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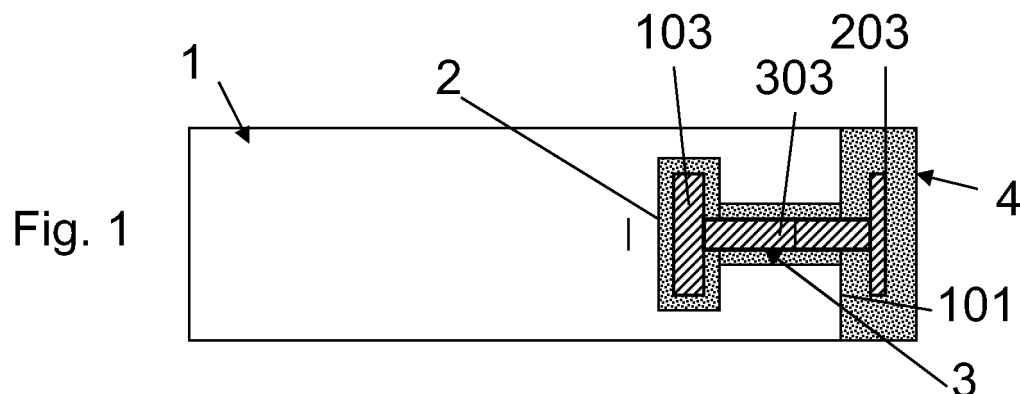
(54) **Panel for making formwork walls and process for making said panel**

(57) Panel for making formwork walls for containing concrete castings particularly for containment formworks for making concrete slabs or the like and process for making said panel.

The panel according to the present invention has a sealing edge (4) made of soft material at least along an

edge of a wooden panel that is transversal to the direction of wood fibres or grains.

As an alternative or in combination the panel has at least a stiffening strip (3) fastened to at least a part of an edge particularly the edge along the transverse side of the panel.



Description

[0001] The present invention relates to a panel for making formwork walls for containing concrete castings, particularly containment formworks for making concrete slabs or the like, which panel is made of at least a wooden layer or the like.

[0002] Formworks for containing concrete castings are known and are made of a plurality of panels making together walls for containing the concrete having desired shape and size and which panels are mounted such to make said containment walls as a supporting structure.

[0003] As mentioned above each panel is composed of at least a wooden layer having such length, width and thickness to support the stress of the concrete without deformations and at the same time to have a certain handiness for personnel assigned to transport and mount the formwork. Such sizes are substantially fixed, particularly with reference to the thickness. At present therefore there is the problem of increasing the loading resistance of panels without changing the thickness and particularly without increasing their thickness.

[0004] It is also known the fact of making panels of the type mentioned hereinbefore wherein the wooden layer is protected by a coating layer made of waterproof material like resins, films or plastic layers or the like at least along some side edges and/or parts of some side edges as well as also along at least a part of at least one of the two faces.

[0005] Then it is known for the wooden portion to be made as two or more layers, wherein strips of one layer and the ones of the adjacent layer are crossed one with respect to the other and/or as overlapping wooden sheets glued together and crossed as regards the direction of wood fibres of individual layers, such as for example plywood sheets.

[0006] Other known arrangements have a layer of wooden fibres or the like made of chips and/or dusts pressed together and firmly made by means of resins or glues, such as for example so called chipboards or the like.

[0007] Particularly as regards making formwork walls for slabs, it is necessary for panels to have a sufficient resistance to bending under the concrete weight. In wooden strips, there is a greater resistance in the longitudinal direction of wood fibres than in the transversal direction thereof.

[0008] Therefore strips are made with the longitudinal axis oriented in the direction of wood fibres indicated by natural wood grains, while transverse head edges of strips extend transversally to the direction of wood fibres.

[0009] Therefore as regards the panel having a better resistance to bending it has to be made of a plurality of adjacent strips placed at least in a layer, i.e. coplanar one with respect to the other and with the longitudinal axes oriented parallelly to wood fibres and parallelly to longitudinal direction of the panel, adjacent strips being placed side by side and joined by chemical/physical ad-

hesion, that is by gluing them at mutually contacting longitudinal edges.

[0010] However, in this case, while in the longitudinal direction of strips the panel has a considerable resistance, in the direction transversal to the longitudinal extension of strips and so of wood fibres, individual strips are subjected, in time and with use, to warping and bending giving the panel a bent or warped surface pattern or however a not straight or flat pattern.

[0011] In order to avoid the above wooden panels are made of a single wooden layer or three overlapping wooden layers each layer being made of a plurality of adjacent strips joined together along their longitudinal edges and however strips of each layer with their longitudinal axes and/or wood fibres, being oriented transversally to longitudinal axes and/or wood fibres of strips of the immediately adjacent layer.

[0012] This arrangement guarantees that deformations of the panel in the direction transversal to wood fibres and/or longitudinal extension of strips and/or panels do not occur.

[0013] In single-layer panels, i.e. made of a single layer of adjacent strips joined along longitudinal edges it is known to provide stiffening strips for head edges, i.e. panel edges oriented transversally to the longitudinal extension of strips and composed of an overturned U or C shaped bar inserted above the end portion of one or each one of said two opposite head edges of the panel. The stiffening bar can be fastened by a simple coupling as regards the shape and/or by forcing it on the corresponding end of the panel or it is possible to provide to fasten it by screw means and/or also by gluing it by means of adhesives or similar substances injected and/or applied between the bar and the panel end both previously and subsequently.

[0014] In this embodiment the stiffening bar closes and/or covers the outside of the head edge of the panel that is composed of the assembly of head edges of individual strips and which head edges are oriented transversally to wood fibres, but without guaranteeing to effectively seal said head edges against moisture penetration. Since these head edges transversal to the direction of wood fibres are particularly permeable to water and/or moisture penetration, known stiffening bar, even if they effectively help in preventing the panel to warp in the direction transversal to the one of strips and of wood fibres, are an ineffective obstacle against moisture penetration, but are an effective barrier against drying. This means that they cover head edges leaving water and moisture to pass through, but prejudicing or however preventing or slowing down the drying process, so processes wearing the wood due to moisture penetration are encouraged.

[0015] The invention aims at providing a panel of the type described hereinbefore that can have characteristics about the resistance of the panel to stress that are better or at least equal to the ones of known panels in a simple and inexpensive way, effectively overcoming

drawbacks of known panels and i.e. allowing to effectively increase the loading resistance of the panel without the need of increasing the thickness or of complex and deep structural changes and of materials composing the panel.

[0016] The invention achieves the above aims by a panel of the type described hereinbefore and i.e. a panel for making formwork walls for containing concrete castings, particularly containment formworks for making concrete slabs or the like, which panel is made of at least a wooden layer or the like and wherein at least a panel edge at least for a part thereof is oriented transversally to the direction of wood fibres and having at least for said part a sealing edge made of plastic material, overlapping the head side of the panel along at least said part of said edge and it is fastened to said head side of the panel by chemical/physical adhesion sealing it outwardly.

[0017] According to a further characteristic, said sealing edge is provided in combination with a stiffening bar or it is a stiffening element itself in combination with a reinforcing bar.

[0018] An advantageous embodiment of the panel provides a wooden layer with at least an head wall of a perimetral edge of said wooden layer, a stiffening bar is fastened to such head wall, by mechanical coupling or a coupling as regards the shape, which stiffening bar, at least for a part of its length, projects outwardly from said head side of the edge of said wooden layer being embedded in a plastic sealing edge overlapping said head side of said edge of the wooden layer, said sealing edge being coupled by chemical/physical adhesion to the head side of the edge of the wooden layer and to projecting portions of said stiffening bar.

[0019] The mechanical coupling between the wooden layer and the stiffening bar can be made by providing a stiffening bar with a strap-like central portion and an enlarged end portion along one of the two longitudinal edges, while a groove with a shape corresponding to the section of a part of the strap and of said enlarged end portion is made in the thickness of the wooden layer along said head side of said edge, which groove is open at least at one of its head ends and said bar being engageable in said groove through said open head side, while the bar strap projects for a certain length outwards from the head side of said edge of said wooden layer.

[0020] The sealing edge overlaps all the thickness of the head side along the panel edge to which the stiffening bar is associated and also all the portion of the stiffening bar projecting past said head side of said edge of the wooden layer.

[0021] The stiffening strip can be made of different materials such as for example plastic material, preferably a plastic material having a nature equal to or similar to the one of the sealing edge or a plastic material chemically compatible with the one of the sealing edge and/or also of metal material.

[0022] The projecting portion of the stiffening bar can be provided with a surface roughening treatment or with

a treatment increasing the adhesiveness of plastic material the sealing edge is made of.

[0023] The surface treatment can be a mechanical treatment for example the provision of ridges or knurls on the surface of the stiffening bar and/or a chemical or physical treatment changing physical or chemical conditions of the surface layer of the stiffening bar.

[0024] Various variants are possible.

[0025] Still according to a variant embodiment, the edge of the projecting portion of the stiffening bar can be made also as an enlarged one with respect to the thickness of the flat portion, like the edge inserted in the groove provided in the edge of the wooden layer.

[0026] Sections of enlargements can be the same or different and of any type. A particularly simple shape is a stiffening bar with a double T or H shaped section.

[0027] A particularly simple embodiment provides a T shaped stiffening bar to be associated to the panel, said bar being engaged by forcing it in a groove provided in the corresponding head edge of the panel by the tab corresponding to the stem of the T-shaped section, while the tab constituting the arm of the T adheres against said head edge covering and protecting it. Advantageously the tab constituting the arm of the T ends flush with panel faces.

[0028] Said T-shaped stiffening bar can be provided both without the soft plastic material applied by injection and in combination with said plastic material applied by injection as mentioned above.

[0029] Further variants can be the amount of strip or wood material layers or the like joined together and making the wooden layer of the panel.

[0030] A first layer made of a plurality of adjacent wooden strips joined together along mutually contacting head sides of longitudinal edges of said strips can be coupled to a further layer or to various wood fibre layers that in turn can be as a single- or multi-layer sheet, such as plywood and/or chipboard panel or the like.

[0031] As an alternative or in combination at least a further layer made of wooden strips placed side by side and joined along mutually contacting longitudinal sides of longitudinal edges of said strips can be fastened to the first strip layer in an overlapping position, directly or by interposing further wooden fibre layers of different type and with a different structure.

