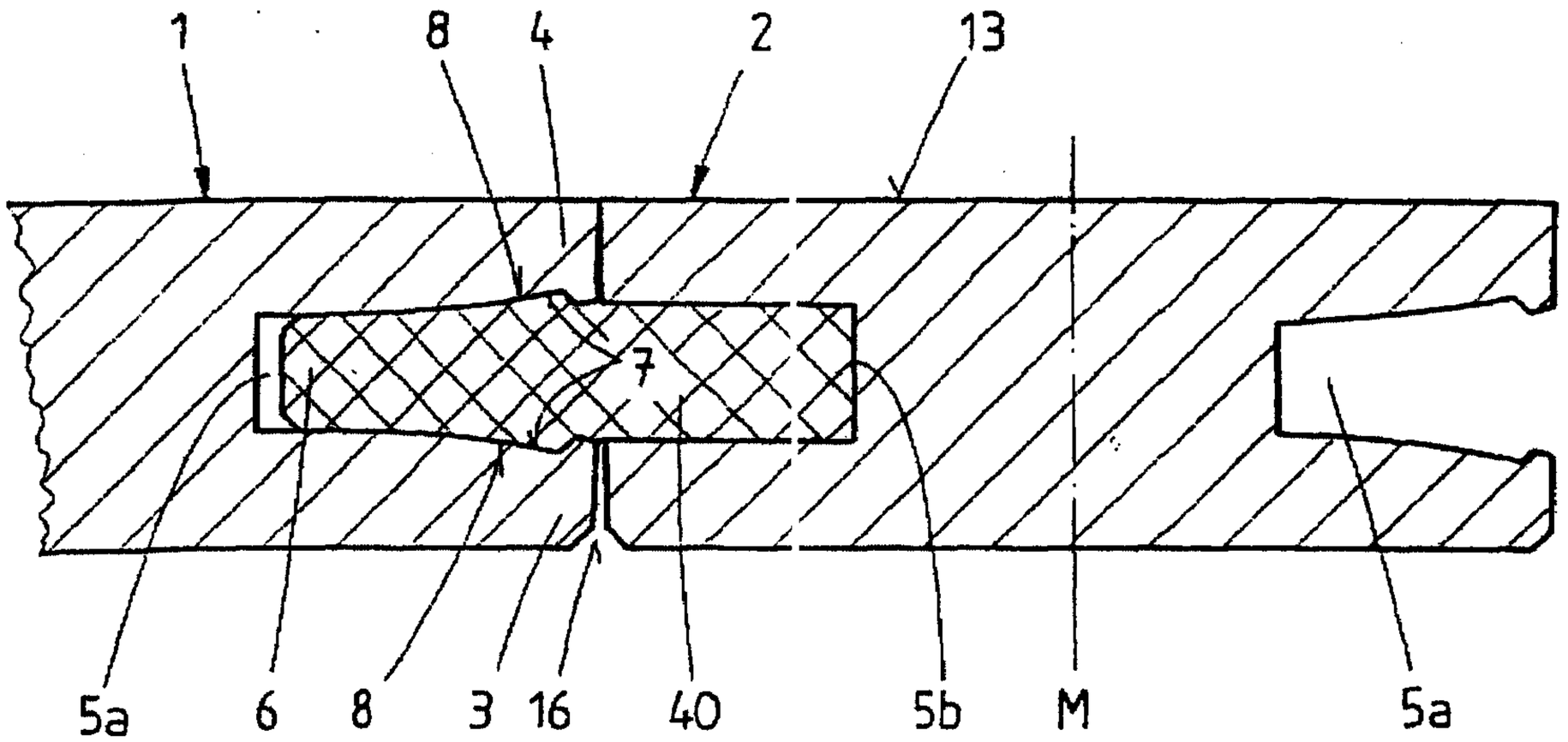


FIG.5

