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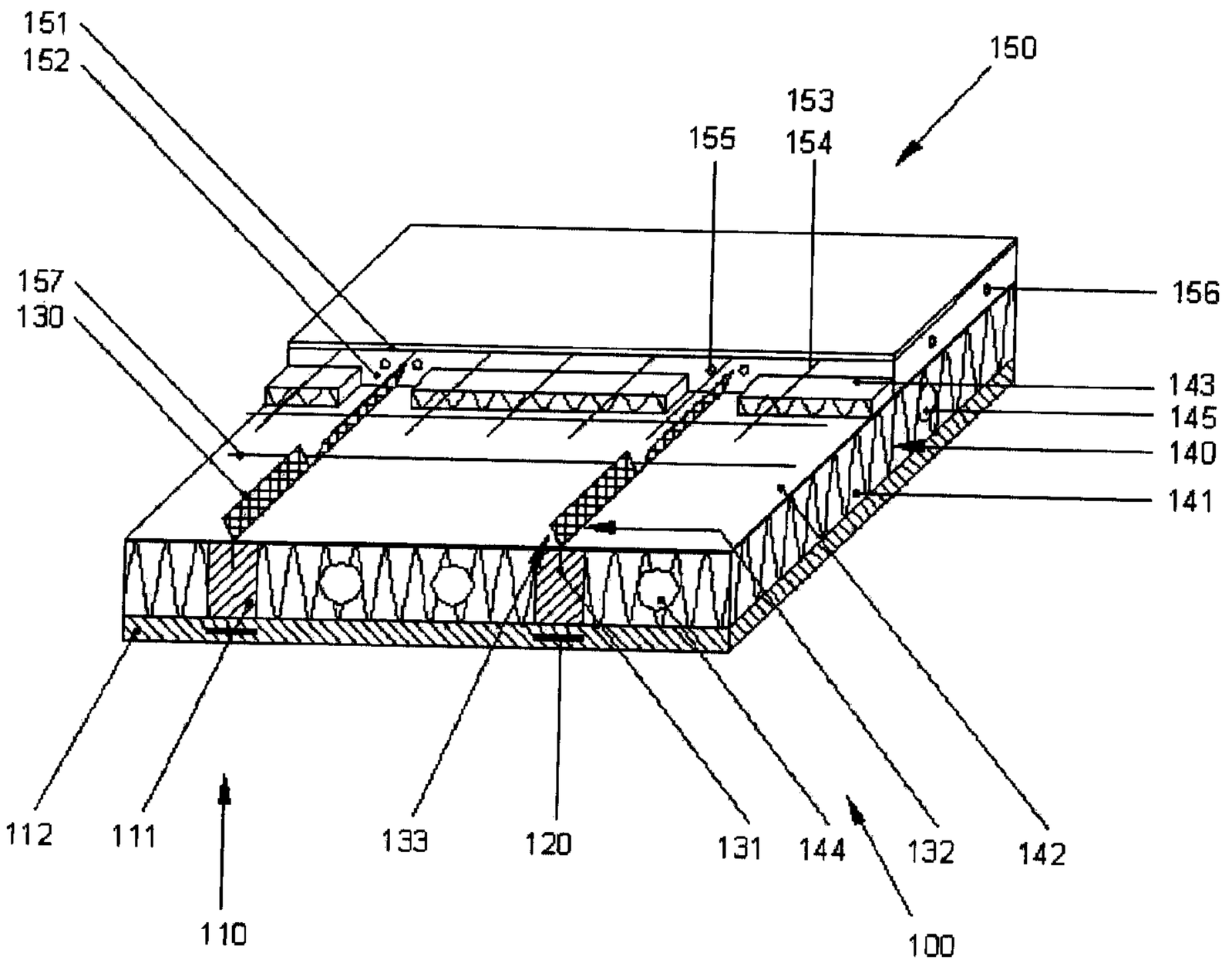

(57) Abrégé/Abstract:
A wood concrete composite system (100,200) has a wood construction component (110, 111, 112, 210, 211), at least single intermediate layer (140, 141, 142, 143, 230, 231, 232) and a concrete construction unit (150, 151, 152, 240, 241). The concrete construction unit (150, 151, 152, 240, 241) faces at least with one side towards the wood construction component (110, 111, 112, 210, 211). The at least single intermediate layer (140, 141, 142, 143, 230, 231, 232) creates at least a partial uncoupling between the wood and concrete.

