



(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.03.2005 Bulletin 2005/09

(51) Int Cl.⁷: **B28B 7/16**, B28B 11/12,
E04C 2/00, B28D 1/00

(21) Application number: **04018766.8**

(22) Date of filing: **06.08.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
 HU IE IT LI LU MC NL PL PT RO SE SI SK TR**
 Designated Extension States:
AL HR LT LV MK

(72) Inventor: **Plessi, Paolo**
41053 Maranello (MO) (IT)

(74) Representative: **Luppi, Luigi**
Luppi Crugnola Bergamini & Partners S.r.l.
Viale Corassori, 54
41100 Modena (IT)

(30) Priority: 07.08.2003 IT mo20030231

(71) Applicant: **Itiemmm S.r.l.**
41053 Maranello (MO) (IT)

(54) **Apparatus and method for manufacturing a decorated product, and decorated product**

(57) A method comprises forming a product (1; 100), providing cavity means (7) that extends to the inside of said product (1; 100) and which defines on an intended visible surface (2) thereof a contour (9) of an opening (13) and subsequently providing further cavity means (26) that extends from a surface opposite (6) said intended visible surface (2) for such a depth as to remove a bottom part (8) of said cavity means (7); a product

comprises cavity means (7) extending to the inside of body means (21) of said product (1; 100) starting from one of its own intended visible surfaces (2) and defining on said intended visible surface (2) a contour (9) of an opening (13) and further cavity means (26) having a greater extent than said cavity means (7) and extending from a surface (6) opposite said intended visible surface (2) for such a depth that said cavity means (7) is lacking of its own bottom portion (8).

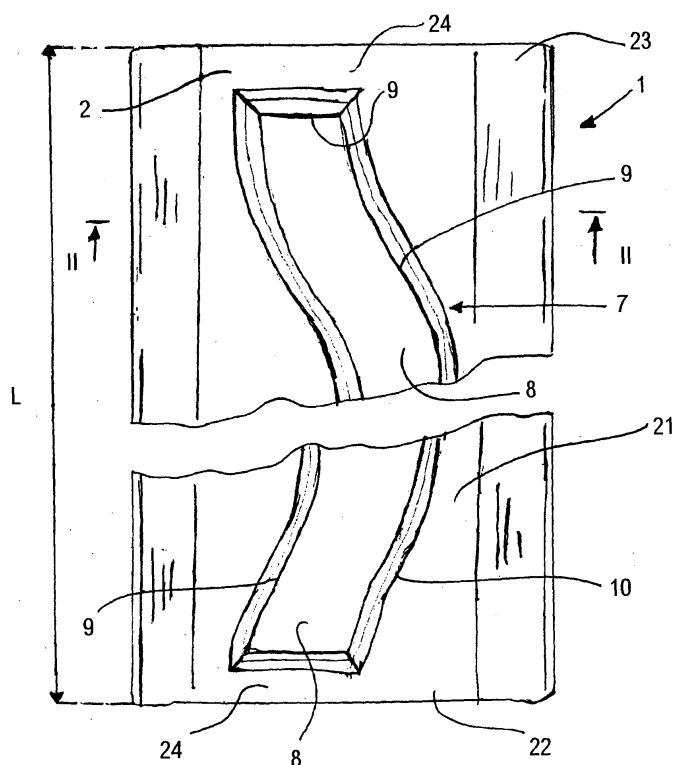


Fig. 1

Description

[0001] This invention relates to an apparatus and a method for obtaining a product, in particular a product intended for the installation of finishes of building products in general; also a new product being included within the scope of the present invention.

[0002] From the prior art, producing ceramic products for cladding surfaces in general is known, these products comprising a substantially flat support or support provided with raised surfaces, provided with through openings in the thickness of the support that are configured in such a way as to receive within themselves, in a shapingly coupled manner, variously configured tesseras that are made from a vast range of materials so as to obtain a desired inlay decorative effect.

[0003] The through openings can be obtained by removing from the already formed support a certain quantity of material that makes it up initially.

[0004] This removing operation can be achieved by computer controlled water-jet cutting machines advancing continuously to perform the cutting operation along the corresponding perimeter of the opening that is to be defined.

[0005] Such machines have to be programmed afresh to change over from the creation of openings having a preset shape to the creation of openings having different shapes.

[0006] One drawback of this system is that considerable processing time is necessary both for cutting the through openings and for correspondingly shaping the tesseras to be inserted in such openings.

[0007] A not insignificant time is also required for programming the cutting machines whenever one wishes to change the shape of the openings to be obtained on the ceramic products.

[0008] A further drawback is that the cutting machines are programmed to obtain openings of different shapes without taking into account any variations in the thickness of the ceramic products, due for example to the presence of bas-relief on the surface thereof.

[0009] Owing to these differences in thickness, there is the risk that in the product is made a cut that is not a through cut and therefore that the desired openings are not obtained.

[0010] To eliminate the operations of cutting the support and in any case in the event of large-scale production, the openings are obtained directly during the phase of forming the support.

[0011] In this case, moulds are used that are provided with cores fixed to the base of the mould cooperating with punches that have holes corresponding to the section of the cores and are shaped according to the particular shape of the openings to be made.

[0012] One drawback of the system disclosed above is that it requires dedicated moulds that must be built on demand and that must to be replaced whenever one wishes to modify the number and/or the shape and/or

the position of the openings provided on a given product.

[0013] This involves considerable extra costs and slowdowns to the productive cycle.

[0014] One object of the invention is to simplify the methods and the apparatuses for obtaining products.

[0015] A further object is to supply an apparatus and a method for obtaining products that may be used independently of the particular configuration of the products that one wishes to obtain.

[0016] Yet another object is to supply products that are provided with openings made with great precision whilst keeping cost very moderate.

[0017] In a first aspect of the invention, a method is provided, comprising forming a product, providing cavity means extending to the inside of said product and defining on an intended visible surface a contour of an opening, characterized in that it further comprises subsequently providing further cavity means extending from a surface opposite said intended visible surface for such a depth that a bottom part of said cavity means is removed.

[0018] In one embodiment, said cavity means is shaped like an indentation that delimits the perimeter of a rusticated element having any desired shape.

[0019] In this way, when the further cavity means is made, the separation of the rusticated elements from the product is also obtained.

[0020] In a second aspect of the invention, an apparatus is provided comprising removing means arranged for making an opening in a product provided with cavity means extending from an intended visible surface of said product, characterized in that said removing means is configured in such a way as to remove a part of said product from a surface opposite said intended visible surface until a bottom portion of said cavity means is removed.

[0021] In one embodiment, said removing means enables a portion of said product to be removed having a length approximately corresponding to the length of said product.

[0022] In other embodiments, said removing means enables a portion of said product to be removed having a width less than or also approximately corresponding to the width of said product.

[0023] Owing to these aspects of the invention, it is no longer necessary to use complete dedicated moulds or to provide cutting tools provided with high precision to obtain products provided with through openings, which enables the costs of the equipment required to produce such products to be significantly reduced.

[0024] In fact, it is no longer necessary to provide perforated punches cooperating with cores protruding from the base of the mould, such cores and such holes being sized in accordance with the shapes and dimensions of the openings to be made.

[0025] On the other hand, owing to this invention, it is possible to obtain a method and an apparatus that are extremely versatile, inasmuch as it is sufficient to use

the usual mould punches, i.e. mould punches lacking in fixed parts, and replace such punches when it is necessary to change over from the production of products provided with openings having preset shapes and dimensions to the production of products having openings with different shapes and dimensions.

[0026] In a third aspect of the invention, a product is provided comprising cavity means extending to the inside of body means of said product starting from its own intended visible surfaces and defining on said intended visible surface a contour of an opening, characterized in that it further comprises further cavity means having a greater extent than said cavity means and extending from a surface opposite said intended visible surface for such a depth that said cavity means is lacking in its own bottom portion.

[0027] In one embodiment, said cavity means is delimited by edge means having at least one portion that is tilted in relation to said intended visible surface.

[0028] Owing to these aspects of the invention, it is possible to manufacture products for cladding surfaces, provided with through openings and arranged for being coupled with variously configured products, made from a vast range of materials, in particular ceramic materials, in such a way as to obtain a desired decorative effect.

[0029] Owing to the invention, it is no longer necessary to shape the openings at the moment of forming of the products using dedicated moulds or cutting machines.

[0030] Furthermore, it is not even indispensable to shape the tesseras that have to be visible through the openings of the products inasmuch as the further cavity means can have a preset shape, for example rectangular or square, completely independently of the shape of the openings, particularly when the latter have tilted edges.

[0031] The further cavity means may have an extent equal to a longitudinal and/or transversal dimension of said products.

[0032] Furthermore, it is possible to obtain widely differing inlay decorative effects from the association of the products with the tesseras simply by varying the shape and/or the number of the openings made on the ceramic products, independently of the actual shape of the tesseras associated with them.

[0033] It is furthermore possible to significantly simplify the operations of production and installation of a composite element formed by the association of the products according to the invention with decorating elements, because decorating elements are used that have greater dimensions than those that were used in the prior art.

[0034] In a fourth aspect of the invention a composite element is provided comprising product means provided with a plurality of opening means and decorating means associated with said product means and comprising a plurality of protruding means shaped in such a way as

to be shapingly coupled with said opening means.

[0035] Owing to this aspect of the invention, it is possible to further simplify the operations necessary to create a composite element that has the effect of plurality of decorating tesseras inserted into a corresponding plurality of openings of a product means, whilst associating with the product means a sole decorating element and not a plurality of tesseras.

[0036] Furthermore, as this decorating element has significantly larger dimensions than the single tesseras, handling operations are further simplified, furthermore, as the dimensions of the decorating element do not depend on the dimensions of the openings of the product means, it is possible to create openings with dimensions that are even very small without being consequently forced to use tesseras of the corresponding dimensions.

[0037] Furthermore, it is possible to obtain a composite element with an improved decorative effect compared with composite elements obtained by inserting sized tesseras into openings of the product means, because, whilst the edges of the normally used tesseras are not glazed, it is on the other hand possible to glaze the sides of the protruding means of the decorating means, avoiding in this way unglazed parts with a rough appearance to be visible.

[0038] The invention may be better understood and implemented with reference to the enclosed drawings, that show some exemplifying and non-limiting embodiments in which:

Figure 1 is a fragmentary view from above of an embodiment of a ceramic listel according to the invention at an intermediate stage of the production cycle, namely after pressing or forming;

Figure 2 is a section taken along plane II-II of Figure 1;

Figure 3 is a view like the one in Figure 2 that shows the ceramic listel at a subsequent stage of the production cycle, namely after a preset quantity of material has been removed from a bottom surface of a cavity that occupies a visible face of the ceramic listel;

Figure 4 is a view like the one in Figure 3, highlighting the fitting of a decorating element to the ceramic listel in Figure 1;

Figure 5 is a partially sectioned perspective view of the ceramic listel and of the decorating element in Figure 4;

Figure 6 is a view like the one in Figure 4, highlighting a decorating element fixed to the respective ceramic listel by interposition of an adhesive material; Figure 7 is a perspective view of a further embodiment of a ceramic listel according to the invention; Figure 8 is a partially sectioned perspective view of the ceramic listel in Figure 7 with which a further decorating element is associated;

Figure 9 is a section taken along the plane IX-IX of Figure 8;

Figure 10 is a partially sectioned perspective view of the ceramic listel in Figure 7 with which a yet further decorating element is associated;

Figure 11 is a section taken along the plane XI-XI in Figure 10;

Figure 12 is a section of a ceramic listel according to the invention made according to one version;

Figure 13 is a section of a ceramic listel of the invention made according to a further version;

Figure 14 is a section of a ceramic listel of the invention made according to a yet further version;

Figure 15 is a schematic side view of an apparatus for obtaining the ceramic listels according to the invention;

Figure 16 is an enlarged section taken along plane XVI-XVI of Figure 15;

Figure 17 is a schematic side view of a further apparatus for obtaining ceramic listels according to the invention;

Figures 18 to 22 are sections like the ones in Figure 2 showing the listel according to the invention in subsequent phases of the production cycle;

Figure 23 is a view from above of a yet further embodiment of a ceramic listel according to the invention at an intermediate stage of the production cycle, namely after pressing or forming;

Figure 24 is a section taken along the plane XX-IV-XXIV of Figure 23;

Figure 25 is a view like the one in Figure 24 showing a first embodiment of a part to be removed in the removing phase;

Figure 26 is a view like the one in Figure 24 that shows the ceramic listel of Figure 23 after the part of material shown in Figure 25 has been removed from a not visible face thereof;

Figures 27 to 31 are views like that one of Figure 26, highlighting the fitting of decorating elements to the ceramic listel in Figure 26;

Figure 32 is a partially sectioned and fragmentary perspective view of Figure 27;

Figure 33 is a partially sectioned and fragmentary perspective view of Figure 28;

Figure 34 is a view like the one in Figure 24 in which there is shown a further embodiment of a part of the ceramic listel to be removed during the removing phase;

Figure 35 is a view like the one in Figure 24 that shows the ceramic listel in Figure 23 after the part shown in Figure 34 has been removed from a not visible face thereof;

Figures 36 to 39 are views like the view in Figure 35, highlighting the fitting of decorating elements to the ceramic listel in Figure 33;

Figure 40 is a view from above of a yet further embodiment of a ceramic listel according to the invention at an intermediate stage of the production cycle, namely after pressing or forming;

Figure 41 is a section taken along the plane XLI-XLI

in Figure 40;

Figure 42 is a view like the one in Figure 41 in which there is shown one embodiment of a part to be removed during the removing phase;

Figure 43 is a view like the one in Figure 41, wherein there is shown another embodiment of a part to be removed during the removing phase;

Figure 44 is a view of the ceramic listel in Figure 40 after the part shown in Figure 43 has been removed;

Figure 45 is a view like the one in Figure 41 highlighting the fitting of a decorating element to the ceramic listel in Figure 44;

Figure 46 is a view from above of a yet further embodiment of a ceramic listel according to the invention at an intermediate stage of the production cycle, namely after pressing or forming;

Figure 47 is a section taken along the plane XLVII-XLVII of Figure 46;

Figure 48 is a view from above of a yet further embodiment of a ceramic listel according to the invention at an intermediate stage of the production cycle, namely after pressing or forming;

Figure 49 is a section taken along the plane XLIX-XLIX of Figure 48;

Figure 50 is a view like the one in Figure 49 in which there is shown one embodiment of a part to be removed during the removing phase;

Figure 51 is a view of the ceramic listel in Figure 49 after the part shown in Figure 50 has been removed;

Figure 52 is a view like the one in Figure 51 highlighting the fitting of a decorating element to the ceramic listel in Figure 51;

Figure 53 is a view like the one in Figure 50, in which there is shown another embodiment of a part to be removed during the removing phase;

Figure 54 is a view of the ceramic listel in Figure 49 after the part shown in Figure 53 has been removed;

Figure 55 is a view of the ceramic listel in Figure 49 after the part shown in Figure 53 has been removed and a further cut has been made along the separation line W indicated in Figure 53.

[0039] Figures 1 to 12 and 23 to 55 show different embodiments of a ceramic listel 1 obtained by forming, for example by pressing ceramic material in powder form.

[0040] The ceramic listel 1 is provided with a body 21 having a visible surface 2, resting portions 3 to enable the ceramic listel 1 to be rested on a desired resting surface 4, a not visible surface 6, a thickness 5, an end portion 22 and a further end portion 23.