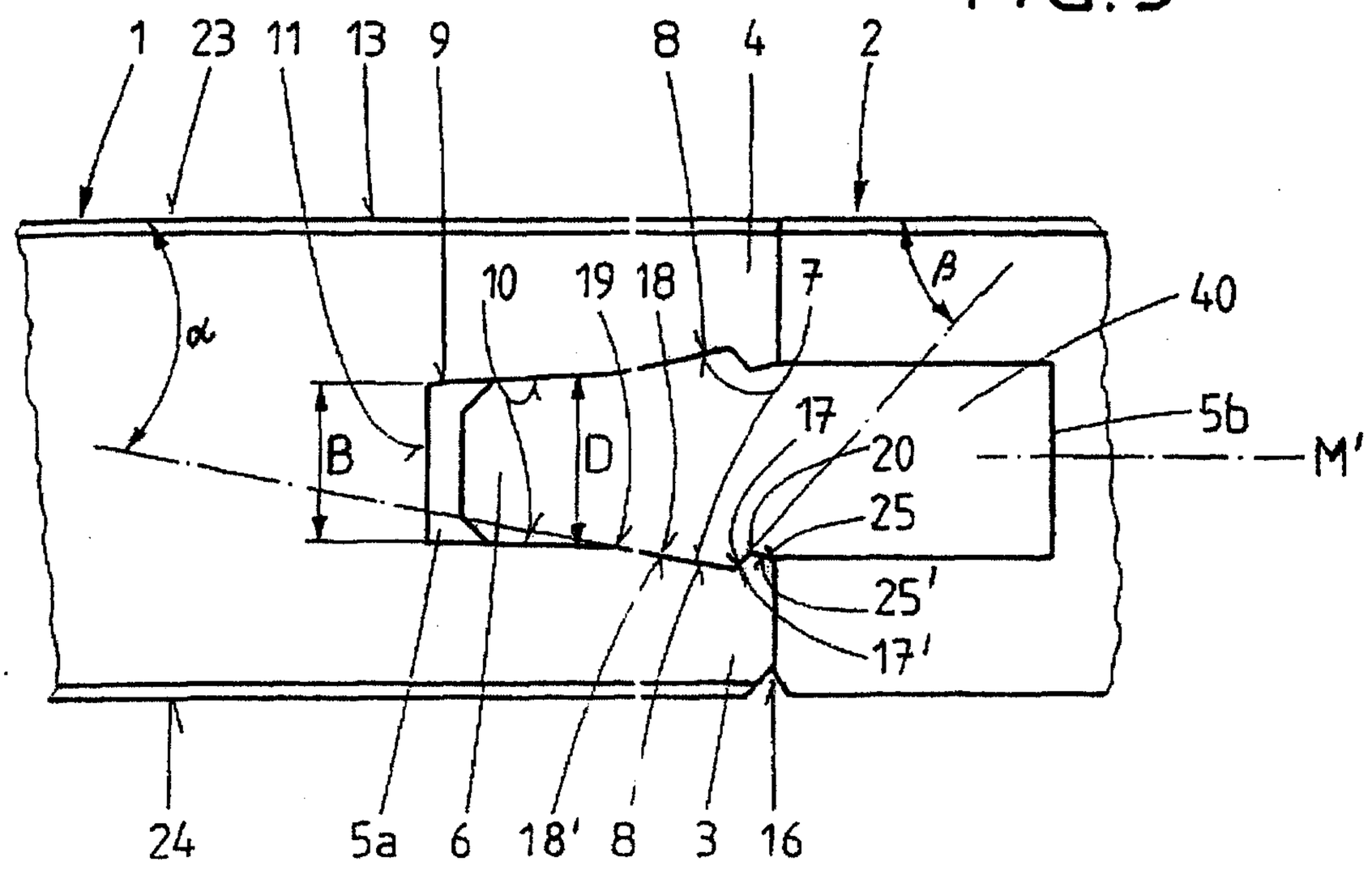


FIG.6

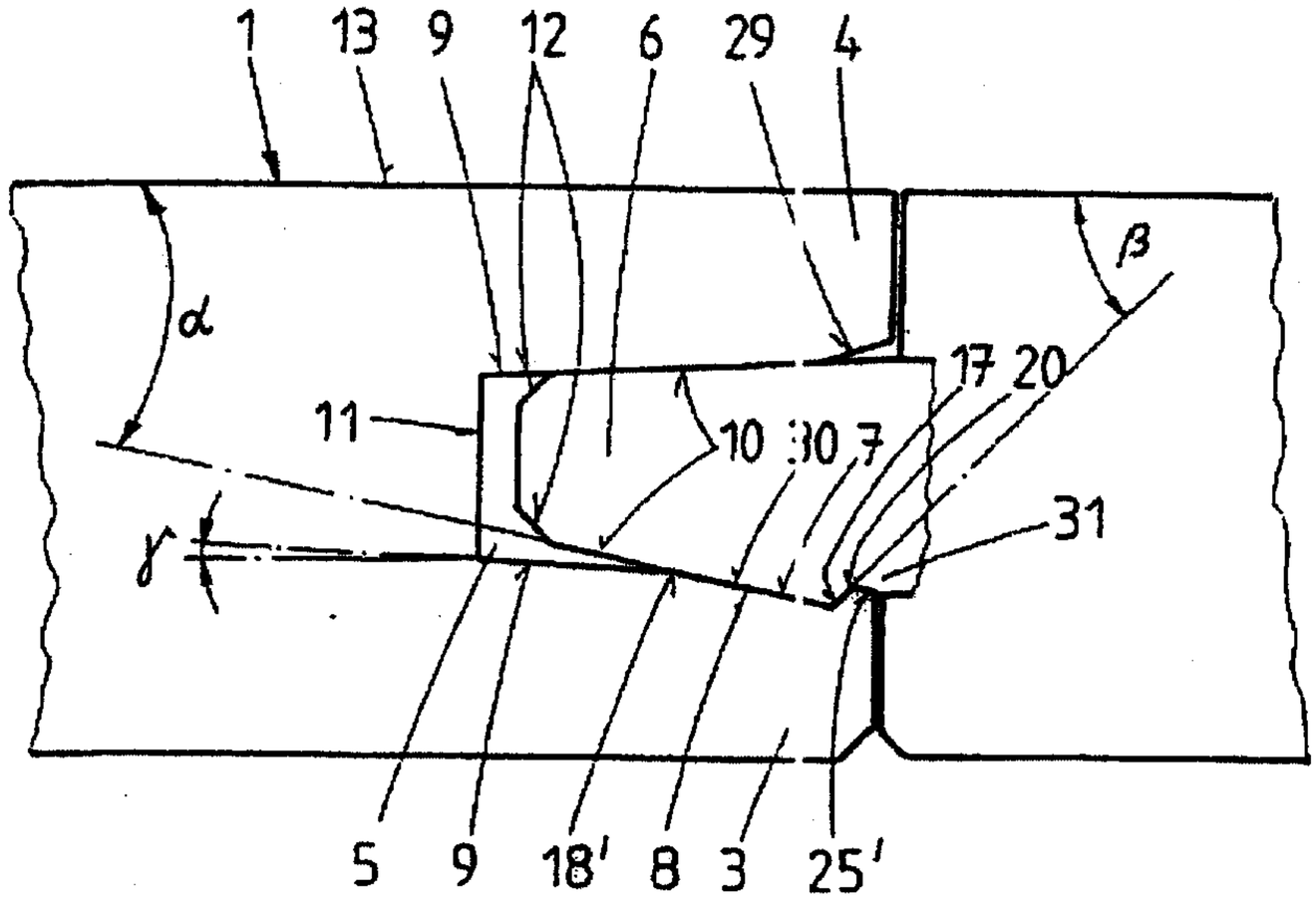