[0032] The at least two strip layers can be arranged with longitudinal axes of strips oriented in different directions, i.e. crossed one with respect to the other. Particularly the arrangement can provide strips of one layer to be oriented perpendicularly to strips of the adjacent layer with reference of their longitudinal axes.

[0033] As regards the provision of strip layers, the invention provides the wooden layer to be made of at least a layer made of a plurality of adjacent wooden strips joined together along mutually contacting longitudinal sides of longitudinal edges of said strips, wood fibres of individual strips being oriented in the longitudinal direction of strips.

[0034] This can be provided also as regards two or more overlapped strip layers.

[0035] The sealing edge can be made of any type of plastic material. Particularly a soft or substantially soft and elastic plastic material is used such as soft polyurethane.

[0036] The application of the sealing edge preferably occurs by over-molding and particularly by injection. This mode allows to perfectly seal the edge or edges of interest of the wooden layer, and also to improve the mechanical anchorage of the stiffening bar. The plastic material injected for over-molding the sealing edge penetrates also in possible gaps due to manufacturing tolerances and generated between walls of the groove in the wooden layer and the corresponding part of the stiffening bar inserted therein. This helps also the anchorage of the sealing bar therefore having extensions in said groove.

[0037] On the other hand, the result improving the anchorage is further increased also by the combination of the rigid material being of the same type or similar type of the soft material. The soft material applied by injection having the characteristic of better penetrating in gaps between stiffening bar and the groove engaging it and at the same time of penetrating also deeply in gaps of wood pores acts synergically with the effect of the better and more resistant mechanical anchorage of the stiffening bar to wood.

[0038] When the edge of the wooden layer to which the sealing edge is applied is oriented transversally to wood fibres, the surface along said edge is rough or however porous and uneven, so a better interpenetration between said wood surface and the plastic material of the sealing edge is obtained therefore improving not only the mechanical anchorage, but also the sealing, creating a barrier against moisture having a certain penetration depth in the wooden layer.

[0039] A further advantage of the synergic combination of soft plastic material of the sealing edge with the rigid plastic material of the stiffening strip is the fact that the sealing edge can be thicker without the risk of being deformed by the loading of the concrete casting due to the provision of the rigid material of the stiffening strip. A soft material edge having a greater thickness or section naturally leads to a better protection against impacts of the wooden layer, since the volume of material that can be deformed and so intended to absorb the impact energy is greater. On the contrary the provision of rigid material allows to break the shock wave absorbing and discharging the energy of the shock wave over its length and so reducing the local stress dividing the local peak of impact energy on a larger absorbing surface.

[0040] The panel in combination on one or both faces can provide one or more outer coating layers having anti-moisture function as well as an anti-adhesion function as regards the concrete.

[0041] These coating layers can be made of thin resin, paint films or the like or of layers made of plastic material for example composed of polypropylene filled with veg-

etable flours and known for example under the name Wood-Stock®. Said coating or protective layers can be tightly joined together by being chemically/physically adhered to sealing edges thus generating a jacket sealing the inner wooden layer that is made of plastic material or resin and that is tightly closed on all sides by said chemical/physical adhesion for example welding, gluing or the like.

[0042] In the above example, the sealing edge is applied to the panel already provided with the wooden layer and with a coating or protective layer on at least a side, such that during molding the material of the sealing edge overlaps the head surface of the edge of the wooden panel and of the corresponding thickness of the edge of the coating and/or protective layer.

[0043] With particular reference to the case wherein at least a further layer made of wooden strips placed side by side and joined along mutually contacting longitudinal sides of longitudinal edges of said strips can be fastened to the first strip layer in a position overlapped thereto, directly or by interposing further wood fibre layers being of a different type and with a different structure as the one described above, it has also been found that it is very advantageous to provide at least two overlapping wooden layers each one made of a plurality of wooden strips placed side by side joined together along mutually contacting longitudinal sides of longitudinal edges of said strips, wood fibres of individual strips being oriented in the longitudinal direction thereof.

[0044] Advantageously in this arrangement, the position of strips of a first layer is transversally offset with respect to the position of strips of at least a second adjacent layer such that, mutually contacting and joining longitudinal surfaces of strips of said first layer are in a position non coinciding with mutually contacting and joining longitudinal surfaces of strips of said second layer, i.e. in a position coinciding with an intermediate longitudinal axis of strips of said second adjacent layer and obviously viceversa.

[0045] Said arrangement has considerable advantages. From one hand considering the mechanical point of view, the panel is more resistant to loadings with reference to its extension parallel to the longitudinal extension of strips. Such longitudinal direction is substantially parallel to the direction of wood fibres and so to the condition with the wood carrying out its greatest mechanical resistance to the loading. The at least two wooden layers each one made of an assembly of strips placed side by side joined together which strips are oriented with their longitudinal axes parallel one with respect to the other and which longitudinal axes are substantially parallel to the direction of wood fibres therefore guarantee an increase in the loading resistance with reference to said longitudinal direction of the panel. Such increase allows to have a wooden layer of the panel made of only two strip layers and having a loading resistance greater than the resistance provided by an usual panel having a wooden layer made of at least three overlapping strip layers and where-

in directions of strips are crossed one with the other. Obviously the loading resistance in the transversal direction of strips and the resistance of the panel to deformation or transversal warping is guaranteed by the provision of sealing edges that are reinforced at least along the two head edges of the panel oriented transversally to the longitudinal axis of strips and/or to the direction of wood fibres.

[0046] Advantages of such arrangement are beyond what already mentioned above, since, due to the fact that strips of individual layers are parallel one with the other, both with reference to the direction of the longitudinal axis and with reference to the direction of wood fibres, surfaces of head edges of strips oriented transversally to wood fibres are provided for all the panel only along the two transverse edges of the panel.

[0047] Moreover considering that water or moisture absorption by strip surfaces oriented parallelly to wood fibres are negligible, so it results that sealing against moisture and/or water penetrations is necessary only along said two edges of the panel at which head sides of strips are present or constituted by them.

[0048] If two layers or more layers of wood fibres and particularly two or more overlapping strip layers are provided, it is possible to provide only a stiffening strip for each head edge of the panel or a stiffening strip for each wooden layer or for a sub-group of layers with respect to the general amount of layers.

[0049] The groove for introducing the strip can be made as extending within the thickness of one layer or it can extend over the thickness of various adjacent layers. Obviously size and shape of the stiffening strip section have to correspond to the groove ones.

[0050] Still an advantageous characteristic of the present invention that can be provided separately or in combination with previous characteristics, provides the wooden layer to have hollow corner regions filled with insert made of plastic material having such a size to complete the perimetral shape of the panel to an ideal shape of it provided without said hollow regions.

[0051] Recesses at corner regions of panels having square, rectangular or polygonal shapes are provided with a U-shaped curved wall opening towards the edge corresponding to the transverse side of the panel.

[0052] When a sealing edge is provided said sealing edge can be connected to the plastic filler of at least one of said recesses.

[0053] Particularly said sealing edge joins together the filling material of two recesses at corner regions at two ends of said transverse edge of the panel.

[0054] The sealing edge can be made as a reinforced one like mentioned above and the reinforcing element can extend also in recesses of corner regions being embedded in the filling plastic material like the region of the sealing edge.

[0055] The reinforcing element can be a stiffening strip inserted in a groove along an edge, preferably a transverse edge of the panel.

[0056] Said groove by each one of its ends leads in one of the two recesses of the panel provided in opposite corner regions at ends of said transverse edge and the stiffening strip can have such a length to project in one or both said recesses at least for a part of their extension in a direction parallel to the transverse edge of the panel.

[0057] It is also possible to provide for the one or two ends of the stiffening strip projecting in corner recess/recesses of the panel to be bent such to extend for a certain depth in the corresponding recess in the direction of the extension of the recess both parallelly to the transverse edge and parallelly to the longitudinal edge.

[0058] The filler of recess/recesses is made by over-molding one or more edges of the wooden layer and/or at least a part of it/them by the same treatment there being possible to make at the same time also the sealing edge, so the portion of the sealing edge and filler/fillers of recesses are firmly made and are made of the same material.

[0059] Recesses of the wooden layer constituting the panel core and filled with plastic material, particularly of the soft type as for the stiffening edge and being also partially reinforced, give a high protection of panel corner regions that are regions more subjected to damages when transporting, mounting and/or dismantling the formwork.

[0060] The provision of the continuous reinforcement and being one-piece with the sealing edge increases the mechanical resistance both as regards the anchorage to the wooden layer and as regards the absorption of mechanical stresses particularly the ones due to impacts.

[0061] As already said above a synergic effect between rigid material and soft material is generated that is not limited to the simple combination of mechanical effects due to each of said materials and i.e. the sealing, the better interpenetration between soft material and wooden panel and the action absorbing the impact energy for the soft material and the action stiffening and increasing the mechanical resistance as well as the better mechanical anchorage between the element of rigid material and the panel by mutual engagement elements. Here, the provision of the rigid material gives a greater resistance to bending and deformation also of the soft material, so it is possible to provide a sealing edge made of soft material having a greater section and so a better effect for elastically absorbing the energy of the impact, while the stress of the loading on the panel does not substantially deform the edge made of soft material to which the rigid core gives a better resistance. On the other hand the soft material increases the mechanical coupling between rigid material and panel removing possible gaps, while the rigid material is an element intended to discharge local stresses due to impacts on larger surfaces thus breaking the shock wave and helping the action protecting the edge made of soft material.

[0062] The provision of an U-shaped end cavity in the wall of the recess faced towards the transverse edge of the panel increases the contact surface between the fill-

ing insert made of plastic material and the wooden layer, thus preventing the separation also under a sudden stress condition for example an impact.

[0063] The invention has further characteristics that are object of subclaims.

[0064] Characteristics of the invention and advantages deriving therefrom will be more clear from the following description of a non limitative embodiment shown in annexed drawings, wherein:

Fig. 1 is a schematic view of a first embodiment of the invention with an enlarged section of the end part of a panel at one of the transverse edges thereof and according to a perpendicular, longitudinal plane.

Fig.2 is a variant of the embodiment of fig.1 wherein the panel is made of two wooden layers.

Fig.3 is the embodiment of figure 1 wherein the wooden layer is covered on both faces by a protective and waterproofing layer.