[0041] The visible surface 2 of the ceramic listel 1 is configured in such a way as to comprise at least one recessed portion 7 extending into the thickness of the ceramic listel 1 towards the not visible surface 6 thereof.

[0042] Such recessed portion 7 comprises side edges 9, an external edge 10 and a bottom surface 8 corresponding to the zone of maximum depth of the recessed portion 7 in relation to the visible surface 2 of the ceramic

listel 1.

[0043] The bottom surface 8 is located at a distance D1 from the visible surface 2, and at a further distance D2 from the not visible surface 6.

[0044] On the visible surface 2, can be obtained a desired number of recessed portions 7 that can have differing shapes one with to other and are delimited by side edges 9 and by external edges 10 of any shape, for example of curved shape.

[0045] The recessed portions 7 extend on the visible surface 2 of the ceramic listel 1 in such a way as to be contained in said visible surface 2, in particular in such a way as to be distanced from the end portion 22 and from the further end portion 23 of the ceramic listel 1 by corresponding edge zones 24.

[0046] The side edges 9 may be substantially perpendicular to the bottom surface 8, or they may comprise a first segment 9a, nearer the visible surface 2, which is tilted in relation to the not visible surface 6, and a second segment 9b, further away from the visible surface 2, that is substantially perpendicular to the not visible surface 6.

[0047] The presence of the second segment 9b enables openings 13 to be obtained that have defined contours, namely contours lacking in burrs or in ragged zones.

[0048] The second segment 9b furthermore enables to prevent that possible shifts in a vertical direction in relation to the ceramic listel 1 of abrading means, disclosed in greater detail below, generate irregularities in the edge zones of the obtained openings.

[0049] In one embodiment, the second segment 9b has a thickness that is not less than 1,5 mm.

[0050] After a forming phase in which the ceramic listel 1 is obtained as previously disclosed, i.e. provided with the recessed portions 7, it is subjected to a milling operation - carried out by the abrading means - by means of which a volume of ceramic material is removed from the part of the not visible surface 6.

[0051] As shown in Figure 2, in consequence of the removing of a preset volume of material, in the ceramic listel 1 a space is defined having a rectangular section 12 - indicated by a broken line in Figure 2 - and a greater extent than the recessed portions 7.

[0052] This space has a substantially regular shape, in particular a parallelepiped shape, which significantly simplifies the milling operation inasmuch as space with a simple shape are easier to make.

[0053] This space has a length that is the same as the length L of the ceramic listel 1, so as to extend from the end portion 22 to the further end portion 23 of the body 21 of the ceramic listel 1, and a thickness that is approximately the same as the distance D2 between the bottom surface 8 of the recessed portions 7 and the not visible surface 6.

[0054] In consequence of the milling operation, the listel 1 appears as shown in Figure 3, i.e. it is provided on its not visible surface 6, with a through channel 26, i.e. a channel extending along the entire length L of the ce-

ramic listel 1.

[0055] The listel 1 is furthermore provided, on a zone of its visible surface 2 corresponding to the bottom surface 8 of the recessed portions 7, with openings 13 that are obtained in consequence of the milling operation and that are delimited by the side edges 9 of the recessed portions 7.

[0056] The number and/or the shape of the openings 13 depend respectively on the number and/or the shape of the recessed portions 7 that were previously obtained in the ceramic listel 1.

[0057] The openings 13 are configured in such a way that when a decorating element 14 is associated to the listel 1, for example in the manner shown in Figure 4, an upper portion 15 of the decorating element 14 is visible through the openings 13 on the visible surface 2 of the ceramic listel 1.

[0058] As shown in Figures 4 and 5, the decorating element 14 may have a thickness S2 such that one of its bottom surfaces 44 is coplanar with the resting portions 3, so as to form with the latter a resting base 20A of a composite product 20 formed by associating the decorating element 14 with the listel 1.

[0059] Again with reference to Figure 1, there is shown a listel 1 arranged for being installed in such a way as to be adjacent to a cladding made of ceramic products, for example tiles 31.

[0060] In such a case the listel 1 constitutes a finishing element of the cladding of a building product, for example a wall.

[0061] The tiles 31 have a thickness S1 that is the same as the thickness S2 of the decorating element 14.

[0062] In such a case the decorating element 14 can be obtained by cutting a tile 31 so as to obtain a tessera having dimensions that are such as to be able to be received inside the through channel 26.

[0063] By fitting to each other materials of different type and/or shaping in a different manner the openings 13 of the listel 1, it is possible to achieve the most widely differing decorative effects in a very simple manner.

[0064] To facilitate assembly of the composite product 20, it is placed on a suitable net 18 in such a way that the resting portions 3 and the bottom surface 44 are fixed to a surface 17 of the net 18.

[0065] The presence of the net 18 enables transport and installation of the composite product 20 to be facilitated and furthermore enables the stability thereof to be increased, preventing, for example, mutual shifts between the listel 1 and the decorating element 14.

[0066] As shown in Figure 6, a further decorating element 140 having a thickness that is less than the distance between the bottom surface 8 and the resting portions 3 can be associated with the ceramic listel 1.

[0067] Adhesive materials are used in this case in order to ensure stable cohesion between the further decorating element 140 and the ceramic listel 1.

[0068] The further decorating element 140 is connected to the ceramic listel 1 by limited amounts 141 of the

adhesive materials.

[0069] If the listel has considerable dimensions and/or the recessed portion has a very limited extent in relation to that of the listel, there is provided to remove a quantity of ceramic material from the part of the not visible surface of the ceramic listel so as to create a space having dimensions that are only slightly greater than those of the recessed portion, said space does not extend along the entire length L of the listel 1.

[0070] This space has a rectangular or anyway regular section such as to be able to receive a ceramic listel having a desired shape.

[0071] Thus, in such a case, the space has a longitudinal dimension that is less than the length L of the listel 1.

[0072] If a plurality of openings 13 has to be made in the listel 1, it is possible to obtain a corresponding plurality of spaces arranged one after the other in relation to the extent of the listel 1.

[0073] In this way, it is thus possible to reduce the costs due to milling operations - inasmuch as it is possible to remove only the quantity of material necessary to obtain the one or more spaces - and consequently reduce the overall costs associated with the production of the listels 1.

[0074] In a further embodiment of the listel 1, shown in Figures 7 to 9, the parts corresponding to the listel 1 in Figures 1 to 5 are indicated by the same numerical references.

[0075] The listel 1 is shown in Figure 7 after being subjected to a milling operation similar to the one previously disclosed and that is such to remove also in this case from the listel 1 a volume of material such as to define a channel 26 extending along the entire length L of the listel 1.

[0076] In consequence of this milling operation, on the visible surface 2 of the ceramic listel 1 is identified at least one opening 13 configured in such a way as to enable a yet further decorating element 14A to be inserted inside it, as shown in Figures 8 and 9. The yet further decorating element 14A has functions that are similar to the decorating element 14 and to the further decorating element 140 but is shaped in such a way as to be associatable in a shapingly coupled manner with the openings 13 into which it has to be inserted.

[0077] In particular, the yet further decorating element 14A has a thickness 5A that is substantially the same as the thickness 5 of the listel 1.

[0078] The yet further decorating element 14A is configured in such a way that its bottom surface 25 is placed at the same vertical level as the resting portions 3, in such a way as to constitute with the latter a resting base 20A of the composite product 20.

[0079] As shown in Figures 10 and 11, can be associated with the listel 1 a yet further decorating element 14B shaped in such a way that its upper portion 15 at least partially protrudes towards the exterior in relation to the visible surface 2.

[0080] In another embodiment of the listel 1, shown in Figures 23 to 39, the parts corresponding to the listel 1 in Figures 1 to 5 are indicated by the same numerical references.

5 **[0081]** The ceramic listel 1 is shown in Figure 23 and 24 in an intermediate processing stage, namely at the end of the forming phase.

[0082] Each recessed portion 7 made on the visible surface 2 of the ceramic listel 1, is shaped as an indentation 32 that extends through the thickness of the ceramic listel 1 towards the not visible surface 6 thereof and runs on the side of the visible surface 2 in such a way as to define a preferably closed path, having any desired shape, said path identifies an external perimeter 33 of a portion of the listel 1 shaped as a rusticated element 34 having a thickness 34A that approximately corresponds to the thickness 5 of the listel 1, and shaped for example such as a rhombus.

10 **[0083]** The indentation 32 is defined by a bottom surface 8 located at a distance D1 from the visible surface 2, and at a further distance D2 from the not visible surface 6, and by edges 9.

15 **[0084]** The presence of the rusticated element 34 of thickness 34A inside the perimeter 33 enables a listel 1 to be obtained that has great dimensional stability during the firing phase.

20 **[0085]** Subsequently, is removed from the ceramic listel 1 a volume of ceramic material from the part of the not visible surface 6 that is variously configured, for example as shown in Figures 25 and 34.

25 **[0086]** Such a volume of material has a thickness that is at least equal to the distance D2 between the bottom surface 8 of the indentations 32 and the not visible surface 6 in such a way that, after the volume of material has been removed, the separation of the rusticated element 34 from the listel 1 is obtained, and through openings 13 delimited by the contour of the indentations 32 are obtained.

30 **[0087]** In the embodiment in Figure 25, a cut is made along a cutting plane T, indicated with a broken line, thus separating from the listel 1 a volume of material, indicated by cross-hatching in Figure 25, of a width that is the same as the width L1 of the listel 1 and obtaining the listel 1' of Figure 26, namely provided with a plurality of through openings 13 the shape and number of which depend on the number and shape of the indentations 32 that have been made in the listel 1 and having a new bottom surface 35 approximately corresponding to the plane T along which the cut is made.

35 **[0088]** The listel 1' may at this point be associated with different types of decorating elements and in different ways, for example in the ways shown in Figures 27 to 33, to obtain a composite element 20 with a desired decorative effect, in which an upper surface 60A of the decorating elements is at least partially visible through the openings 13.

40 **[0089]** With reference to Figures 27 and 32, the listel 1' is associated with a first decorating element 50 having

a width the same as the width L1 of the listel 1, in such a way that the new bottom surface 35 of the listel 1 rests on a top surface portion 36 of the first decorating element 50.

[0090] As first decorating element 50 an usual ceramic product can be used, such as a tile, or a slab of building material cut to the dimensions of the space made in the listel 1.

[0091] As this space is of regular dimensions, cutting operations to obtain the first decorating element 50 are very simple, furthermore, by appropriately choosing the values of the length L and of the width L1, a piece can be used that is normally commercially available without subjecting it to any modification.

[0092] In the embodiment shown in Figures 28 and 33, the listel 1' is associated, in a manner completely similar to what has been seen with reference to Figure 27, with a second decorating element 51 provided with portions 52 shaped to be coupled in a shapingly coupled manner with the openings 13, in such a way that after the installation these portions 52 are inserted inside the openings 13.

[0093] The portions 52 may have a variously configured upper surface 60A, for example at least partially protruding towards the exterior in relation to the visible surface 2 of the listel 1. With the listel 1' tesseras 54 may be further associated that are inserted into the openings 13, as shown for example in Figures 29-31.

[0094] Such tesseras 54 may have a variously configured upper surface and may be positioned in such a way that their bottom surfaces 55 is approximately coplanar with the new bottom surface 35 of the listel 1' and cooperates with the latter to define the resting base 20A of the composite element 20 (Figures 29, 30).

[0095] The tesseras 54 can also be positioned in such a way that the new bottom surface 35 of the listel 1' is positioned after installation at a different height in relation to the bottom surface 55 of the tesseras 54, in such a case that it is necessary to appropriately fix the tesseras 54 to the listel 1' to prevent movements of the latter in relation to the tesseras 54, for example in one of the ways seen previously.

[0096] In the embodiments seen previously and in particular in those shown in Figures 27, 28, 32, 33, there is obtained a composite product 20 having as resting base 20A a bottom surface of the decorating elements that does not require particular expedients for installation, but which after appropriately fixing the listel 1' to the pre-selected decorating element, can be installed as a usual building element.

[0097] The thickness of the decorating elements 50, 51, and/or the tesseras 54, and/or the listel 1 can be varied in such a way as to create a composite element 20 that generates a particular desired effect of alternating relief or jutties in relation to the tiles 31 next to which the composite element 20 is installed, in particular such a thickness may be less or the same as the thickness S1 of the tiles 31.

[0098] In the embodiment in Figure 34, is removed from the listel 1 a volume of material indicated with cross-hatching, of a width L2 that is less than the width L1 of the listel 1, configured in such a way as to originate in the listel 1 a further resting portion 3' located at a certain distance D4 from the resting portion 3 and comprising two distinct resting portions 3A and 3B located on sides opposite each opening 13 obtained in the listel 1 after the removing operation.

[0099] In consequence of the aforesaid removing operation, the listel 1" in Figure 35 is obtained, which is completely similar to the one in Figure 3 and with which various decorating elements can be associated, as indicated for example in Figures 36 to 39.

[0100] With reference to Figures 36 and 37, tesseras 54 can be inserted in the openings 13 of the listel 1", in a manner that is completely similar to what has been seen with reference to Figures 29-31, such tesseras 54 having variously configured upper surfaces 60A, namely such as to be substantially coplanar with the visible surface 2 of the listel 1" (Figure 36), or at least partially protruding from the visible surface 2 of the listel 1" (Figure 37), and a bottom surface 55 that in installation may be coplanar with the resting portions 3 of the listel 1.

[0101] Furthermore, the listel 1" may be associated, with reference to Figures 38 and 39, with a third decorating element 56 in such a way that the resting portions 3A and 3B of the listel 1" rest on surface portions 56A of the third decorating element 56 and a bottom surface 56B of the third decorating element 56 constitutes the resting base 20A of the obtained composite element 20.

[0102] The thickness of the third decorating element 56 may be such that the resting surface 3 of the listel 1" is positioned in installation at a different height from that of the resting base 20A of the composite element 20, furthermore the upper surface 60A of the third decorating element 56 may be flat and substantially coplanar with the visible surface 2 of the listel 1" (Figure 38), or may be positioned at a different height in relation with the latter (Figure 39), or may be provided with protrusions that during installation are inserted into the openings 13 of the listel 1" and possibly at least partially protruding from the visible surface 2 of the listel 1".

[0103] In Figures 40 to 45 a further embodiment of ceramic listel 1 is shown that is similar to the one shown in Figures 23 to 33, and differs therefrom substantially in the different path of the indentations 32 that identify a rusticated element 34 with a curved shape.

[0104] This ceramic listel 1 may be subjected to the same milling operations seen for the ceramic listel in Figures 23-24, in particular, from the ceramic listel a volume of material can be removed with the same width as the width L1 of the listel 1 (Figure 42), or with a width less than the width L1 of the listel 1 (Figure 43).

[0105] The listel obtained after any of the above milling operations can then be associated with any decorating element, shaped for example in any of the previ-

ously seen ways, obtaining each time composite elements 20 having decorative effect that are different from one another.

[0106] In consequence of the milling operation shown in Figure 43, the ceramic listel 1''' in Figure 44 is obtained that can for example be associated with the decorating element 56, as shown in Figure 45.

[0107] The listel 1 of the invention may have a desired extent, for example listels 100 may be made that have a width that is the same as a desired multiple of the width L1 of the listel 1 in such a way that the listels 100 give the impression of a desired number of listels 1 placed side by side, and the indentations 32 made therein may have a desired reciprocal spatial arrangement, for example, as shown in the two embodiments in Figures 46-47 and 48-55 the listel 100 may have width L3 that is twice the width L1, with a symmetry axis W that ideally identifies two distinct listels 1 of width L1.