FIG.7

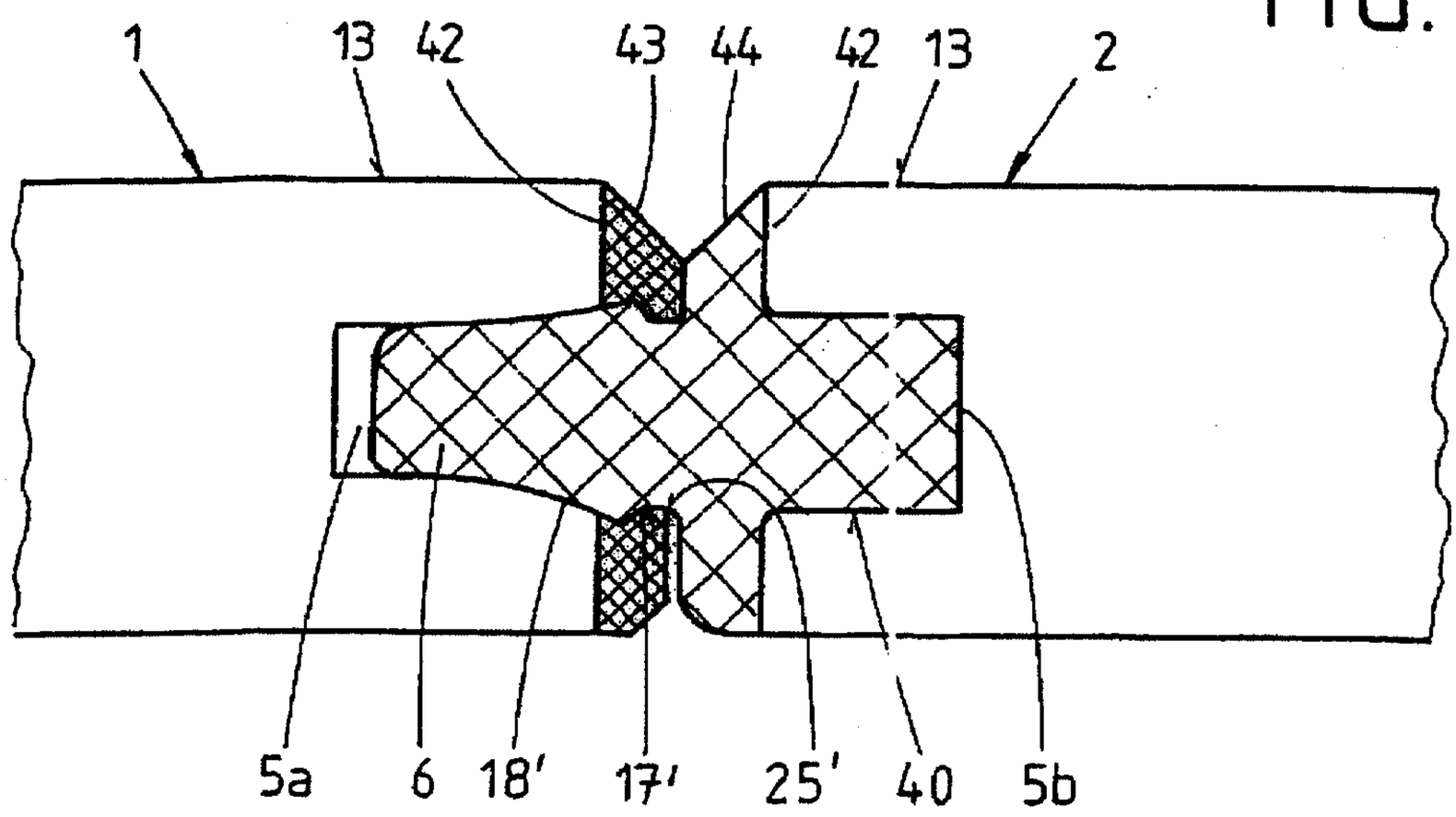