Fig.4 is a variant of the embodiment of figure 2 wherein the wooden layer is covered on both faces by a protective and waterproofing layer.

Fig. 5 is an exploded view on the transverse head side of a panel according to the variant of figure 3 with the stiffening strip and the sealing edge being omitted.

Fig. 6 is an exploded view on the head transverse side of a panel according to the variant of figure 4 with the stiffening strip and the sealing edge being omitted.

Fig. 7 is a perspective view of the arrangement of strips on the two strip layers making the wooden layer of the variant embodiment according to figures 2 or 4.

Fig. 8 is a plan view of the wooden layer of the panel according to a further characteristic of the invention being the provision of recesses at corner regions of the wooden layer, the wooden layer being made of one, two or more strip layers placed side by side.

Fig. 9 is the panel according to fig.8 wherein one head transverse side of the panel (the left one) is provided with the stiffening strip and the sealing edge and with fillers for recesses of the wooden layer, which sealing edge and which fillers are integrally made and comprise it, while the opposite head transverse side (the right one) has only the strip, the sealing edge part and the filling part for recesses being shown by broken lines.

Figure 10 is an enlargement of the corner region of a panel according to fig.9.

Fig. 11 is an enlargement of a variant embodiment of a panel according to the arrangement of figures 8 to 10 whose recess has a different shape.

Fig. 12 is a view like the one of figures 1 to 4 of a further embodiment of the invention.

[0065] It is important to point out that examples described in the following description are not to be intended like limitative ones and they are only specific choices

among various variant embodiments, wherein the configuration of the panel is a preferred configuration or a configuration from which the invention principle can be better understood.

[0066] Generally panels for making formworks have a length from about one to three meters and a width from about 0,5 meters and 1,5 meters, the length being greater than the width (so a rectangular shape) and the thickness changes from some centimeters to at most about ten centimeters depending on materials and on the structure. Due to the above these are maximum and minimum measurements changing also depending on the configuration of the supporting frame or framework wherein panels are mounted placed side by side for making containing walls of formworks.

[0067] Therefore with reference to figure 1 there is shown a panel according to a first embodiment of the invention wherein the panel has a minimal configuration as regards the amount of layers and the amount of structural parts.

[0068] The panel according to figure 1 comprises a wooden layer of which only the portion at one of the two opposite edges oriented in the width direction of the panel being shown and in the present disclosure and in claims it is called transverse edge.

[0069] A T-shaped groove 2 is made in the thickness of the transverse edge of the wooden layer 1 wherein the arm of the T is parallel or substantially parallel to the thickness surface 101 of the edge and the stem of the T is perpendicular to said thickness surface 101 and it leads at it. On at least one of the two longitudinal sides, i.e. at ends of the transverse edge of the panel said groove 2 is open in order to allow the introduction of a stiffening bar 3. The latter has a T-shaped section corresponding to the one of the groove 2 as regards shape and size, but the stem of the T having such a length to project outwards past the thickness surface 101 of the transverse edge of the wooden layer.

[0070] Figure 1 is a schematic figure and the stiffening bar has a size corresponding to the one of the groove 2 and however it has such a size allowing to introduce it in the groove by sliding it in the axial direction thereof even with a certain force. It is also possible for the stiffening bar 3 to have a size with respect to the groove such to generate a coupling as regards the shape and/or by a forcing action or said size can be slightly smaller than the groove one.

[0071] In all above cases, figure 1 and following ones mean that when an end sealing edge 4 made of plastic material is manufactured, particularly when said edge is manufactured by injection over-molding, the plastic material of said edge can penetrate in desired or accidentally arranged cavities or gaps between walls of the groove 2 and the bar 3 and it can fill said gaps firmly connecting the bar to the groove.

[0072] The stiffening bar 3 can have an enlargement 203 even at ends of the portion projecting out of the groove. In figures the stiffening bar 3 has a H-shaped

section or overturned double-T shaped section having a central flat portion 303 having one of the side tabs 103, 203 of the double-T or H shaped section along each of its longitudinal edges.

[0073] The plastic sealing edge 4 extends all along the edge of the wooden layer wherein the groove 2 with the stiffening bar 3 is provided. Said sealing edge extends over all the thickness of the surface 101 on said edge of the wooden layer such to completely cover it and it completely covers the portion of the stiffening bar 3 projecting out of the edge of the wooden layer 1.

[0074] Thus the panel is composed of at least a wooden layer 1 having at least one of its edges covered by a sealing edge with a reinforcing element.

[0075] The stiffening effect caused by the stiffening strip 3 and by the sealing edge 4 firmly made by chemical/physical adhesion, can be obtained also by providing a stiffening strip embedded in the sealing edge 4 but having no mechanical anchorage to the wooden layer 1. The fact of providing a mutual mechanical engagement that is made more firm by the possible material of the sealing edge 4 between the stiffening strip and the wooden layer 1 further increases the stiffening effect and at the same time it improves the anchorage of the sealing edge to the wooden layer 1 and so it improves also the sealing effect increasing the adhesion between the sealing edge and the head surface of the edge of the wooden layer 1 to which the sealing edge is applied.

[0076] The stiffening strip can be made of any material suitable to give the required mechanical resistance particularly the resistance to deformation of the wooden layer under the loading. Particularly for the stiffening strip the use of a metal or plastic material is provided. The sealing edge is made also of plastic material. For such sealing edge a soft plastic material is preferred for example polyurethane or the like. Advantageously the plastic material of the sealing edge is of the type that can be injected and applied to the wooden layer by over-molding it on the edge of the wooden layer.

[0077] The stiffening strip 3 can be made of the same or compatible plastic material such to obtain the best adhesion between the strip and the plastic material of the sealing edge.

[0078] When for the stiffening strip a metal material is chosen, the adhesion between said stiffening strip and the material of the sealing edge can be increased by a roughening treatment for the strip surfaces such as knurling or the like.

[0079] Roughening treatments can be also provided if the stiffening strip is made of plastic material.

[0080] As shown in figure 2, the wooden layer can be composed of two or more overlapping wooden layers 1A, 1 B. Each of such layers can have a different structure. One of the layers or part of these layers or all said layers can be made of wooden sheets likewise plywood panels. One of the layers or part of these layers or all layers can be made of chipboard panels or the like. One of the layers or at least a part of these layers or all wooden layers can

be composed of a plurality of strips placed side by side such to make a continuous layer. Wooden strips can be continuous over all the length of the wooden layer or can have a length smaller than the length of the wooden layer 1A, 1 B, the wooden strips being placed side by side laterally and longitudinally.

[0081] Figures 4 and 5 show further variants of the panel according to the invention. Here arrangements of figures 1 and 2 are further combined with layers coating and protecting at least one preferably both faces of the wooden layer 1 or 1A and 1B. Coating and protective layers schematically denoted by 5 in figures 3 and 4 can be composed of paint or resin films or of plastic layers in the form of plates applied to the wooden layer by gluing or another type of adhesion or anchorage. Particularly the coating and protective layer/layers 5 can be composed of plates made of polypropylene filled with vegetable flours for example plates made of a material known under the brandname of Wood-Stock®. In these cases, the coating and protective layer/layers 5 are applied before applying the sealing edge/edges 4, so when such sealing edges 4 are applied said sealing edges 4 overlap head sides of edges of coating and protective layers 5 connecting thereto such to generate a sealing joint. Therefore coating and protective layers 5 are sealingly adhered to sealing edges 4 by chemical physical adhesion of plastic materials composing said parts.

[0082] Even if sealing edges 4 and also stiffening strips 3 can be provided along each perimetral edge of the wooden layer with or without coating and protective layers 5, the invention provides a further improvement helping to increase the loading resistance of the panel at least in an extending direction thereof without the need of increasing the thickness or the weight of the panel and at the same time removing the need of covering edges of wooden layers on all sides thereof.

[0083] Figure 12 shows a wooden layer 1 that can be composed of a single layer or two or more layers as mentioned above and it is provided in combination with a T-shaped stiffening strip 3. Here the tab 303 constituting the stem of the T-shaped section of the strip 3 is engaged in a groove 2 for example by friction or forcing it. The latter is made in the thickness of the panel along an edge of the panel, while the tab 203 constituting the transverse of the T outwardly covers the head side on said panel edge. Advantageously, but not necessarily, said tab 203 constituting the transverse of the T has a width corresponding to the thickness of the layer 1 and it covers said head edge over all the thickness ending with side edges being flush with the two faces of the layer 1.

[0084] The above T-shaped bar can be provided without a sealing edge 4 or as in examples of figures 1 to 4 in combination with a sealing edge made of soft plastic material preferably applied by injection.

[0085] With reference to figure 5 there is shown a wooden layer 1 composed of two overlapping layers 1A and 1 B made of wooden strips. As it can be seen in figure 5, wooden strips 6 of individual layers are arranged

with their longitudinal axes oriented parallelly one with respect to the other, in opposition to prior art. Each strip layer 1A, 1 B is composed of strips placed side by side and joined by chemical/physical adhesion at mutually contacting side surfaces. When the length of strips corresponds to the size of the wooden layer in such direction of strips, so strips are not provided as placed side by side in the longitudinal direction. In the opposite case, strips are placed side by side also in the longitudinal direction the contacting head surfaces oriented transversally to the longitudinal axis thereof being provided offset with respect to the mutually contacting head surfaces of two subsequent strips in a position laterally adjacent to the first ones.

[0086] Moreover, the two layers of wooden strips are overlapped one with the other the mutually contacting longitudinal side surfaces of strips of one layer being arranged laterally offset and in a position coinciding with an intermediate longitudinal axis of the strips of the adjacent layer 1 B made of wooden strips.

[0087] Individual layers 1A and 1B made of wooden strips as also wooden strips 6 are glued one with the other in a manner known per se to the person skilled in the art.

[0088] According to an advantageous characteristic, strips are made with their longitudinal axes oriented in the direction of fibres and so of grains of wood grains. By virtue of this characteristic, each strip and so the panel has a greater loading resistance as regards the longitudinal extension of strips and so of the panel since the wood has a greater resistance to stress in the direction of fibres and grains.

[0089] In the transversal direction, on the contrary the panel has a smaller loading resistance, but since such size is smaller than the longitudinal one and a stiffening strip 3 is provided at least on each transverse panel edge the panel is prevented from transversal warping or bending.