[0108] Such embodiments of the listel 100 may be subjected to milling operations completely similar to those seen previously that are partially discussed below with reference to the embodiment in Figure 48.

[0109] From the listel 100, from the part of the not visible surface 6, a desired volume of material can be removed to obtain a plurality of through openings 13 in the listel 1.

[0110] For example, as indicated in Figure 50, a cut can be made along a cutting plane T indicated with a broken line thus separating from the listel 100 the volume of material indicated by the cross-hatching in Figure 50 that has a width that is the same as the width L3 of the listel in Figure 48.

[0111] In consequence of the aforesaid cutting operation, is also obtained the separation of the listel 100 in Figure 51 along the axis W into two listels 100', shown in Figure 51, that are completely analogous to the listel shown in Figure 44.

[0112] In the case in which a generic listel 100 has width that is the same as a desired multiple of the width of a single listel and is so configured as to result virtually obtained by placing side by side a plurality of ceramic listels, after the aforesaid removing operation a plurality of ceramic listels of the kind of those examined up to here is obtained starting from a sole listel 100.

[0113] After the removing operation, with the listel 100 different types of decorating elements can be associated in different ways, in particular, as shown in Figure 52, the listel 100 can be associated with a building element 60 provided with rusticated elements 61 shaped in such a way as to be inserted into the openings 13.

[0114] As indicated in Figure 50, the listel 100 can be subjected to a milling operation that enables the portions of material indicated with the cross-hatching in Figure 53 to be separated from the listel 100 and thereby obtaining the listel 100'' in Figure 54; following to a further cutting operation along the axis W in Figure 53, the listel 100''' of Figure 55 is obtained.

[0115] The listel 100'' and the listel 100''' can be both

associated with decorating elements having various shapes and dimensions, for example in one of the previously shown ways.

[0116] The configuration of the listel 100 in Figures 46-55 enables, after associating a desired decorating element with the listel 100, decorative effects to be obtained that are even more different from those previously seen.

[0117] Furthermore, the dimensions of the space that is created in the listel 100 after the above seen removing operation enables further simplifying and further speeding up the operations of association of the decorating elements with the listel 1 and installation of the obtained composite element 20 obtained, as listels and decorating elements are handled having dimensions that are significant and completely comparable with those of tiles or other cladding materials alongside which the composite elements are placed.

[0118] Furthermore, in the embodiment in Figure 52, by appropriately varying the dimensions and reciprocal positions of the through openings 13, a mosaic arrangement can be easily simulated, without however having to handle a plurality of tesseras which and above all tesseras of small dimensions in order to improve the final aesthetic effect of the composite mosaic element, as by contrast occurs in the prior art.

[0119] With reference to Figures 15 and 16, there is shown an apparatus 200 to make in the listels 1 the channel 26 by removing therefrom by a milling operation a preset volume of material adjacent to the not visible surface 6.

[0120] The apparatus 200 comprises flexible conveying means 203 wrapped in a loop around rolling bodies 201 rotating around a rotation axis X in the direction indicated by the arrow F1 and arranged in such a way as to move a train 210 of listels 1 in an advancing direction F.

[0121] The listels 1 of the train 210 of listels are arranged on the flexible conveying means 203 in such a way that the not visible surface 6 of the listels 1 is turned towards an upper surface 209 of the flexible conveying means 203.

[0122] Above the listels 1, pressing means 205 is provided arranged to exert pressure in the direction indicated by P so as to press the listels 1 against the flexible conveying means 203, in particular during the milling operation.

[0123] The apparatus 200 is provided with abrading means comprising a grinding wheel 204 that is rotatable about a further axis Y in the rotation direction F1 and movable in the direction of the arrow F3 away from and towards the listels 1, in such a way as to make on the side of the not visible surface 6 of the listels 1, channels 26 having a desired depth.

[0124] The grinding wheel 204 is positioned in such a way as to be able to interact with each listel 1 in such a way that when the listel 1 travels over an active part 206 of the grinding wheel 204 a through channel 26 is made

therein, such a channel 26 being provided with an opening turned towards the flexible conveying means 203.

[0125] To ensure the contact of each listel 1 with the active part 206 of the grinding wheel 204 and thus enabling an effective milling operation to be conducted, the pressing means 205 exerts a pressure of a preset amount on the listels 1.

[0126] The rotation direction of the grinding wheel 204 and that of the drive rollers 201 may be consistent between themselves as in the case shown in Figure 15, or be inconsistent.

[0127] The flexible conveying means 203 is supported rigidly, at least at the zone thereof on which the train 210 of listels 1 is positioned, in such a way as to enable milling at a constant depth.

[0128] The grinding wheel 204 that was disclosed above is suitable for removing limited quantities of material from the listels.

[0129] The active part 206 of the grinding wheel is dimensioned according to the width of the space that one wishes to make in the listel 1. If the listels 1 are made in hard and fragile materials, are used abrasive belts 27 (Figure 13) closed in a loop and tensioned between a return roller and a drive roller, the latter being arranged to rotationally actuate them.

[0130] In order to increase the productivity of the apparatus 200, the abrading means may comprise a plurality of abrading elements arranged on the apparatus 200 in longitudinally consecutive positions.

[0131] The abrading elements are positioned at different vertical heights in order to carry out progressive abrasion of the material.

[0132] The vertical height at which each abrading element is positioned can be adjusted by appropriate adjusting means in the direction indicated by the arrow F3.

[0133] In Figure 17 there is shown one embodiment of the apparatus 200 in which the grinding wheel 204 is provided with a translation movement in a horizontal and vertical direction in relation to a further train 301 of listels 1, in such a way as to be able to perform the milling action.

[0134] The further train 301 of listels 1 is in this case placed on a work surface 302 after the forming phase in such a way that the visible surface 2 of each listel 1 is in contact with a further upper surface 304 of the work surface 302.

[0135] The work surface 302 may comprise a conveying surface for conveying the listels 1 provided with translation movement in a conveying direction of the listels 1, or may comprise a fixed surface on which the further train 301 of listels 1 to be subjected to the milling action is cyclically loaded.

[0136] If the work surface 302 is movable in the conveying direction, the grinding wheel 204 and the work surface 302 are moved in opposite directions to one another so as to reduce the time required for milling the listels 1.

[0137] If the work surface 302 is fixed, only the grind-

ing wheel 204 is moved for milling.

[0138] When the further train 301 of ceramic listels 1 to be milled has been loaded onto the work surface 302, the grinding wheel 204 is translated in the yet further direction indicated by the arrow F7, from a position A in which the grinding wheel 204 is arranged in an end zone 308 of the work surface 302, to a further position B, in which the grinding wheel 204 is arranged in a further end zone 307 of the work surface 302 opposite the end zone 308.

[0139] During the afore said translation the grinding wheel is rotatingly actuated in the direction indicated by the arrow F6 and is kept in contact with the listels 1.

[0140] Subsequently, the grinding wheel 204 is moved away from the work surface 302 and it is returned to the position A.

[0141] With reference to Figure 12, a listel 1 is shown that after the forming phase is completely similar to the ceramic listel shown in Figure 1, in which, starting from the not visible surface 6, a pair of grooves 11 is made that is obtained by a tool, for example a rotating disc 16.

[0142] The grooves are arranged to enable sides 19 (Figure 13) of the aforesaid abrading means not to interfere during milling operations with portions of material with which the listel 1 is made.

[0143] This is particularly appropriate if the abrading means consists of abrasive belts 27.

[0144] The abrasive belts 27 are in fact unable to work on the sides 19 inasmuch as the latter are damaged by the contact with portions of the material that forms up the listels 1.

[0145] In such cases, as shown in Figure 15, in the apparatus 200 the rotating disc 16 is positioned upstream of the abrading means in such a way as to make the grooves 11 in the listels 1.

[0146] In this way, the grooves 11 define cavities inside which the sides 19 are received, which are thus preserved from premature wear.

[0147] The presence of the grooves 11 thus enables the productivity of the apparatus 200 to be increased, drastically reducing the need for maintenance or replacement of the abrading means.

[0148] Figure 12 furthermore shows that the listel 1 has a substantially constant thickness even in shaped zones 28 obtained at opposite ends thereof.

[0149] The uniform thickness enables, in cases in which the listels are obtained by pressing, substantially constant density to be obtained at all points of the ceramic listels. This enables dimensional lack of uniformity between listels of the same type to be avoided.

[0150] With reference to Figure 13, it is shown a listel 1 provided on its not visible surface 6 with a pair of hollows 29 having the same function as the above-disclosed grooves 11.

[0151] In this case the hollows 29 are not made by tools but are obtained during forming of the listel 1.

[0152] With reference to Figure 14, it is shown a listel 1 provided on its not visible surface 6 with a pair of

throats 30 performing the same function as the grooves 11 and the hollows 29 disclosed above.

[0153] In a similar manner to what occurs for the hollows 29, the throats 30 are obtained during forming of the listel 1.

[0154] The grooves 11, the hollows 29 and the throats 30 have a greater depth S than the further distance D2 identified between the bottom surface 8 and the not visible surface 6.

[0155] Figures 18 to 22 show subsequent phases of a production cycle of a composite product according to the invention made by associating a listel 1 with a decorating element 14.

[0156] In Figure 18 there is shown a listel 1 obtained by forming, for example by pressing ceramic powders.

[0157] In Figure 19 there is shown with cross-hatching a volume of material that has to be removed from the ceramic listel 1.

[0158] Figure 20 shows grooves 11 made by a disc tool in the not visible surface 6 of the listel 1.

[0159] The grooves 11 enables the sides 19 of abrading means arranged for removing the afore said volume not to interfere with the material that forms the listel 1.

[0160] Figure 21 shows the listel 1 after the volume of material has been removed.

[0161] Figure 22 shows the decorating element 14 fixed to the listel 1 by appropriate amounts 141 of adhesive material that are interposed between the listel 1 and the decorating element 14.

[0162] The phase of the processing cycle during which the grooves 11 are made can be eliminated if, as shown in Figures 12 and 13 disclosed above, the listel 1 is provided with hollows 29, or throats 30 made during forming.

Claims

1. Method, comprising forming a product (1; 100), providing cavity means (7) that extends to the inside of said product (1) and defines on an intended visible surface (2) thereof a contour (9) of an opening (13), **characterized in that** it further comprises subsequently providing further cavity means (26) that extends from a surface opposite (6) said intended visible surface (2) for such a depth as to remove a bottom part (8) of said cavity means (7).
2. Method according to claim 1, wherein said providing comprises removing from said opposite surface (6) of said product (1; 100) a portion of material (12).
3. Method according to claim 2, wherein said removing involves a zone of said opposite surface (6) opposite said intended visible surface (2) having a greater extent than said cavity means (7).
4. Method according to claim 2, or 3, wherein said removing involves a zone of said opposite surface (6) opposite said intended visible surface (2) having the same extent as a transversal dimension (L1; L3) of said product (1; 100).
5. Method according to claim 2, or 3, wherein said removing involves a zone of said opposite surface (6) opposite said intended visible surface (2) having a lower extent than a transversal dimension (L1; L3) of said product (1; 100).
6. Method according to any claim 2 to 5, wherein said removing comprises actuating rotating removing means (204) to make it to interact with said product (1).
7. Method according to claim 6, and further comprising moving said product (1; 100) in relation to said removing means (204).
8. Method according to claim 7, and further comprising pressing said product (1; 100) against said removing means (204).
9. Method according to any one of claims 6 to 8, and further comprising moving said removing means (204) in relation to said product (1; 100).
10. Method according to any preceding claim, wherein said providing comprises making in said cavity means (7) at least an edge portion (9b), more distant from said intended visible surface (2), that is substantially perpendicular to said bottom part (8).
11. Method according to any preceding claim, wherein said providing comprises shaping said further cavity means (26) in such a way that said further cavity means (26) occupies the entire longitudinal extent (L) of said product (1; 100).
12. Method according to any one of claims 1 to 10, wherein said providing comprises shaping said further cavity means (26) in such a way that said further cavity means (26) extends for a limited portion of the longitudinal extent (L) of said product (1; 100), said portion being comprised between a zone located upstream of said opening (13) and a zone located downstream of said opening (13).
13. Method according to any preceding claim, wherein it is provided for cutting said product (100) along a desired cutting line (W) for separating portions of said product (100) from one another.
14. Method according to any preceding claim, and further comprising obtaining groove means (11; 29; 30) in said opposite surface (6) opposite said intended visible surface (2).

15. Method according to claim 14, wherein said groove means (11, 29, 30) has a greater height (S) than the distance (D2) between said opposite surface (6) opposite said intended visible surface (2) and said bottom part (8).
16. Method according to claim 14, or 15, wherein said obtaining occurs during said forming.
17. Method according to claim 14, or 15, wherein said obtaining occurs after said forming and before said providing.
18. Method according to claim 17, wherein said obtaining comprises abrading said product (1; 100) by tool means (16) at said opposite surface (6) opposite said intended visible surface (2).
19. Method according to any preceding claim, wherein said forming comprises pressing loose ceramic material.
20. Product comprising cavity means (7) extending to the inside of body means (21) of said product (1; 100) starting from one of its own intended visible surfaces (2) and defining on said intended visible surface (2) a contour (9; 32) of an opening (13), **characterized in that** it further comprises further cavity means (26) having a greater extent than said cavity means (7) and extending from a surface (6) opposite said intended visible surface (2) for such a depth that said cavity means (7) is lacking of its own bottom portion (8).
21. Product according to claim 20, wherein said further cavity means (26) has the same extent as a transversal dimension (L1; L3) of said product (1; 100).
22. Product according to claim 21, wherein said further cavity means (26) has a lower extent than a transversal dimension (L1; L3) of said product (1; 100).
23. Product according to any one of claims 20 to 22, wherein said contour (9) has a variously configured curved shape.
24. Product according to any one of claims 20 to 23, wherein said curved shape has an outline that is different from a further outline of said further cavity means (26).
25. Product according to any one of claims 20 to 24, wherein said cavity means (7) is delimited by walls comprising at least one edge portion (9b) more distant from said intended visible surface (2), which is substantially perpendicular to said bottom part (8).
26. Product according to any one of claims 20 to 25, wherein said further cavity means (26) occupies the entire longitudinal extent (L) of said product (1; 100).
27. Product according to any one of claims 20 to 25, wherein said further cavity means (26) extends for a limited portion of the longitudinal extent (L) of said product (1; 100) said segment being comprised between a zone located upstream of said opening (13) and a zone located downstream of said opening (13).
28. Product according to any one of claims 20 to 27, and further comprising decorating means (14; 14A; 14B; 140; 50; 51; 55; 56; 60) received in said channel means (26) in such a way as to be visible through said opening (13).
29. Product according to claim 28, wherein a portion (15; 60A; 53; 60) of said decorating means (14B; 55; 51; 60) protrudes from said intended visible surface (2) through said opening (13).
30. Product according to claim 28, or 29, wherein said decorating means (14; 140; 50; 51; 55; 56; 60) is associatable in a shapingly coupled manner with said channel means (26).
31. Product according to claim 28, or 29, wherein said decorating means (14A; 14B; 54; 55; 60) is associatable in a shapingly coupled manner with said opening (13).
32. Product according to any one of claims 20 to 31, and further comprising support means (18) arranged for enabling said decorating means (14; 14A; 14B; 140) to be fixed to said body means (21).
33. Product according to any one of claims 20 to 31, and further comprising amounts of gluing material interposed between said decorating means (14; 14A; 14B; 140) and said body means (21) in order to fix said decorating means (14; 14A; 14B; 140) and said body means (21).
34. Product according to any one of claims 20 to 33, wherein said body means (21) has a thickness measured at an intermediate zone of said body means (21) that is substantially the same as a further thickness measured at shaped edge zones (28) of said body means (21).
35. Product according to any one of claims 20 to 34, wherein said body means (21) is obtained by forming ceramic material.
36. Product according to claim 35, wherein said body means (21) is obtained by pressing said ceramic

material.