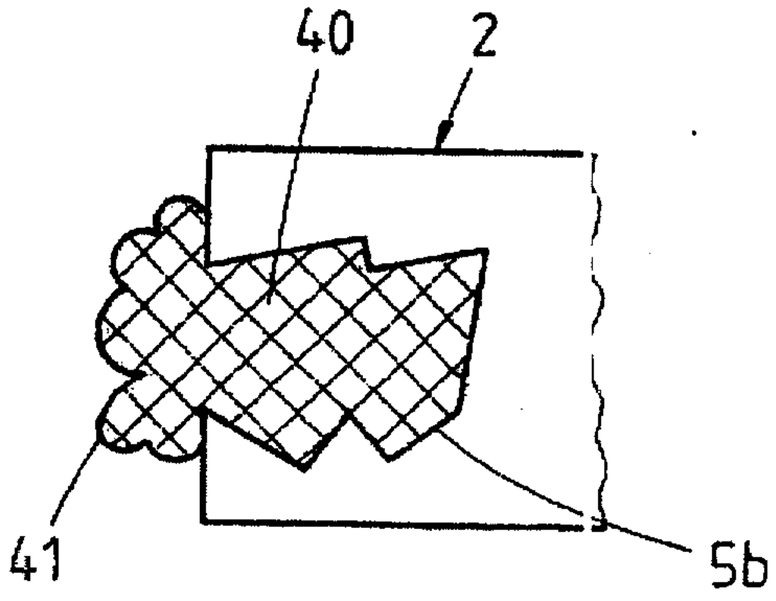
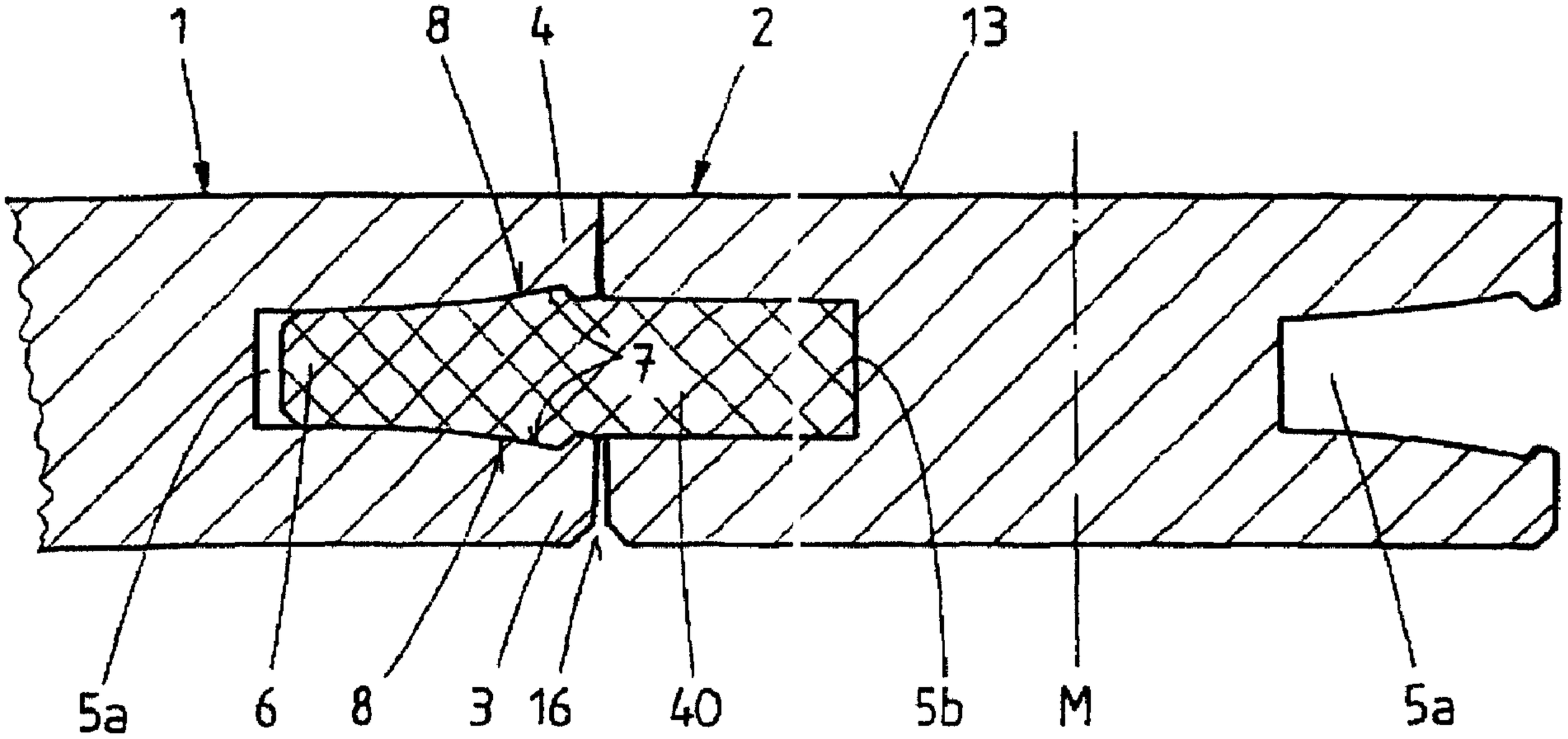


FIG.8




1
8
4
2
13
7
5a
6
8
3
16
40
5b
M
5a