[0090] A further characteristic of this arrangement allows to avoid to cover at least longitudinal edges of the wooden layer 1, since absorption or penetretion of moisture through strip surfaces oriented parallelly to fibres and so to wood grains is considerably lower than the absorption and penetration of moisture through surfaces oriented transversally to the direction of wood fibres.

[0091] Wooden layer edges transversally oriented, i.e. in the direction of the panel width therefore are composed of head sides 106 of strips oriented transversally to wood fibres and grains.

[0092] The sealing edge 4 is applied to said transverse edges of the wooden panel. In combination with said sealing edge, along transverse sides of the panel, the corresponding stiffening strips 3 can be also provided.

[0093] The latter are manufactured as already said above. The sealing edge 4 that is applied particularly by over-molding it to head sides of strips oriented transversally to wood grains involves that by virtue of the greater porosity of such surfaces, the plastic material constituting

sealing edges 4 can penetrate to a certain extent in pores and between wood grains, thus involving an effective sealing action against the penetration of moisture and moreover a better anchorage of the sealing edge 4 to the edge surface of the wooden layer that generates a chemical/physical adhesion that is tipycal of plastic material and also a mechanical adhesion due to the interpenetration of said plastic material and wood grains.

[0094] As already said above with reference to figures 3 and 4, the wooden layer 1 or overlapping layers 1A and 1B on their surfaces faced towards the outside can be covered by a coating and/or protective layer 5. Coating and protective layer/layers 5 are composed of paint, resin or plastic material in the form of films or plates that are connected to wooden layer/layers by chemical/physical adhesion, while the sealing edge 4 overlaps head surfaces also of the edge of said coating and protective layers 5 at the the edge of wooden layer/layers 1, 1A, 1B to which said coating and protective layers 5 are coupled, said sealing edge 4 being sealingly connected to the corresponding edge of said coating and protective layers 5 by chemical/physical adhesion.

[0095] Obviously it is possible for the sealing edge to be provided also at longitudinal edges of wooden layer or layers 1, 1A, 1B.

[0096] Still with reference to the embodiment wherein the wooden layer is composed of various layers 1A, 1B made of wooden strips which layers are overlapped, at least along an edge of said wooden layer it is possible to provide a stiffening strip 3 for each edge and in common to two or more layers or a stiffening strip 3 associated to each strip layer 1A, 1B.

[0097] In the case of the example shown in the first variant the groove 2 and so the stiffening strip 3 can extend in the direction of the wood thickness such to pass completely and/or partially through more than one layer with reference to their thickness see figures 2 and 4. With reference to the second variant there is provided a groove 2 made in the thickness of each wooden layer 1A, 1B and intended to house a stiffening strip engaging with strips of only one strip layer 1A, 1B. This arrangement is not shown in details, but it is clear if the arrangement of Figure 1 is considered as suitably changed in that two elements according to figure 1 are overlapped one with the other with the sealing edge 4 ending as being flush with them. It is also possible to provide different projections for the two or more stiffening strips and so different projections of the sealing edge 4 at each strip layer and/or each stiffening strip 3. However it is to be noted that also in this case, it is preferred to make the sealing edge 4 as one-piece for example by injection over-molding.

[0098] Figures 8 to 11 show a panel according to the present invention wherein the panel has a further characteristic whose function is to protect corner regions that are the most sensitive to damages. Here, a panel having a rectangular, square or polygonal shape has at least four or more corner regions and the panel is made of one-layer or multi-layer wooden plate 1 having the rec-

tangular, square or polygonal shape which plate has recesses 7 at corner regions. Said recesses pass from a face to the other one of the wooden plate 1 and are filled with an insert made of plastic material adhering against the thickness surface of the edge of the wooden plate 1 by chemical/physical adhesion in order to complete the wooden plate in the area of said recesses for obtaining the overall rectangular, square or polygonal shape. The completing fillers 8 are preferably made of soft plastic material, such as soft polyurethane that is applied to the corresponding hollow corner region of the wooden plate 1 by molding.

[0099] Recesses can have different shapes and size and particularly are completed by means of the plastic insert 8 such that it has a first perimetral edge connected as being flush with and as a continuation of a parallel first perimetral edge of the wooden plate or a first perimetral sealing edge 4 and a second perimetral edge connected as being flush with and as a continuation of a parallel second perimetral edge of the wooden plate or a second perimetral sealing edge which first and second perimetral edges are incident and make a corresponding corner region of the panel.

[0100] With reference to the embodiment shown in figures 8 to 10, recesses 7 of the wooden plate are provided with an edge 107 parallel to the edge in the width direction of the wooden panel or plate 1 that is bent in a concave manner. Thus the insert 8 has a curved extension that is inserted inside the recess with a certain coupling as regards the shape. Therefore in addition to the increase of total adhesion resistance due to the larger contacting surface between the wall delimiting the recess 7 and the corresponding plastic insert 8, the concave edge 107 of the recess 7 and the curved end of the filler 8 engaging therein make a kind of coupling as regards the shape helping in increasing the coupling resistance of the two parts and in improving the absorption of impact stresses by the plastic insert 8 avoiding the wooden part 1 to be damaged, i.e. the plate 1. Plastic inserts 8 are better protected against a separation due to a sudden and deep stress such as an impact or the like on corner regions of the panel.

[0101] This characteristic can be provided separately or in combination with one or more of the characteristics or characteristic combinations described above.

[0102] Therefore it is possible for a panel to be composed of a wooden plate 1 having any structure and wherein only corner regions are composed of plastic inserts 8 completing corresponding recesses of corner regions of the wooden plate 1.

[0103] Such as shown in figure 9 it is also possible for a panel to have a wooden layer 1 wherein along at least an edge there is provided an edge sealing the wooden layer which sealing edge 4 connects fillers 8 of recesses 7 at corner regions of the wooden layer.

[0104] Here the sealing edge 4 can be limited to one of panel edges or to two opposite edges or said sealing edge can extend all over the panel perimeter.

[0105] In figure 9, the sealing edge 4 is provided on two opposite panel edges oriented in the direction of the panel width, the sealing edge 4 on the right side being shown by a broken line i.e. it is not still applied to the wooden layer 1.

[0106] The sealing edge 4 and fillers 8 at corner regions of the panel are made of preferably the same plastic materials or however they are consistent one with the other. Preferably said sealing edge 4 and fillers 8 are made by contemporaneous injection over-molding and with the same material such as for example polyurethane. Thus a sealing edge 4 and fillers 8 connected thereto are obtained made by a single body, i.e. one-piece.

[0107] As further shown in figure 9, it is possible to provide in combination also stiffening strips 4 embedded or incorporated at least in the sealing edge 4.

[0108] These strips are manufactured as already said above, the groove 2 being provided in the edge of the wooden plate 1 such that it leads in the corresponding recess 7 of the wooden plate 1 with at least an open head side. As an alternative the groove 2 leads in the corresponding recess 7 by each one of its open head sides.

[0109] Under these conditions, as a further improvement it is possible to provide the stiffening strip inserted in the groove to project for at least a part of the corresponding depth in one or both corner recesses 7 of the wooden plate.

[0110] This condition is shown in figure 9 and in the enlarged detail of a corner region in figure 10.

[0111] Broken lines schematically indicating mutually contacting surfaces 106 between wooden strips 6, further indicate that the wooden plate 1 can be made of a plurality of strips placed side by side and connected at longitudinal sides 106. Here, preferably the longitudinal orientation of wooden strips 6, i.e. the longitudinal axis is provided to be parallel or almost parallel to wood fibres or grains, therefore the wooden plate having a configuration as the one described above, and stiffening strips and sealing edge being provided along edges of the wooden panel or plate 1 transversal to the orientation of wood fibres or grains. Also the concave wall 107 delimiting the recesses 7 at corner regions of the wooden plate 1 is oriented as being aligned in a parallel or substantially parallel direction or however in a direction faced towards said transverse edges of the wooden plate or panel 1, so also in this case, in the region of said curved part the plastic material of filler 8 penetrates in wood pores along the curved surface of the recess 7 further increasing the adhesion.

[0112] Obviously the wooden layer can be composed of one, two or more strip layers and particularly when there are various layers strips can be arranged as shown in figures 5 and 6, i.e. contacting surfaces 106 between adjacent strips of one layer 1A made of strips 6 being laterally offset with respect to contacting surfaces 106 between adjacent strips of the adjacent overlapped layer 1 B made of strips 6, said contacting surfaces 106 of one

layer 1A coinciding with an intermediate axis of strips 6 of the adjacent layer 1 B made of strips and viceversa.

[0113] As already mentioned above, in this configuration it is possible to provide a single stiffening strip 3 for the assembly of layers 1A and 1 B making the wooden plate or one stiffening strip 3 for each layer or for at least a part of provided layers.

[0114] Therefore it is clear that characteristics of figures 8 to 11 can be provided independently of individual or combined characteristics with reference to embodiments of figures 1 to 7.

[0115] The shape of recesses 7 at corner regions of the wooden plate 1 is not limited to what described in figures 8 to 10, but it can be also a different one such as shown in figure 11. In this case, each corner region of the wooden plate 1 according to one or more configurations or arrangements possible for this wooden plate 1 can be made having a recess both in the longitudinal and transversal direction, i.e. in the width direction of the panel. That can be obtained by making the recess at corner regions of the wooden plate 1 with a double step like delimiting wall. Even in this case, fillers 8 in combination with sealing edges and with the possible stiffening strip/strips can be manufactured as already described above with reference to the variant of figures 8 to 10.

[0116] Still with reference to the embodiment of figures 8 to 11, the wooden plate 1 can be covered by a coating and protective layer 5 on both exposed faces of the panel. In this case, coating and protective layers 5 can have a shape like the one of the wooden plate 1, i.e. provided with recesses 7 at corner regions, while plastic fillers 8 overlap head surfaces along delimiting edges of recesses 7 also of coating and protective layers 5, connecting thereto in order to generate a watertight seal. As an alternative coating and protective layers 5 can also overlap two front sides of fillers 8 and/or also the corresponding sealing edge 4 connected to said fillers 8, said coating and protective layers 5 having a plan shape and plane size identical to the final ones of the panel.

[0117] From the above the invention principles of the present invention are clear.