37. Composite element (20) comprising product means (1; 100) provided with a plurality of opening means (13) and decorating means (60) associated with said product means (1; 100) and comprising a plurality of protruding means (61) shaped in such a way as to be shapingly coupled with said opening means (13).

10

15

20

25

30

35

40

45

50

55

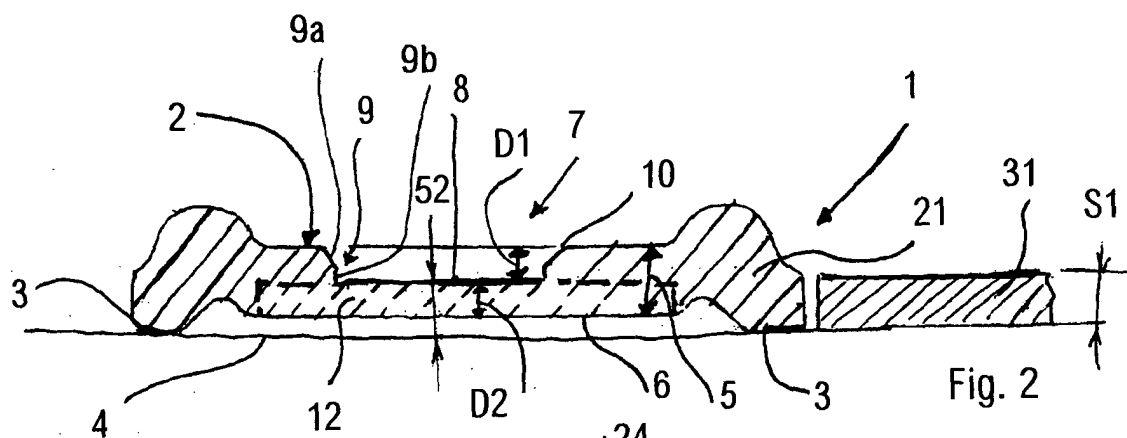


Fig. 2

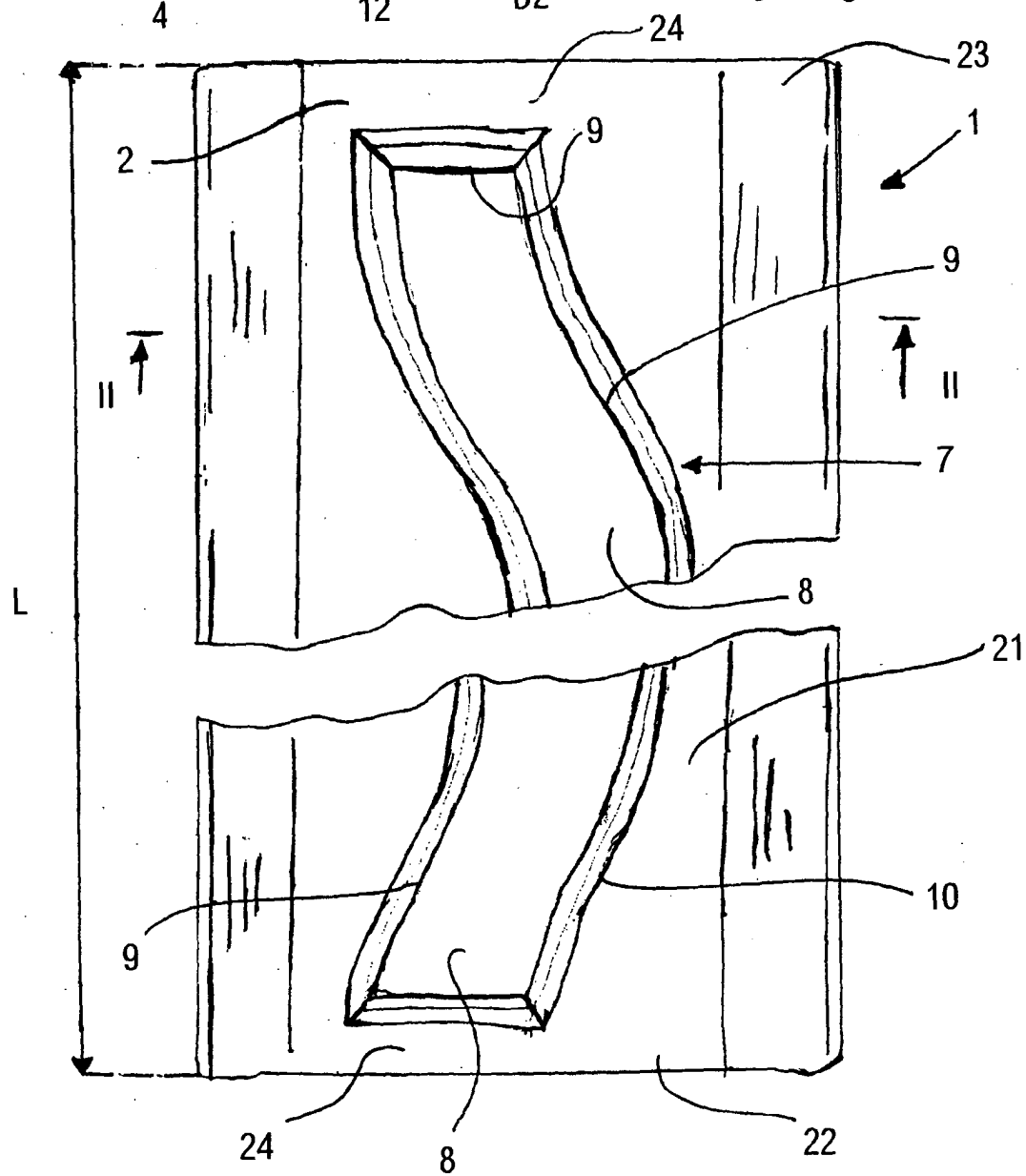


Fig. 1

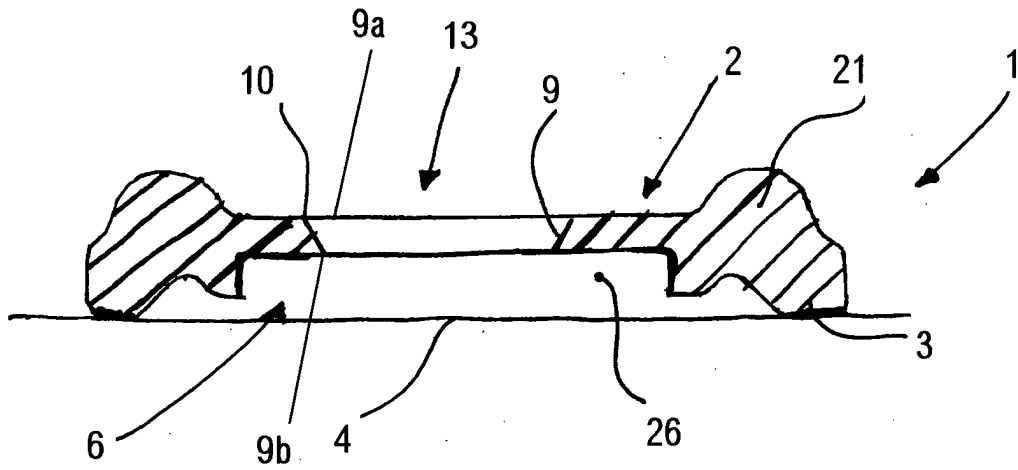


Fig. 3

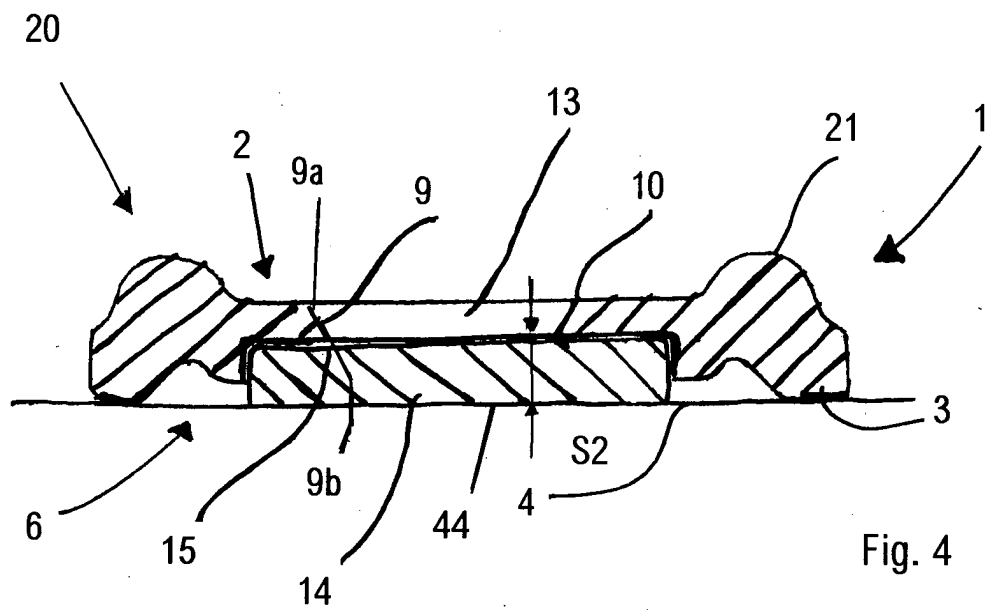


Fig. 4

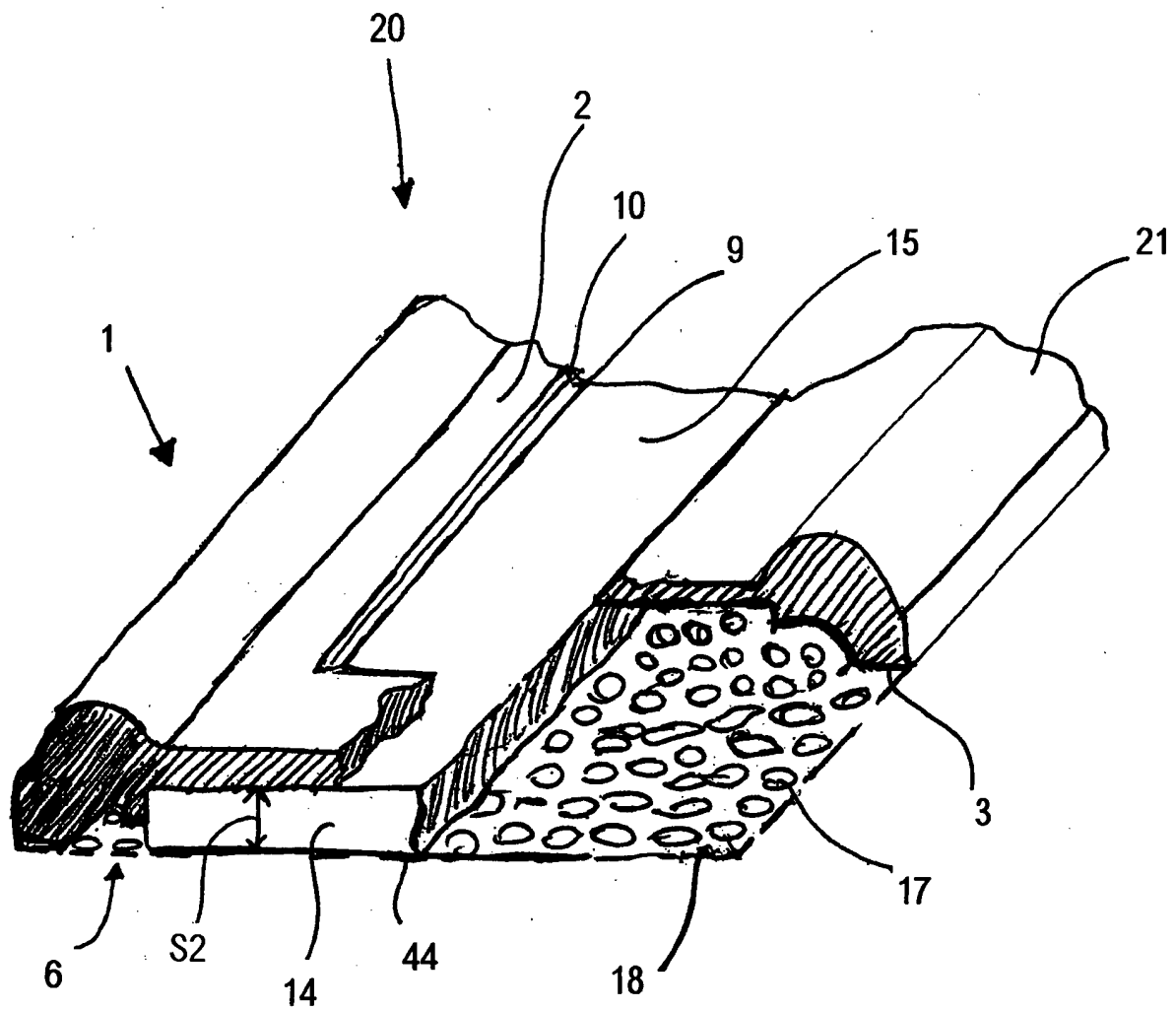
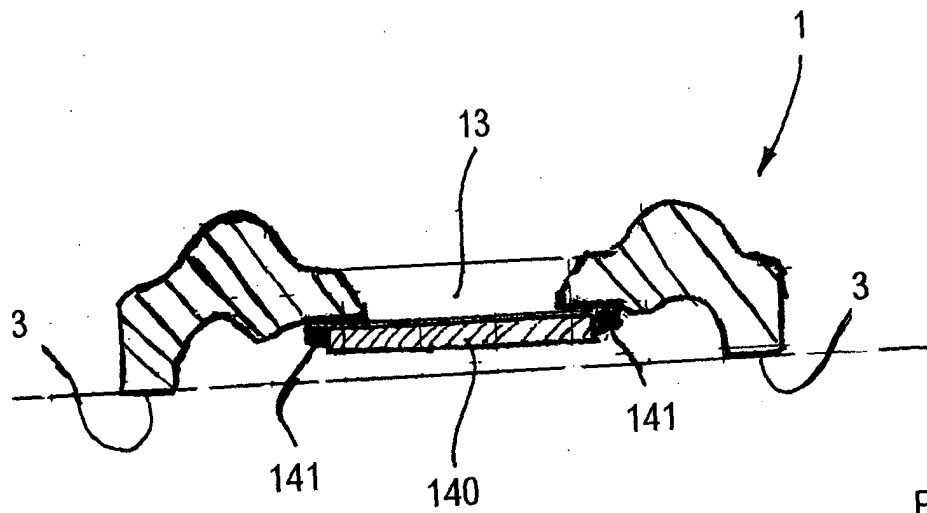
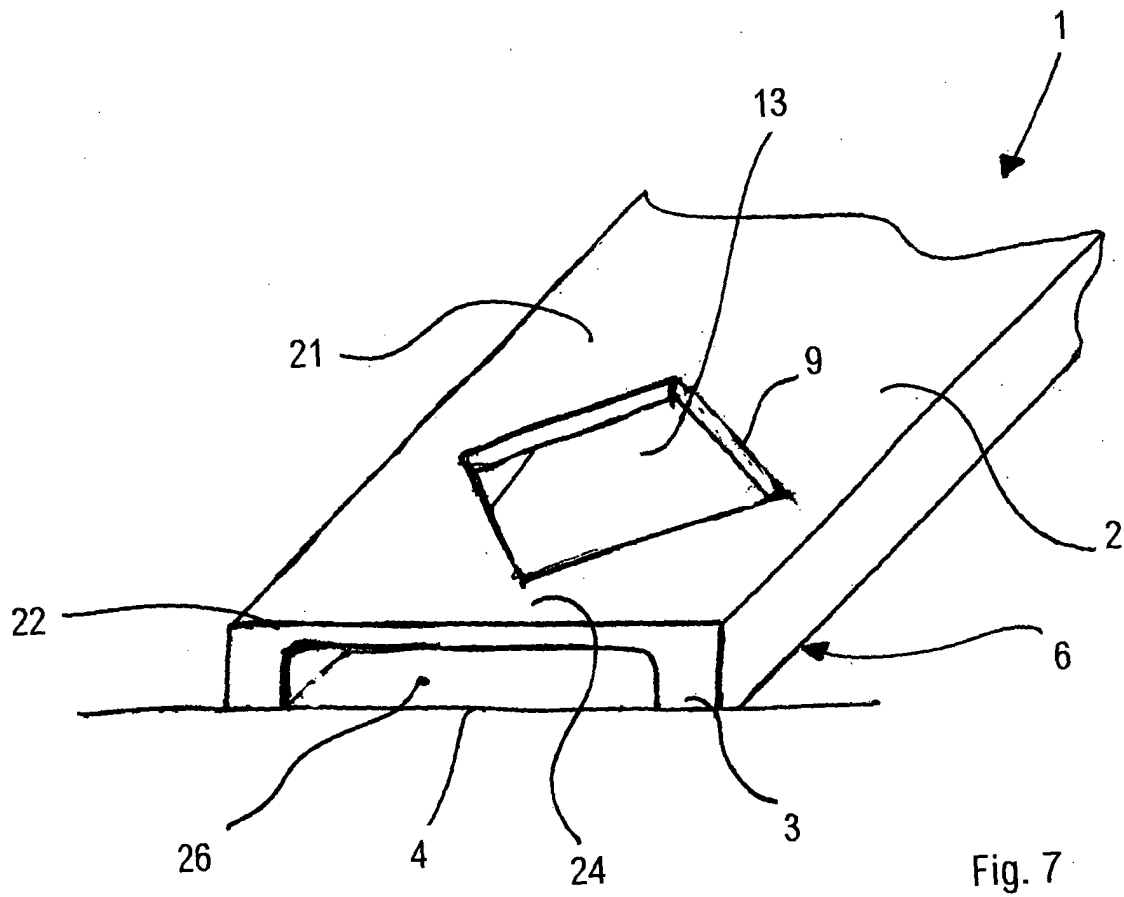
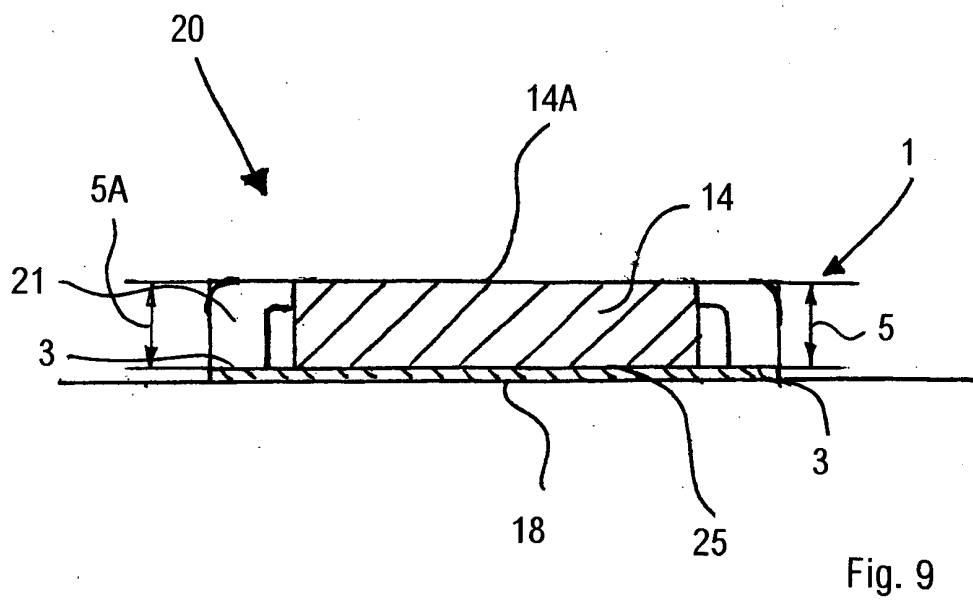
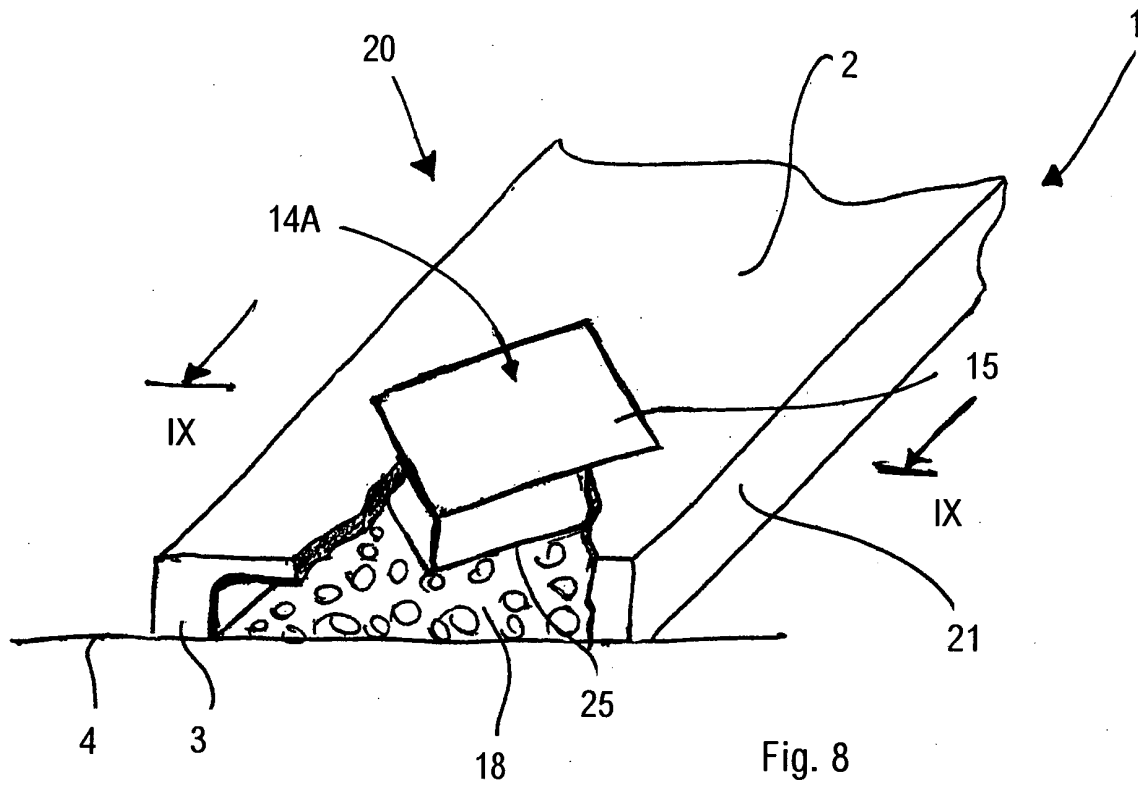


Fig. 5





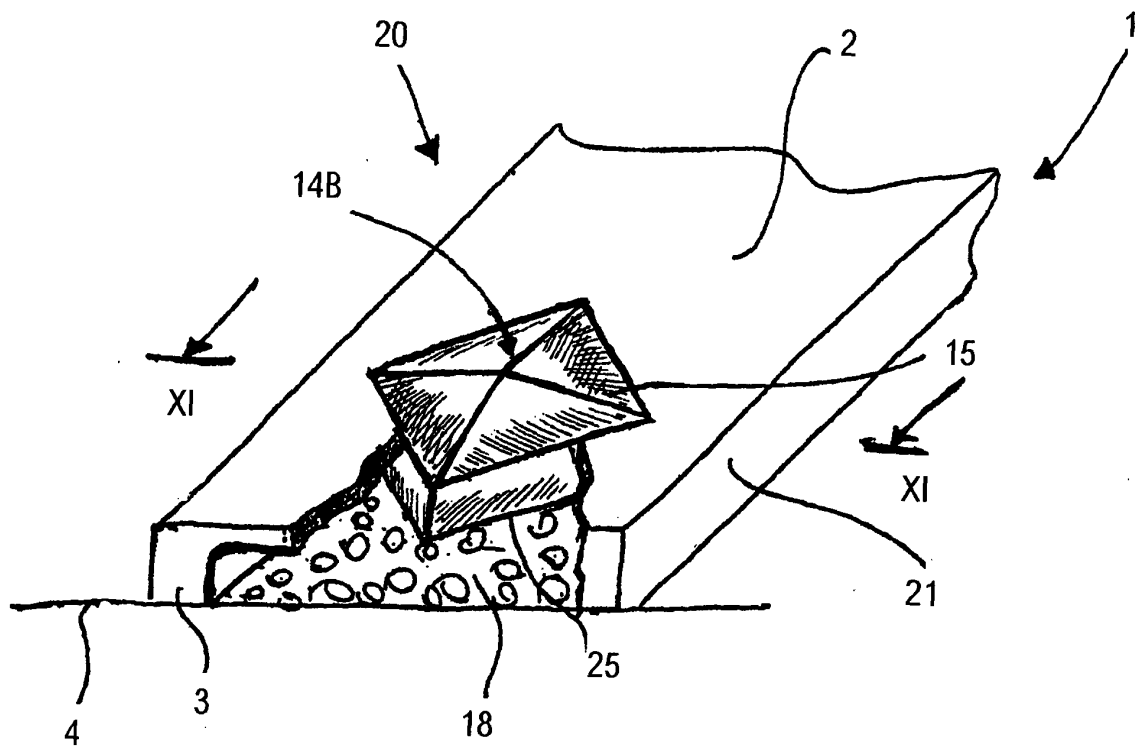


Fig. 10

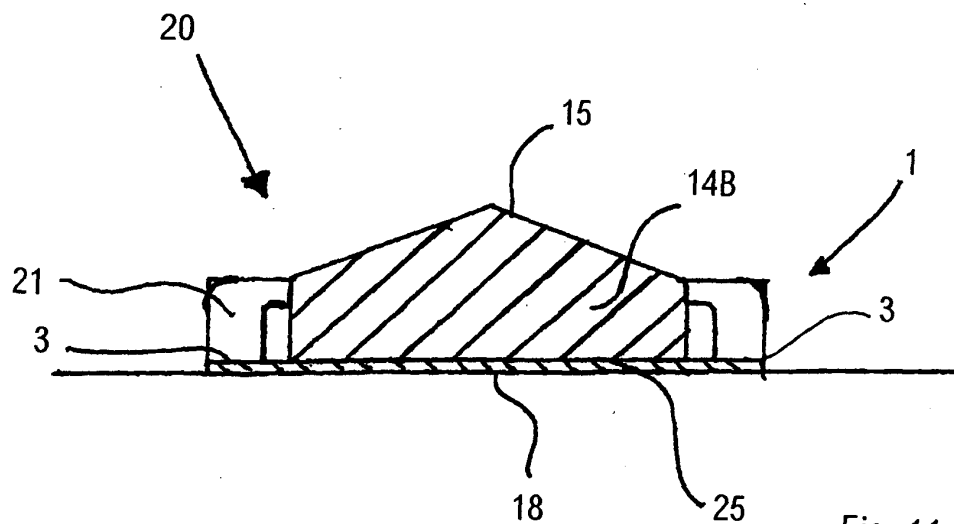
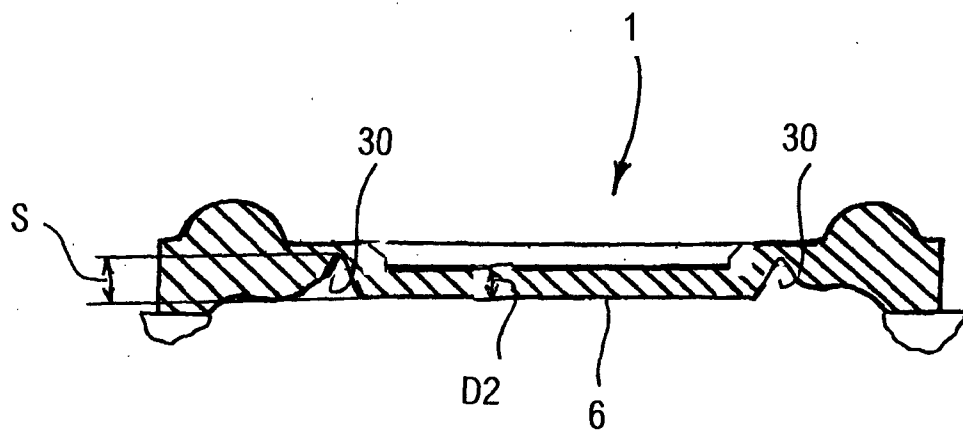
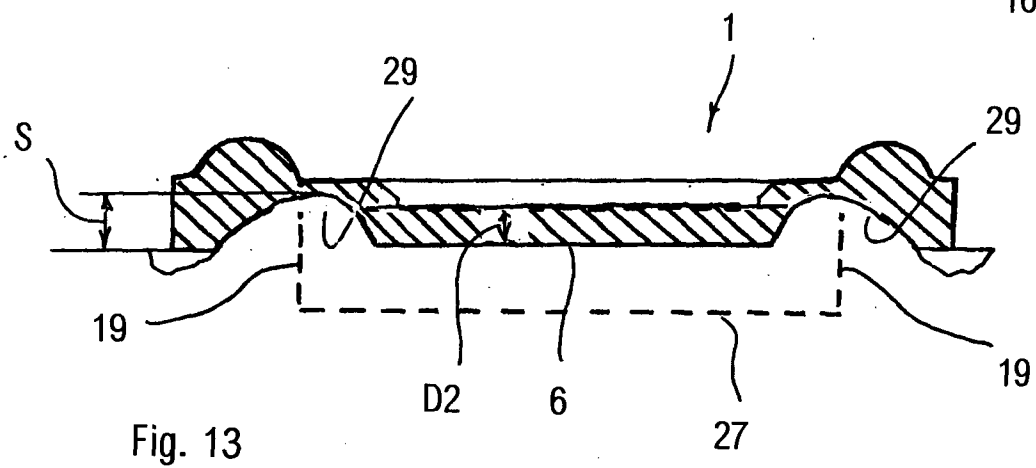
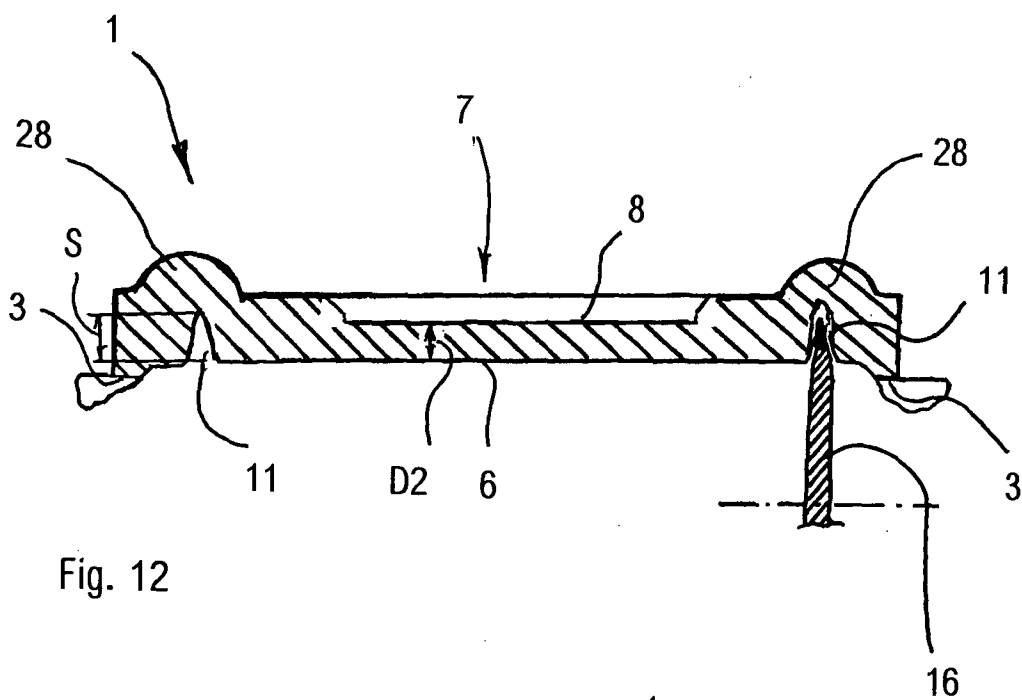
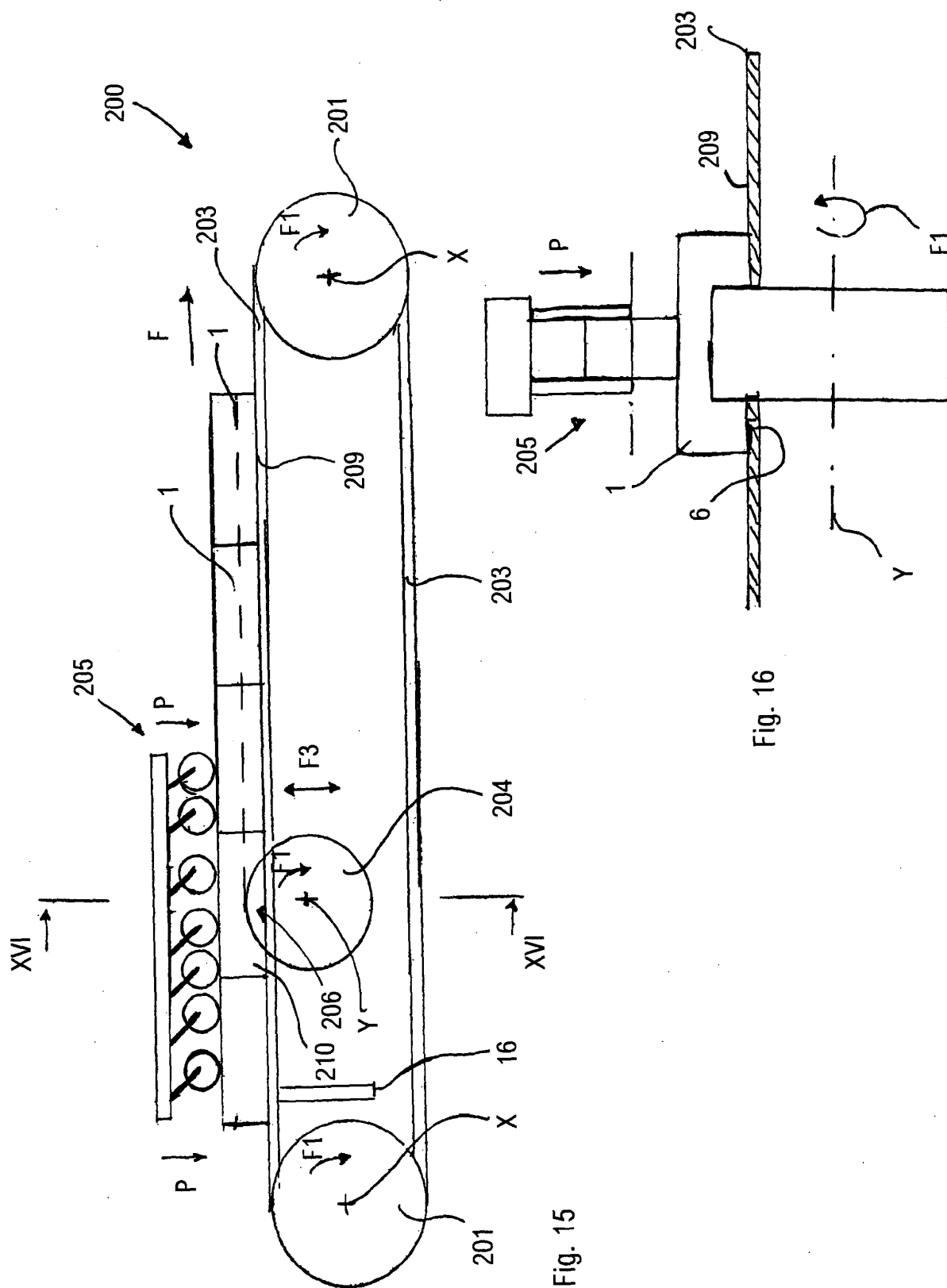