[0118] First a better manufacturing of sealing and stiffening edges of a panel is provided at least with reference to the loading resistance along one the dimensional extension of the panel. The presence of a sealing edge that is reinforced and that has also a reinforcing element mechanically connected to the wooden layer of the panel allows to obtain a composite sealing and stiffening edge but having a solid structure. Moreover it allows to use molding processes for manufacturing the sealing edge helping to improve the structural resistance and compactness of the edge while using a soft plastic material for sealing. The presence of a particular orientation of wood fibres with reference to the longitudinal axis of strips constituting one or more layers of the wooden plate and the fact that such orientation is in common to all strips and that strips are oriented with their longitudinal axes parallel one with the other in all provided layers in com-

bination with the presence of the reinforced sealing edge wherein at least a stiffening strip is provided allows to increase the resistance of the panel under the same thickness in the length direction and to have a similar loading resistance in the width direction of the panel and to limit only to edges oriented in the width direction of the panel the need of a protective coating particularly against moisture penetration.

[0119] Moreover the fact of manufacturing corner regions of the panel with soft plastic inserts that are attached not only by adhesion but also at least a partial coupling as regards the shape allows to limit damages of panels in the most fragile regions and to integrate the manufacturing of these plastic corner regions with the provision of reinforced or not reinforced sealing edges.

Claims

1. Panel for making formwork walls for containing concrete castings, particularly containment formworks for making concrete slabs or the like, which panel is made of at least a wooden layer or the like, **characterized in that** at least a panel edge at least for a part thereof is oriented transversally to the direction of wood fibres and it has at least for said part a sealing edge (4) made of plastic material, overlapping the head side of the panel along at least said part of said edge and it is fastened to said head side (101) of the panel by chemical/physical adhesion sealing it outwardly.
2. Panel according to claim 1, **characterized in that** said sealing edge (4) is provided in combination with a stiffening bar (3) or it is a stiffening element itself in combination with a reinforcing bar.
3. Panel according to claims 1 or 2, **characterized in that** it comprises a wooden layer (1) with at least an head wall of a perimetral edge of said wooden layer, a stiffening bar (3) is fastened to such head wall, by a mechanical coupling or a coupling as regards the shape, which stiffening bar (3), at least for a part of its length, projects outwardly from said head side of the edge of said wooden layer (1) being embedded in a plastic sealing edge (4) overlapping said head side (101) of said edge of the wooden layer (1), said sealing edge (4) being coupled by chemical/physical adhesion to the head side (101) of the edge of the wooden layer (1) and to projecting portions (303, 203) of said stiffening bar (3) in the direction of the thickness of the sealing edge (4).
4. Panel according to one or more claims, **characterized in that** the mechanical coupling between the wooden layer and the stiffening bar is made by providing a stiffening bar with a strap-like central portion (303) and an enlarged end portion (103) along one

- of the two longitudinal edges, while a groove (2) with a shape corresponding to the portion of a part of the strap (303) and of said enlarged end portion (103) is made in the thickness of the wooden layer (1) along said head side (101) of said edge, which groove (2) is open at least at one of its head ends and said stiffening bar (3) being engageable in said groove (2) through said open head side, while the strap (303) of the stiffening bar (3) projects for a certain length outwardly from the head side (101) of said edge of said wooden layer (1).
5. Panel according to one or more of the preceding claims, **characterized in that** the sealing edge (4) overlaps all the thickness of the head side (101) along the panel edge to which the stiffening bar (3) is associated and also all the portion of the stiffening bar (3) projecting past said head side (101) of said edge of the wooden layer (1).
 6. Panel according to one or more of the preceding claims, **characterized in that** the stiffening bar (3) is made of plastic material, preferably a plastic material having a nature equal to similar to the one of the sealing edge (4) or anyway a plastic material chemically compatible with the one of the sealing edge (4) and/or also of metal material.
 7. Panel according to one or more of the preceding claims, **characterized in that** the projecting portion of the stiffening bar (3) is provided with a surface roughening treatment or with a treatment increasing the adhesiveness.
 8. Panel according to one or more of the preceding claims, **characterized in that** the surface treatment can be a mechanical treatment, for example the provision of ridges or knurls on the surface of the stiffening bar (3) and/or a chemical or physical treatment changing physical or chemical conditions of the surface layer of the stiffening bar.
 9. Panel according to one or more of the preceding claims, **characterized in that** the edge (203) of the projecting portion of the stiffening bar (3) can be made also as an enlarged one with respect to the thickness of the flat portion (303), like the enlargement (103) inserted in the groove (2) provided in the edge of the wooden layer (1).
 10. Panel according to one or more of the preceding claims, **characterized in that** sections of enlargements (103, 203) are the same or different.
 11. Panel according to one or more of the preceding claims, **characterized in that** the stiffening bar has a double T or H shaped section.
 12. Panel according to one or more of the preceding claims, **characterized in that** the wooden layer is composed of various layers (1A, 1B) made of strips (6) or made of wood material or the like, joined together and making the wooden layer (1) of the panel.
 13. Panel according to one or more of the preceding claims, **characterized in that** a first layer (1A) is made of a plurality of adjacent wooden strips (6) joined together along mutually contacting head sides of longitudinal edges (106) of said strips (6) and said first layer (1A) is coupled to a further layer (1B) or to various wood fibre layers that in turn can be as a single- or multi-layer sheet, such as plywood and/or chipboard panel or the like.
 14. Panel according to claim 13, **characterized in that** at least a further layer (1B) made of wooden strips (6) placed side by side and joined along mutually contacting longitudinal sides of longitudinal edges (106) of said strips is fastened to the first strip layer in an overlapping position, directly or by interposing further wooden fibre layers of different type and with a different structure.
 15. Panel according to claim 14, **characterized in that** the at least two layers (1A, 1B) made of strips (6) are arranged with longitudinal axes of strips (6) oriented in different directions, i.e. crossed one with respect to the other.
 16. Panel according to claims 14 or 15, **characterized in that** the wooden layer is made of at least a layer in turn made of a plurality of adjacent strips joined together along mutually contacting longitudinal sides of longitudinal edges (106) of said strips, wood fibres of individual strips (6) being oriented in the longitudinal direction of strips (6).
 17. Panel according to claim 16, **characterized in that** it comprises two or more overlapping layers (1A, 1B) made of strips (6), each one having a longitudinal extension or a longitudinal axis (L) oriented in the direction of wood fibres or grains.
 18. Panel according to one or more of the preceding claims, **characterized in that** the sealing edge (4) can be made of plastic material, a soft or substantially soft and elastic plastic material such as soft polyurethane.
 19. Panel according to one or more of the preceding claims, **characterized in that** the application of the sealing edge preferably occurs by over-molding and particularly by injecting plastic material on the perimetral edge for applying the sealing edge (4) provided or not with the stiffening bar or strip (3) kept in the predetermined final operating position.

20. Panel according to claim 19, **characterized in that** it has chambers, gaps or slits filled by injection with plastic material between the inner surface delimiting the groove (2) and the outer surface of the stiffening bar (3) i.e. parts (103, 303) inserted in the groove (2). 5
21. Panel according to claim 20, **characterized in that** the shape of the section and/or size of the shape of section of the groove (2) is different, for all its section and/or only at some predetermined regions, particularly it is larger than the shape of the section and/or size of said shape of the section of the portion (203, 303) of the stiffening bar (3). 10
22. Panel according to one or more of the preceding claims, **characterized in that** the wooden layer (1) is made of a plurality of wooden strips (6) placed side by side and overlapped in at least two layers (1A, 1B) made of adjacent wooden strips (6), all strips by their longitudinal axes being oriented parallelly one with to the other and parallelly to the longitudinal extension (L) of the panel and transverse sides of the panel i.e. the ones oriented in the direction of the panel width being made of head sides of wooden strips provided at said transverse sides of the panel, while said head sides of strips (6) are oriented transversally to wood fibres or wood grains of wooden strips (6). 20 25
23. Panel according to one or more of the preceding claims, **characterized in that** it has on one or both faces of the wooden layer (1) one or more outer coating layers (5) having anti-moisture function, as well as an anti-adhesion function as regards the concrete. 30
24. Panel according to claim 23, **characterized in that** said coating layers (5) are made of thin resin, paint films or the like or of layers made of plastic material for example of the type composed of polypropylene filled with vegetable flours and known for example under the name Wood-Stock®. 35 40
25. Panel according to claim 24, **characterized in that** said coating or protective layers (5) are tightly joined together by being chemically/physically adhered to sealing edges (4), thus generating a jacket sealing the inner wooden layer (1) which sealing jacket is made of plastic material or resin and that is tightly closed on all sides or at least on transverse sides and on the two faces of the panel, by said chemical/physical adhesion for example welding, gluing or the like. 45 50
26. Panel according to claim 25, **characterized in that** the sealing edge (4) overlaps the thickness of the wooden layer (1) and also the thickness of coating or protective layer/layers (5) to which it is tightly connected. 55
27. Panel according to one or more of the preceding claims, wherein to a first layer (1A) made of wooden strips (6) at least a further layer (1B) made of wooden strips (6) placed side by side and joined along mutually contacting longitudinal sides of longitudinal edges (106) of said strips is fastened in a position overlapped thereto, directly or by interposing further intermediate layers and wherein wood fibres of individual strips (6) are oriented in the longitudinal direction of strips (6).
28. Panel according to claim 27, **characterized in that** the position of strips of a first layer (1A) is transversally offset with respect to the position of strips (6) of at least a second layer (1B) overlapping the first one such that, mutually contacting and joining longitudinal surfaces (106) of strips (6) of said first layer (1A) are in a position non coinciding with mutually contacting and joining longitudinal surfaces (106) of strips (6) of said second layer (1B), i.e. in a position coinciding with an intermediate longitudinal axis of strips (6) of said second layer (1B) and viceversa.
29. Panel according to claim 28, **characterized in that** in the transversal direction of strips the resistance to deformation or transverse warping of the panel is determined by the provision of sealing edges (4) that are reinforced by at least a stiffening bar (3) at least along the two head edges of the panel oriented transversally to the longitudinal axis of strips and/or to the direction of wood fibres.
30. Panel according to one or more of the preceding claims **characterized in that** it has at least two layers or more layers of wood fibres and particularly two or more overlapping strip layers (1A, 1B) each one made of strips (6) placed side by side and joined along mutually contacting longitudinal sides (106) there being provided only one stiffening strip (3) for each head edge of the panel or a stiffening strip for each wooden layer (1A, 1B) or for a sub-group of layers with respect to the general amount of layers.
31. Panel according to claim 30, **characterized in that** the groove (2) for introducing the stiffening bar (3) is made as extending within the thickness of one layer (1A, 1B) or it extends or can extend over the thickness of various adjacent layers (1A, 1B).
32. Panel for making formwork walls for containing concrete castings, particularly for containment formworks for making concrete slabs or the like, which panel is made of at least a wooden layer or the like, **characterized in that** the wooden layer (1) has hollow corner regions (7) filled with inserts (8) made of plastic material having such a shape to complete the

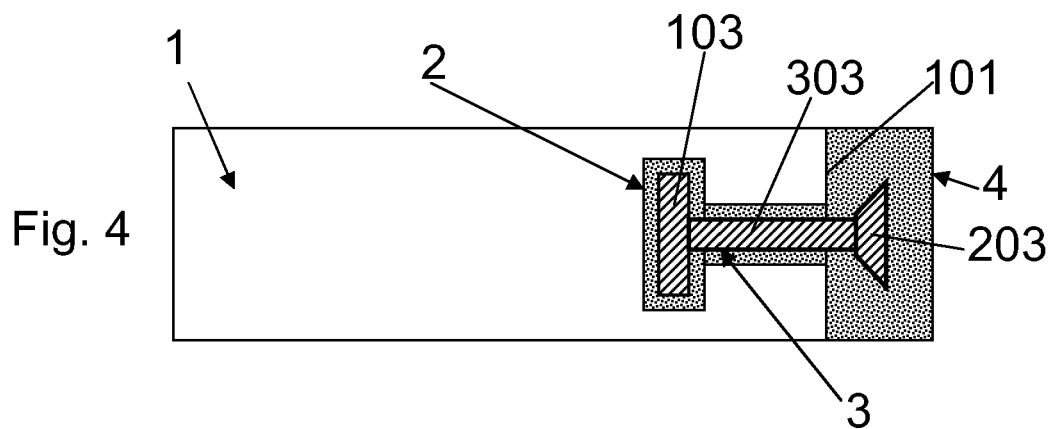
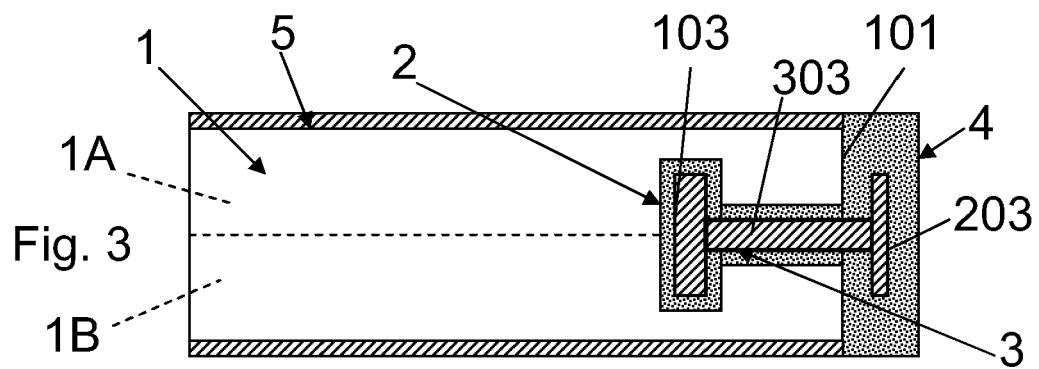
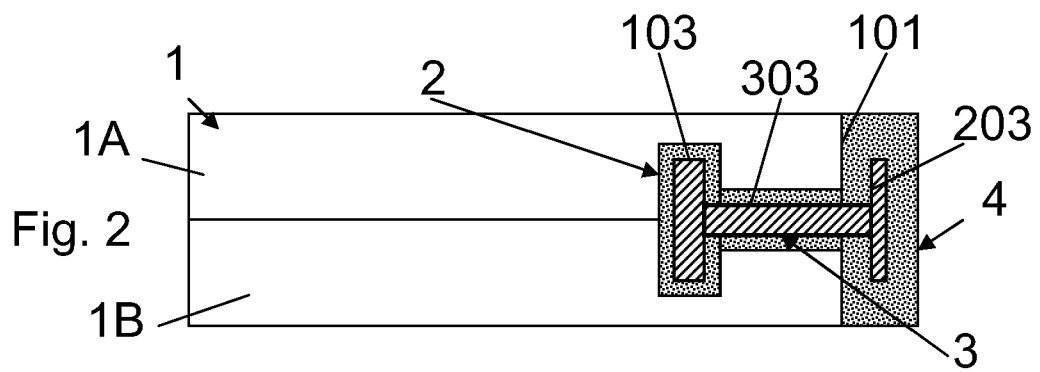
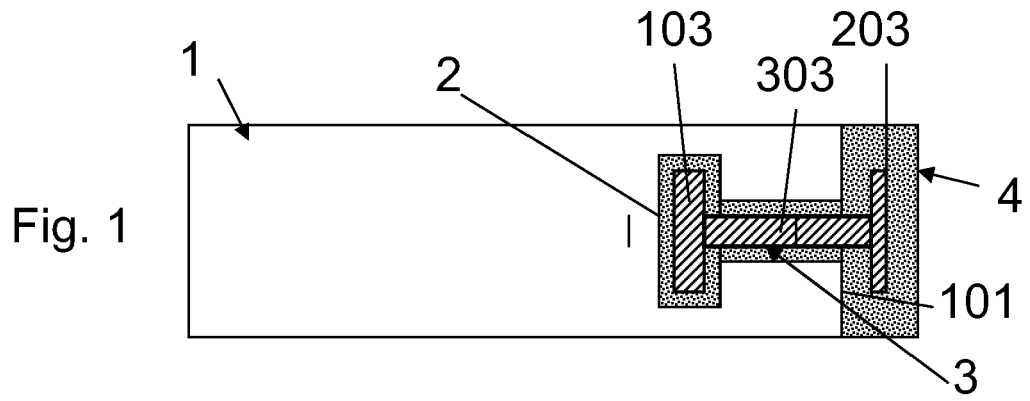
perimetral shape of the panel to an ideal shape of it provided without said hollow regions (7).

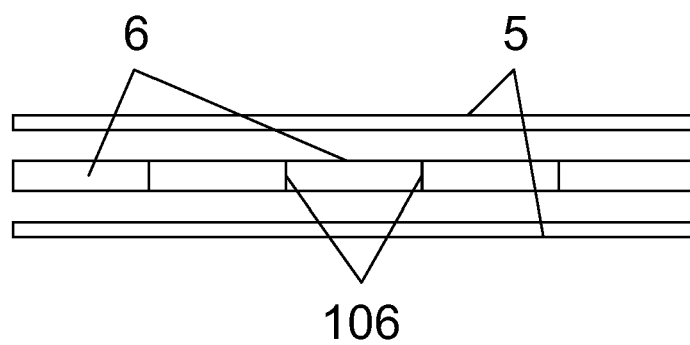
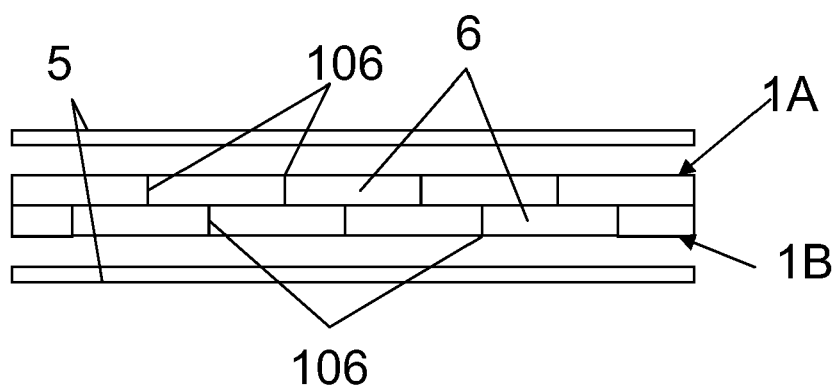
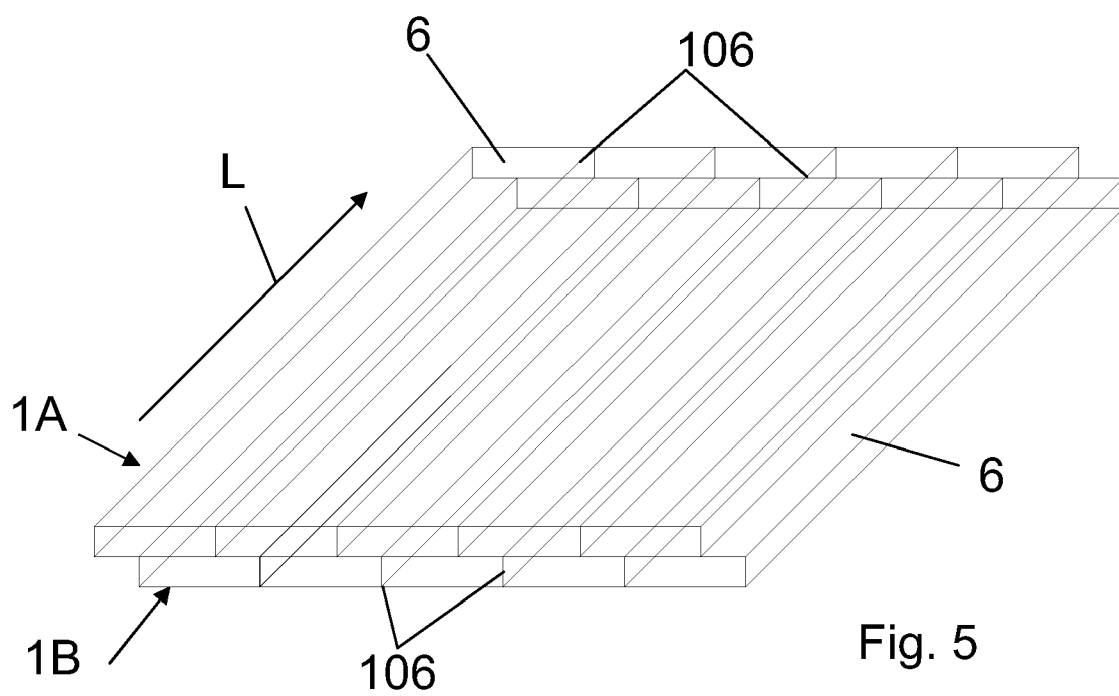
33. Panel according to claim 32, **characterized in that** recesses (7) at corner regions of the panel are provided with a U or C-shaped curved wall (107) opening towards the edge at the transverse side of the panel.
34. Panel according to claims 32 or 33, **characterized in that** it has a sealing edge (4) which sealing edge (4) is connected to one or more filling inserts (8) made of plastic material of at least one or more of said recesses (7).
35. Panel according to one or more of claims 32 to 34, **characterized in that** said sealing edge (4) joins together the filling inserts (8) of two recesses (7) at corner regions at two ends of said transverse edge of the panel.
36. Panel according to claims 34 or 35, **characterized in that** the sealing edge (4) is made as a reinforced one and the reinforcing element (3) extends also in recesses (7) of corner regions being embedded in the plastic material of the corresponding filling insert (8) and at least along a part of the sealing edge (4).
37. Panel according to claim 36, **characterized in that** the reinforcing element is a stiffening bar (3) inserted in a groove (2) along an edge, preferably a transverse edge of the panel.
38. Panel according to claim 37, **characterized in that** said groove (2) by at least one or by each one of its ends leads in a corresponding recess (7) of the corner region of the panel which recesses (7) are provided at opposite corner regions at ends of said transverse edge and the stiffening bar (3) has such a length to project in one or both said recesses (7) at least for a part of their extension in a direction parallel to the transverse edge of the panel.
39. Panel according to claim 37, **characterized in that** the one or two ends of the stiffening bar (3) projecting in corner recess/recesses (7) of the panel are bent such to extend for a certain depth in the corresponding recess in the direction of the extension of the recess both parallel to the transverse edge and parallel to the longitudinal edge.
40. Panel according to one or more claims 32 to 39, **characterized in that** the insert (8) filling the recess/recesses (7) and the sealing edge/edges (4) connected thereto are firmly made and are made of the same material.
41. Panel for making formwork walls for containing concrete castings, particularly for containment form-