Fig. 11





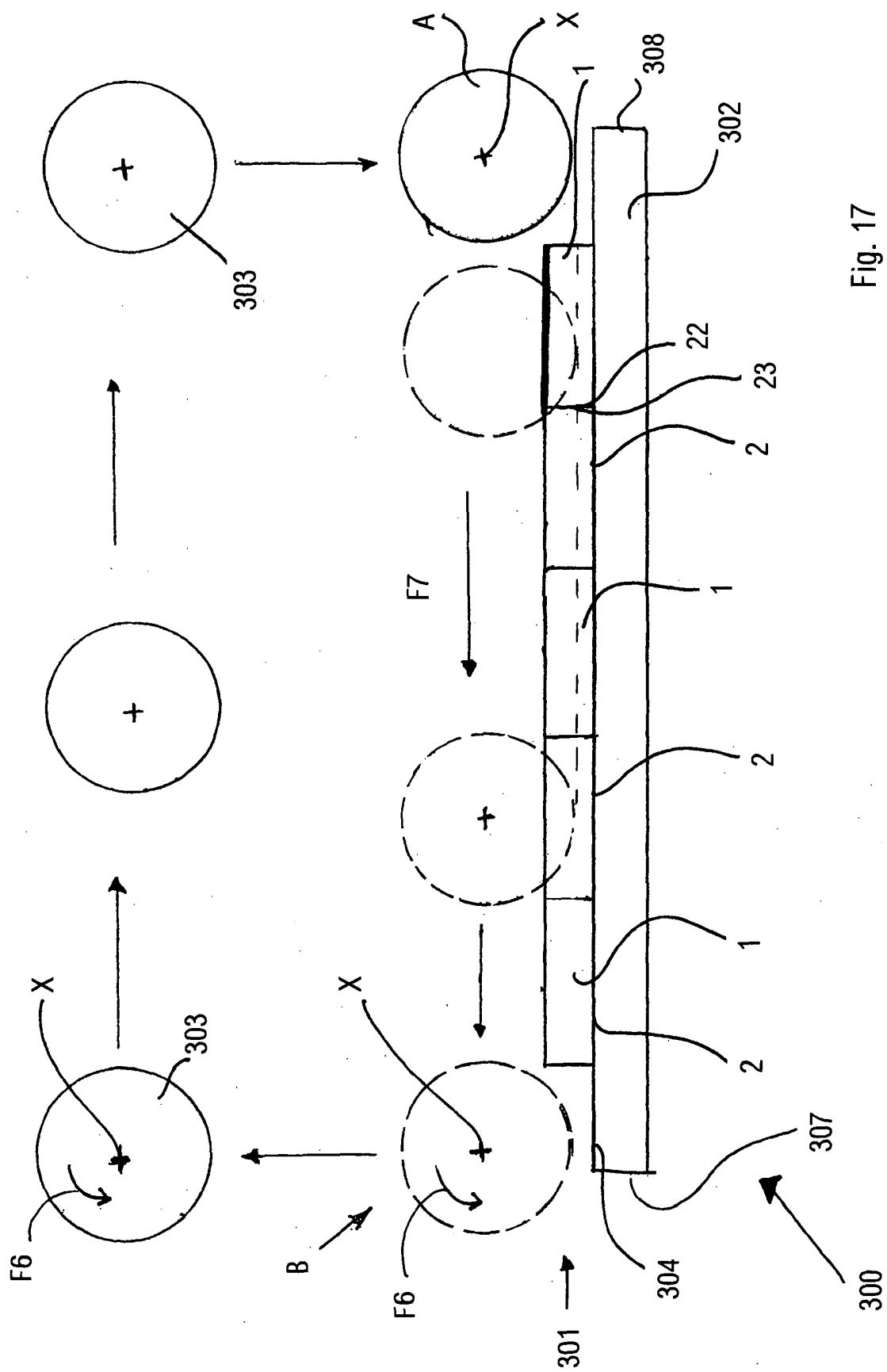


Fig. 17

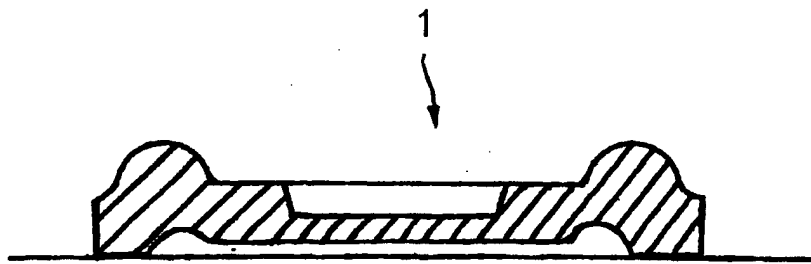


Fig. 18

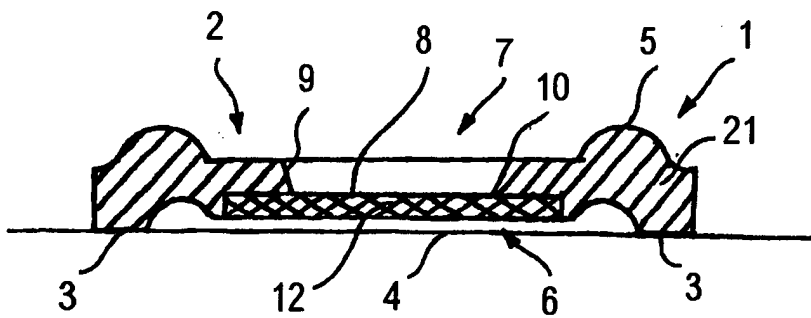


Fig. 19

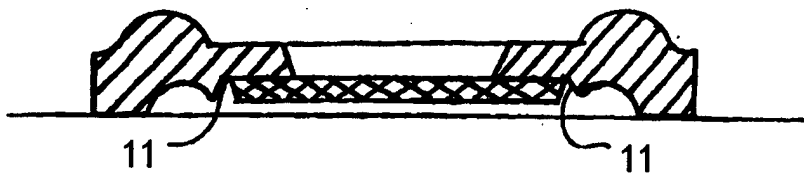


Fig. 20

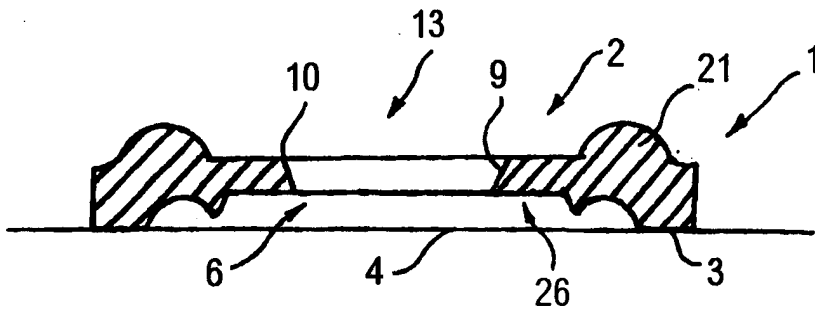


Fig. 21

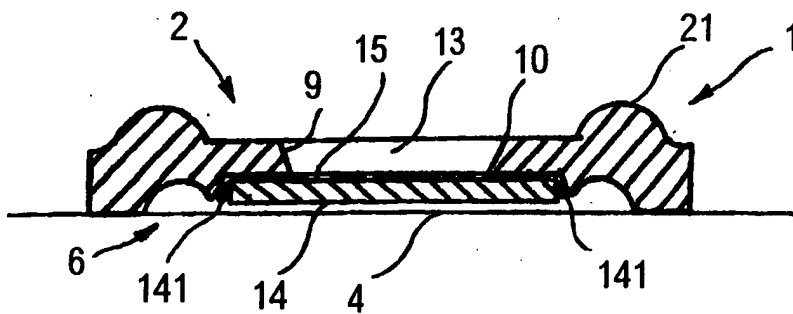
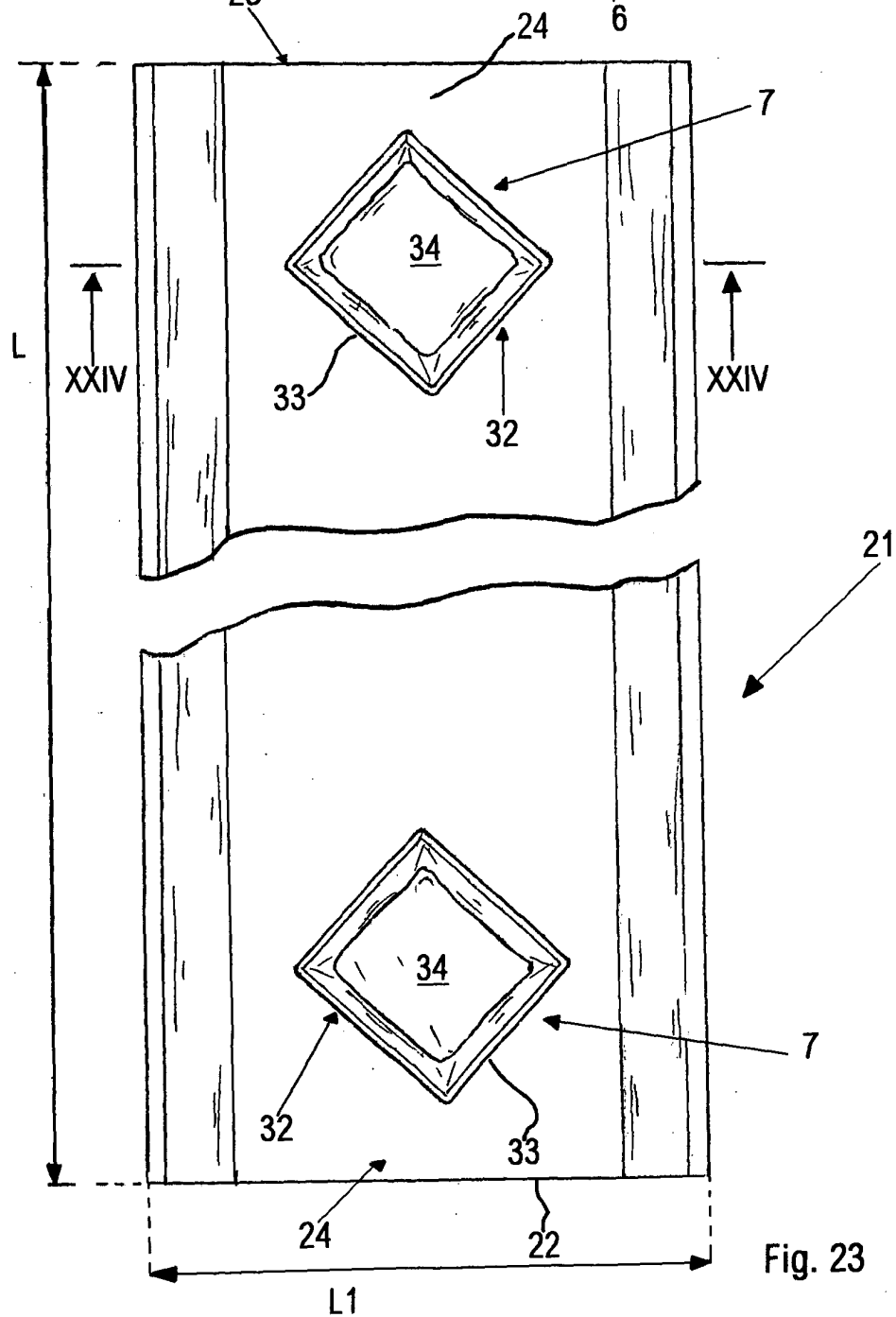
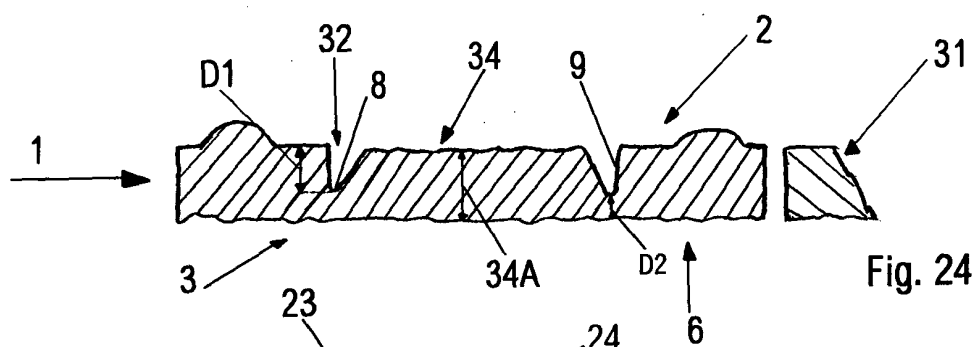