works for making concrete slabs or the like, which panel is made of at least a wooden layer or the like, **characterized in that** at least a panel edge at least for a part thereof is oriented in the direction transversal to the direction of wood fibres and at least along a part of said edge it has a groove (2) for the interlocking engagement of and/or by coupling as regards the shape and/or by friction coupling and/or by forcing coupling a corresponding engagement extension (103, 303) of a stiffening bar (3).

42. Panel according to claim 41, **characterized in that** said stiffening strip fastened to the wooden layer (1) of the panel is embedded and/or incorporated in a sealing edge made of soft plastic material made by over-molding it along at least said part of the panel edge and adhering to the head side of said edge and to the stiffening strip.
43. Panel according to claims 41 or 42, **characterized in that** the stiffening bar has a T, H or double T shaped cross section.
44. Panel according to claim 43, **characterized in that** the stiffening bar (3) has a T cross section the tab (303) corresponding to the stem of the T shaped section being intended to be engaged in a corresponding groove (2) in the head edge of the wooden layer.
45. Panel according to claim 44, **characterized in that** the tab (203) of the stiffening bar constituting the transverse of the T shaped section overlaps the head side of the edge of the wooden layer (1) from the outside to which the bar (3) is fastened and covers it outwardly for at least a part of or all the thickness.
46. Panel according to one or more of the preceding claims 41 to 45, **characterized in that** it has one or more characteristics of one or more claims 1 to 40.
47. Process for making a panel for making formwork walls for containing concrete castings, particularly for containment formworks for making concrete slabs or the like, which panel is made of at least a wooden layer or the like, **characterized in that** it provides the manufacturing of a sealing edge (4) at least along a perimetral edge of the wooden layer of the panel by injection over-molding.
48. Process according to claim 47, **characterized in that** it provides to incorporate a reinforcing element (3) is the sealing edge (4) such as a stiffening bar (3), said bar being kept in position along the edge of the panel and the stiffening bar (3) being embedded in the sealing edge and with it being firmly joined with the edge of the wooden layer by over-molding said sealing edge (4) by injection.

49. Process according to claim 48, **characterized in that** it provides to manufacture a recess or groove for mechanically coupling a stiffening bar along at least one, a part or all peripheral edges of the wooden layer (1), the introduction of said stiffening bar in said coupling recesses and is such a position to overhangly project for a partial length in the space intended to be housed by the sealing edge (4) that is generated by injecting plastic material in said space incorporating the projecting part of the stiffening bar (3) and connected to the corresponding edge or to corresponding edges of the wooden layer (1).
50. Process for making a panel for making formwork walls for containing concrete castings, particularly for containment formworks for making concrete slabs or the like, which panel is made of at least a wooden layer or the like, **characterized in that** it provides to manufacture recesses (7) at corner regions of the rectangular, square or polygonal perimetral shape of the wooden layer (1) and to fill said recesses (7) by over-molding plastic material by injection.
51. Process according to claim 50, **characterized in that** recesses (7) are manufactured with at least a concave delimiting wall (107).
52. Process according to claims 50 or 51, **characterized in that** it provides to manufacture a sealing edge (4) at least along a perimetral edge of the wooden layer (1) which sealing edge is made by injection over-molding, said sealing edge being made as one-piece with at least an insert (8) filling recesses (7) during the same injection over-molding step.
53. Process according to claim 52, **characterized in that** the sealing edge (4) is made as a reinforcing one there being incorporated at least a reinforcing element therein such as a stiffening bar, said stiffening bar (3) having such a length to extend at least partially along the sealing edge (4) and for a part also inside the insert (8) filling the recesses (7) of the wooden layer.
54. Process according to claim 53, **characterized in that** the stiffening bar (3) is mechanically engaged in advance to the corresponding edge of the wooden layer (1), while the sealing edge (4) and filling insert/inserts (8) are over-molded by injection on said edge and in said recesses of the wooden layer and on the stiffening bar.
55. Process according to one or more claims 47 to 54, **characterized in that** by chemical/physical adhesion on the wooden layer (1) at least a layer (5) coating and/or protecting a face thereof is applied, the sealing edge (4) and/or inserts (8) filling the recesses being applied to the panel already provided with the wooden layer and with said at least one coating or protective layer (5) on at least a side, such that during the molding step the material constituting the sealing edge (4) and/or the filling insert (8) overlaps the head surface (101) of the edge of the wooden panel and of the corresponding thickness of the edge of the coating and/or protective layer (5).
56. Process for making a panel for making formwork walls for containing concrete castings, particularly for containment formworks for making concrete slabs or the like, which panel is made of at least a wooden layer or the like, **characterized in that** the wooden layer 1 is made by fastening a plurality of wooden strips (6) placed side by side along longitudinal sides (106) such to make a plate or the like, said strips being made with their longitudinal axis parallel to the direction of wood fibres or grains.
57. Process according to claim 1, **characterized in that** it provides to overlap two wooden layers (1A, 1B) and to fasten said layers together, each layer being made of a plurality of wooden strips (6) placed side by side along faced longitudinal sides (106) such to make a plate or the like and said strips being made with their longitudinal axis parallel to the direction of wood fibers or grains while strips (6) of the two layers are placed with their longitudinal axes parallel one with the other and with adhering surfaces (106) of strips placed side by side laterally in a position laterally offset on each layer (1A, 1B).
58. Process according to claims 56 or 57, **characterized in that** it comprises one or more steps of claims 47 to 55.