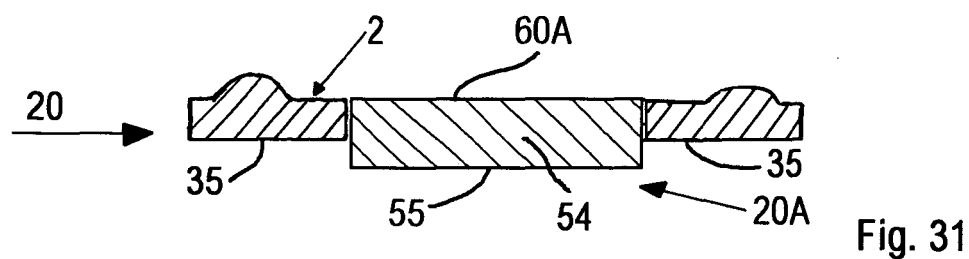
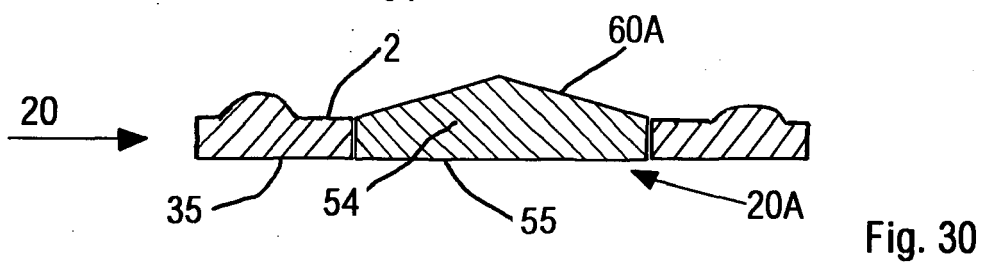
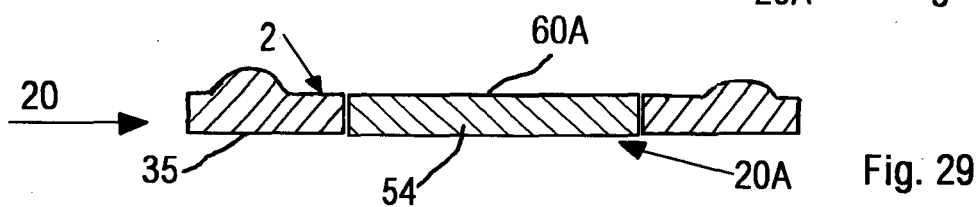
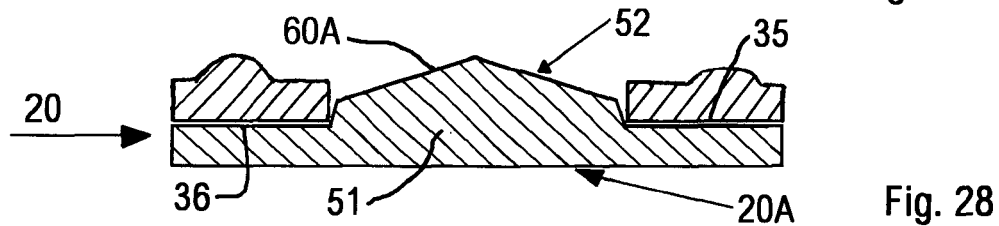
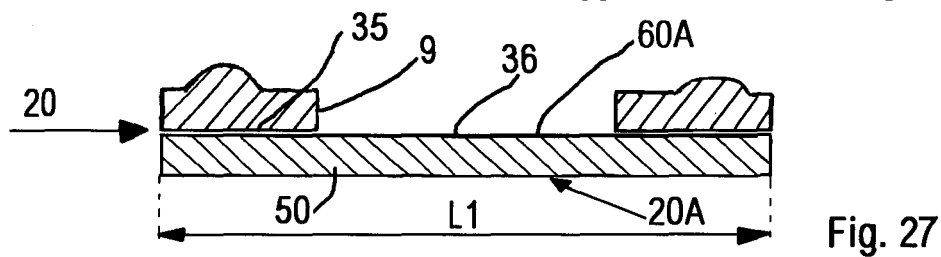
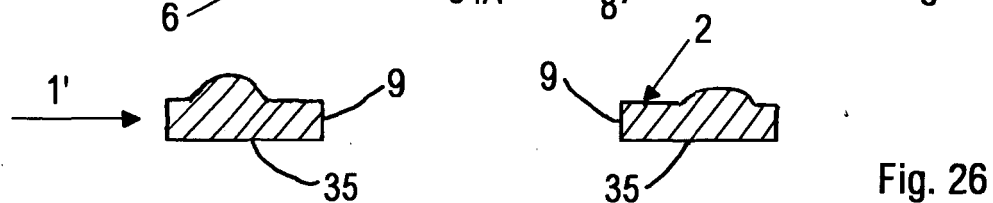
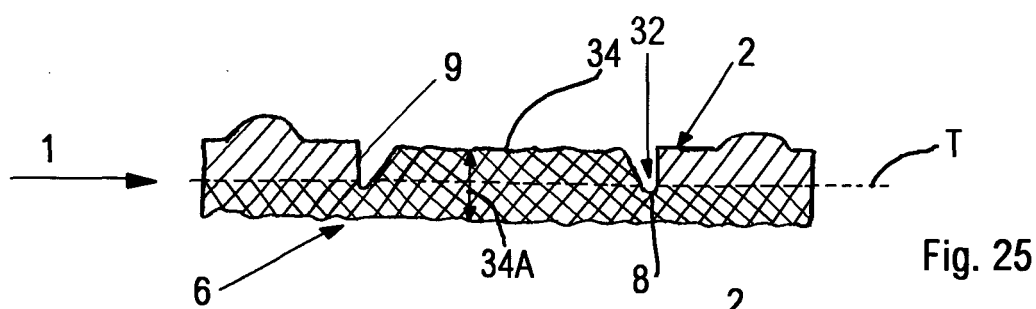
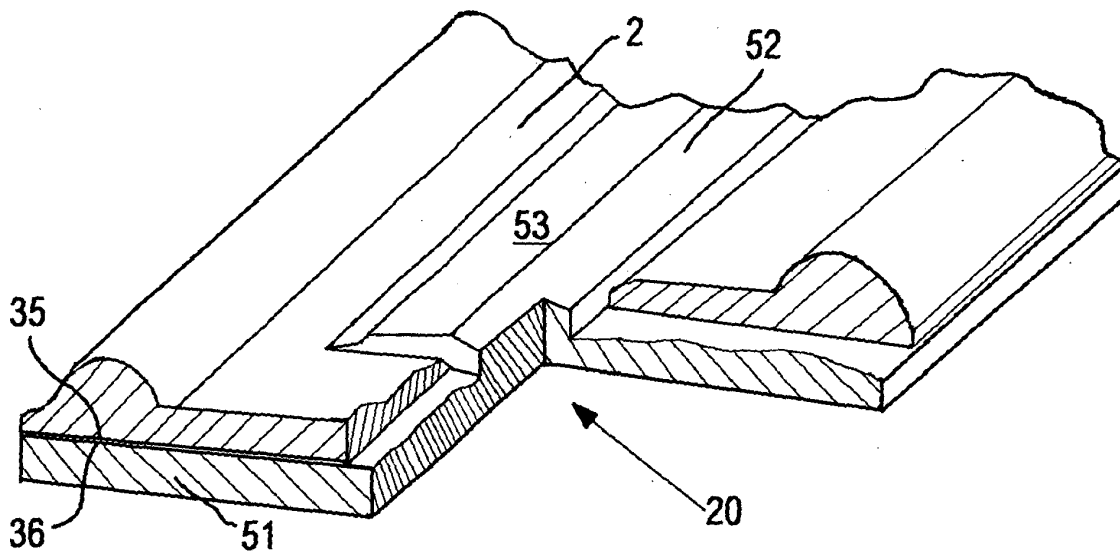
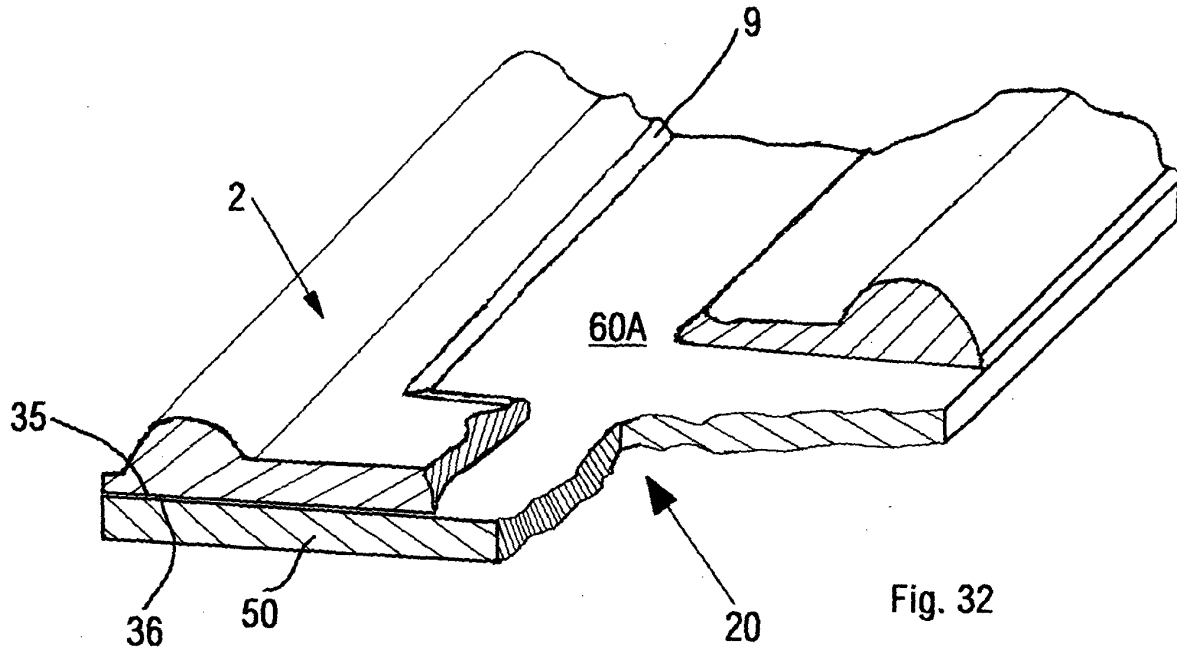


Fig. 22







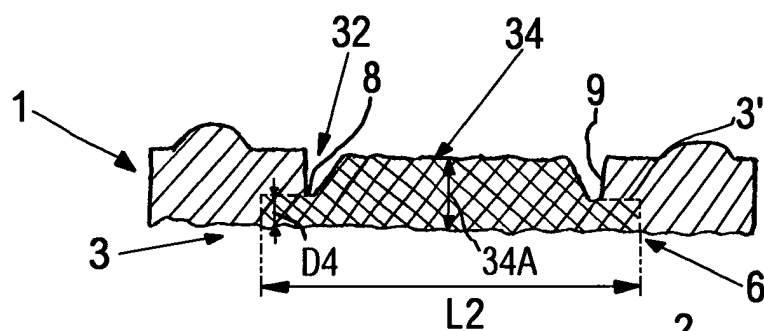


Fig. 34

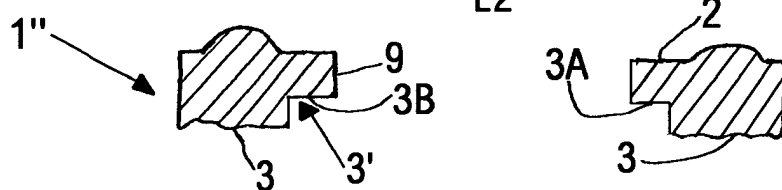


Fig. 35

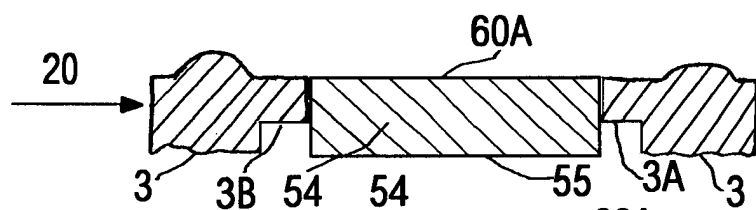


Fig. 36

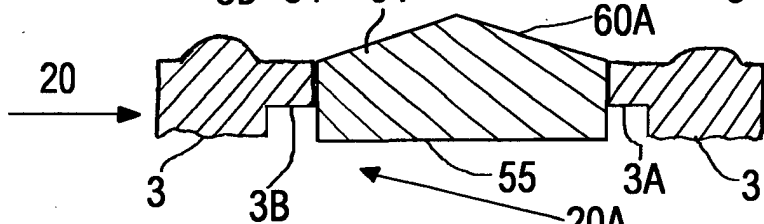


Fig. 37

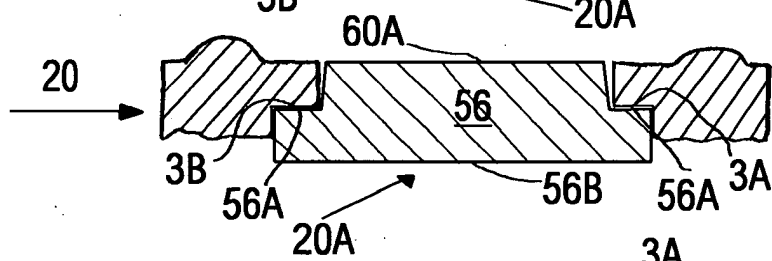


Fig. 38

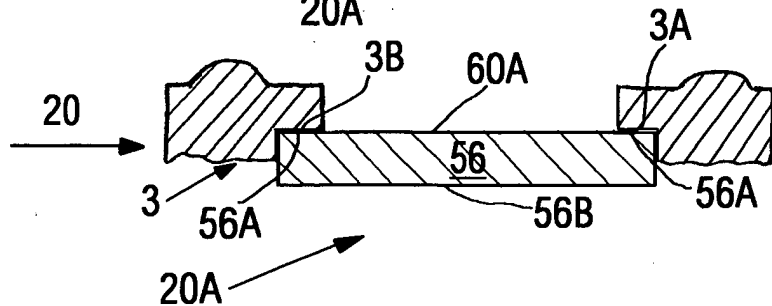


Fig. 39

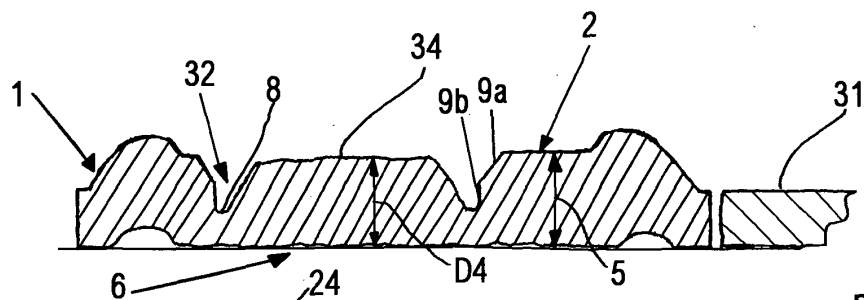


Fig. 41

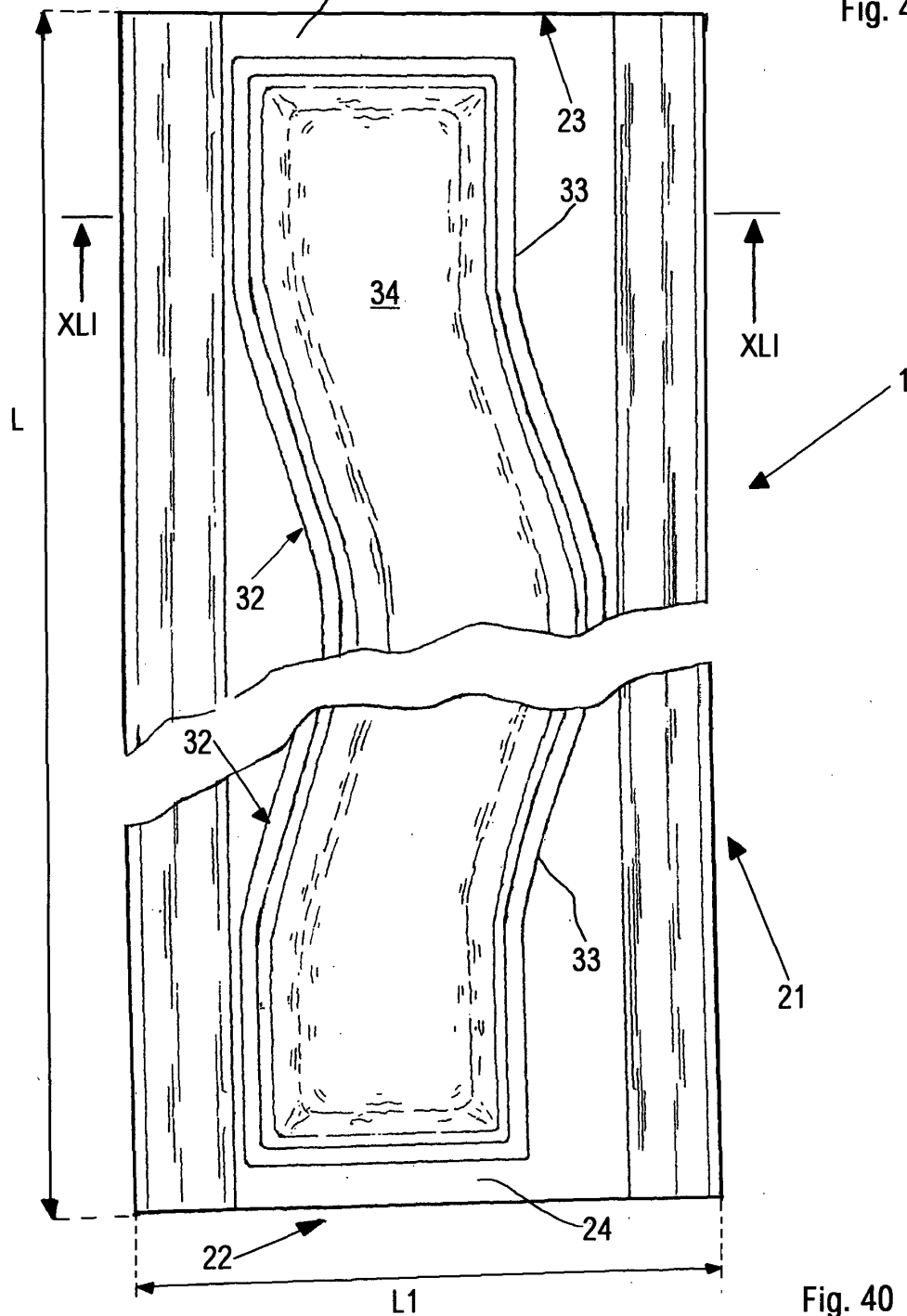


Fig. 40

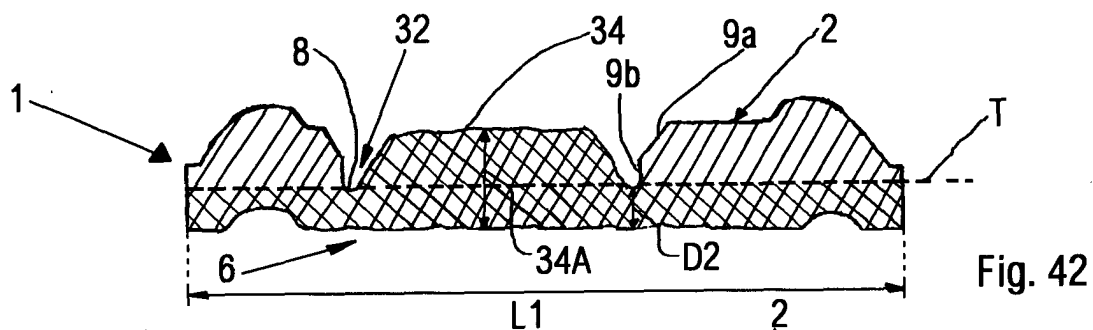


Fig. 42

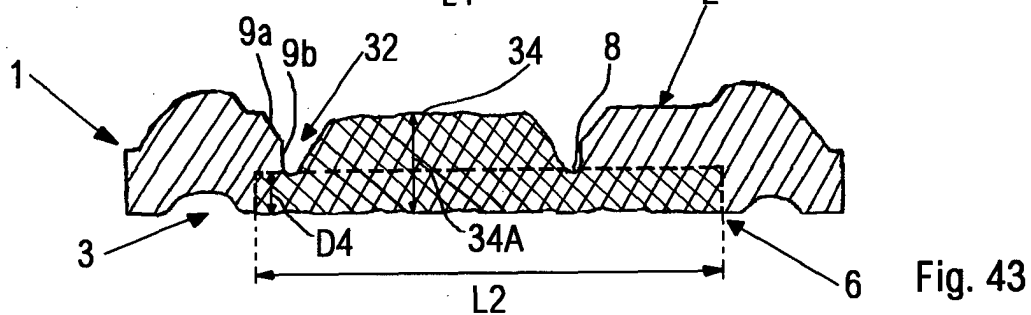


Fig. 43

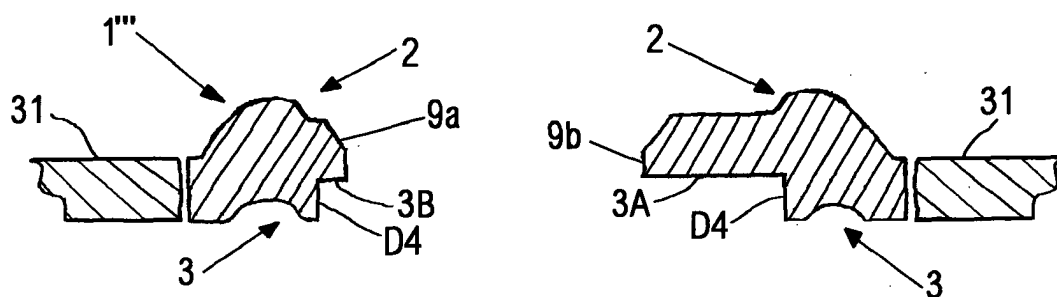


Fig. 44

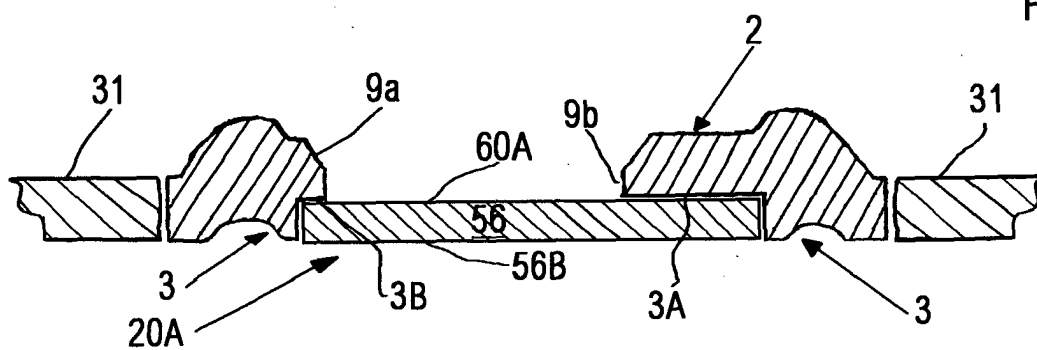


Fig. 45

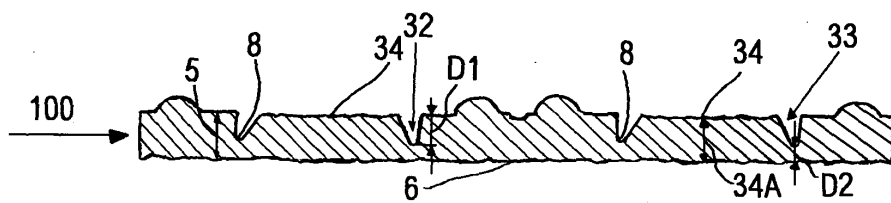


Fig. 47

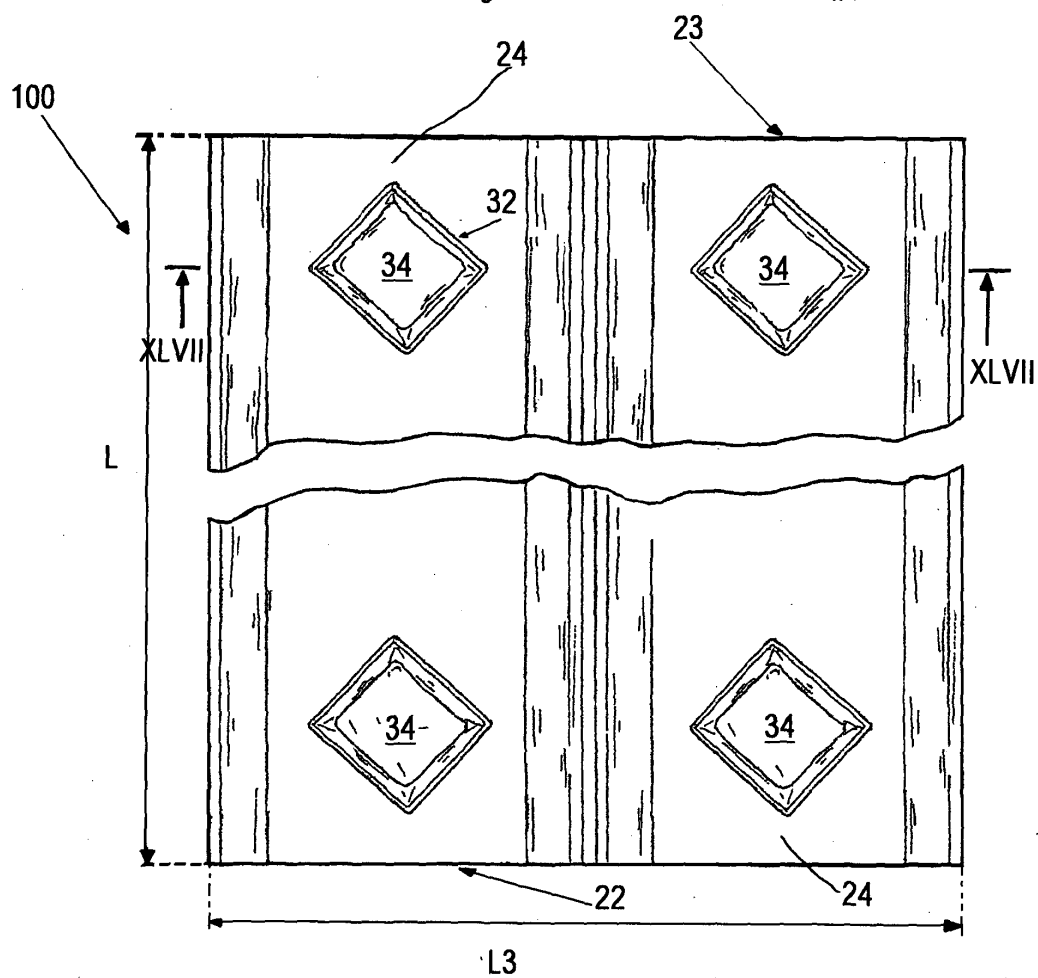


Fig. 46