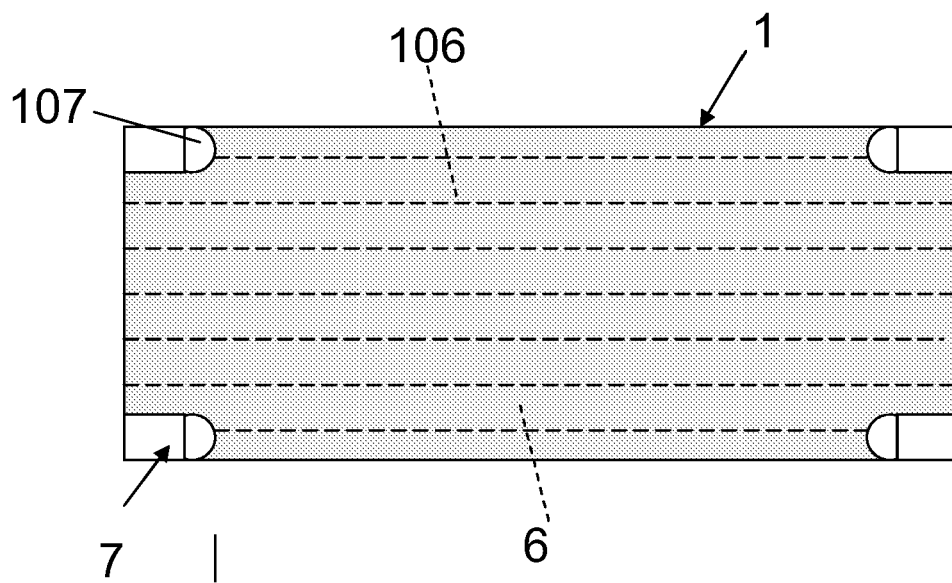


Fig. 8

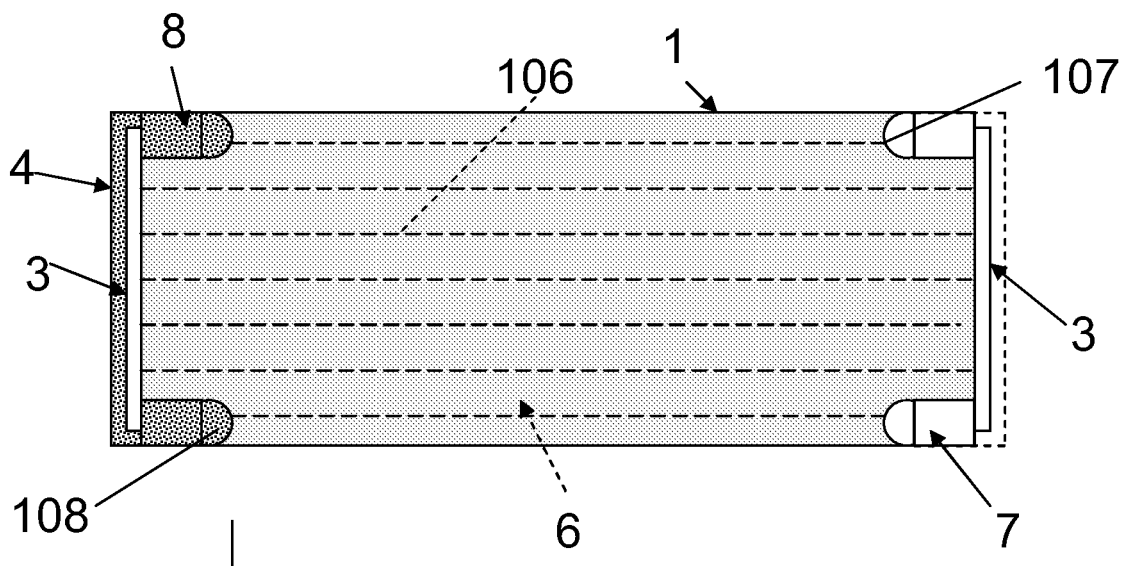


Fig. 9

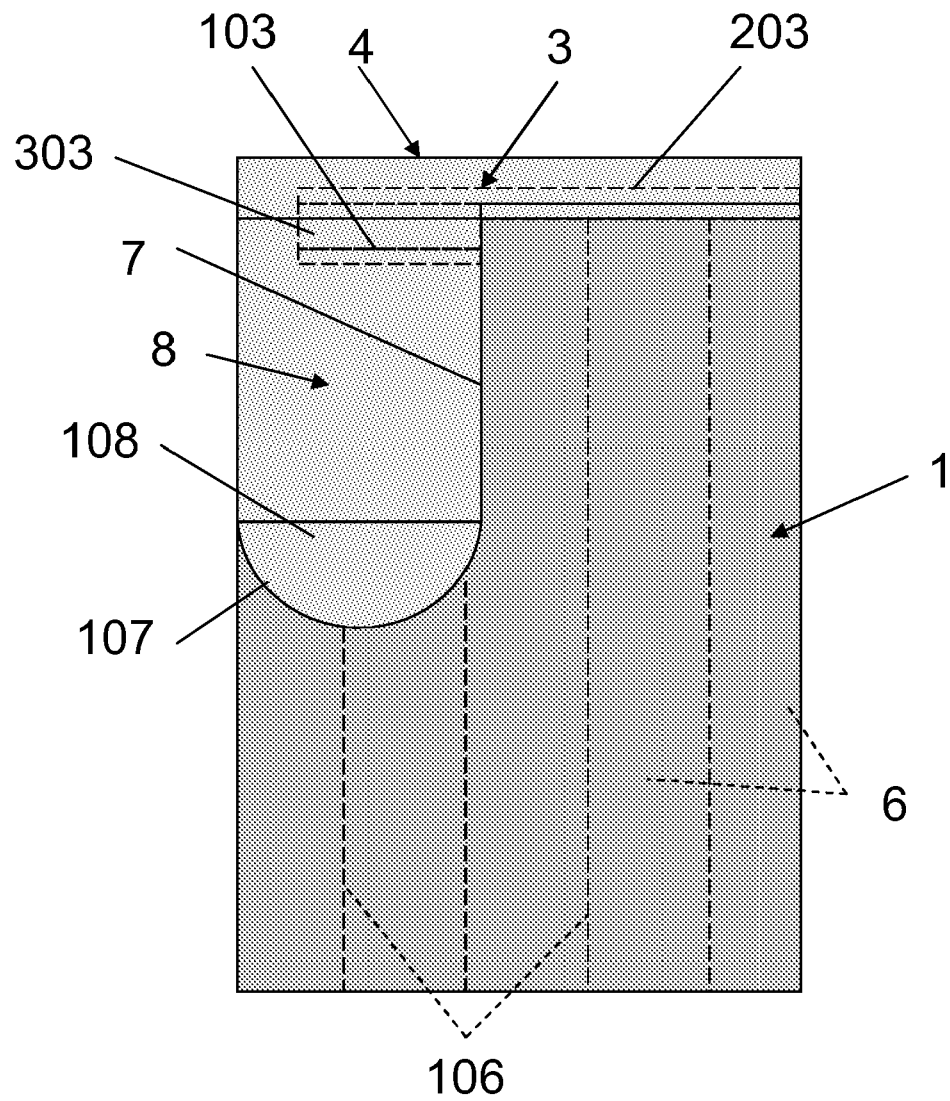


Fig. 10

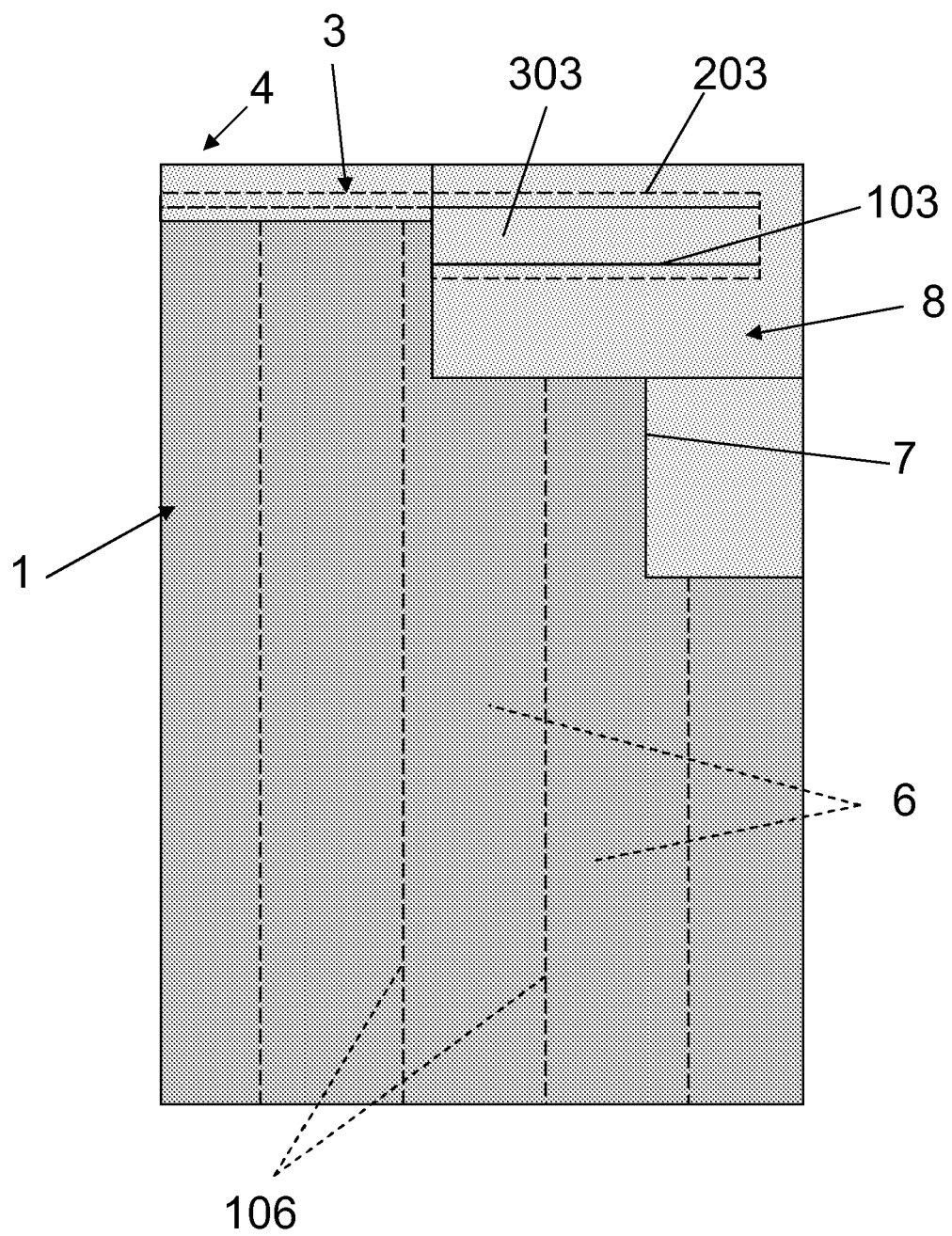


Fig. 11

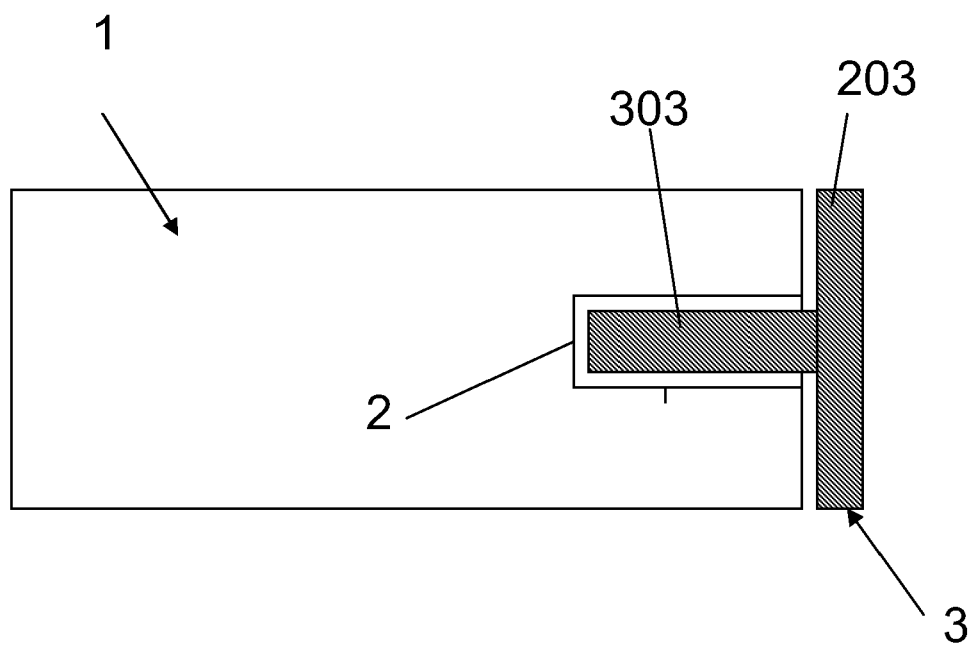


Fig. 12