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WOOD-CONCRETE-COMPOSITE SYSTEMS

Abstract of the Disclosure

A wood concrete composite system (100,200) has a wood construction component (110, 111, 112, 210, 211), at least single intermediate layer (140, 141, 142, 143, 230, 231, 232) and a concrete construction unit (150, 151, 152, 240, 241). The concrete construction unit (150, 151, 152, 240, 241) faces at least with one side towards the wood construction component (110, 111, 112, 210, 211). The at least single intermediate layer (140, 141, 142, 143, 230, 231, 232) creates at least a partial uncoupling between the wood and concrete.

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WOOD-CONCRETE-COMPOSITE SYSTEMS

Background of the Invention

This invention relates to wood concrete composite system, which includes at least one wooden specimen, and a concrete specimen.

The patent DE 44 06 433 C2, the content of which is incorporated herein by reference, presents wood with inserted bonded shaped parts to connect with materials of any kind. The known connection system is a flat body in form of a steel sheet, which is bonded partially into a wooden specimen and partially reaches out of the wooden specimen. The exposed section of the connection system serves to connect to further material.

From the disclosure writing DE 198 08 208 A1, the content of which is incorporated herein by reference, it is known to connect wood to concrete by glued in shaped parts. The known wood concrete composite connection includes flat bodies in form of a steel sheet, which are bonded with one end into a slot brought into the wood and reaches over the wooden surface with the other end. The exposed end of the steel sheet includes anchor tongues, which embody themselves in the up-poured concrete.

From the disclosure writing DE 198 18 525 A1, the content of which is incorporated herein by reference, it is known to connect multiple joined boards with a top sided concrete layer through a steel bars. The composite action between wood and concrete is created through a shear connector which reaches half way into the wooden and concrete section based on mechanical interlock. The shear connectors are oriented perpendicular to grain of the wooden specimen in order to create adequate load bearing forces.

A substantial disadvantage of the aforementioned writings lays in the unsatisfactory composite action between the materials wood and concrete and the limitations resulting from

that fact. It is known that a direct contact between wood and concrete can lead to condensated moisture and thus to fungus growth in the wood.

It is also known that a direct contact between wood and concrete creates a sound coupling, which prevents the serviceability of a wood concrete composite floor without further sound insulation elements. It is also known that the rigidity of a structural cross section increases with an increasing height and therefore an increasing lever arm. Therefore any pronounced intermediate structural layer increases the stiffness of the overall system.

A further disadvantage of the latter writings is the fact that any inserts in form of cables and/or pipes into the wood and/or concrete section undergoes stresses which reduce the long term performance of the insertions.

What is needed is a method of creating a wood concrete composite system which provides for uncoupling of the totally different materials wood and concrete, without reducing the rigid and/or stiff connection - a sole condition for an effective composite action - of the two materials.

Summary of the Invention

A wood concrete composite system has a wood construction component, at least single intermediate layer and a concrete construction unit. The concrete construction unit faces at least with one side towards the wood construction component. The at least single intermediate layer creates at least a partial uncoupling between the wood and concrete.

The wood concrete composite system according to this invention includes wooden construction components, an (at least) on one side bordering concrete construction unit and a (at least) single intermediate layer that creates at least a partial separation and/or uncoupling between the materials wood and concrete. The purpose of the intermediate layers is to (at least) partly separate and/or uncouple the wood and concrete in geometry, mechanics and/or physical

(i.e. thermal, sound, vibration) performance. This uncoupling does however not reduce the composite action between wood and concrete substantially, since otherwise an economical solution is not to be obtained.

The rigid connection between the wood and concrete is achieved by gluing at least one end of the connecting devices into the wooden construction components. The other end reaches trough the intermediate layer and rests rigidly into the concrete section by mechanical friction after the curing of the concrete.

To the surprise of the inventors, it was detected that the composite action can even be increased by connecting two ends of the connection device into the wooden component. It shows both an increase of the individual stability of the connection device itself and also an increase of the overall composite action.

An object of the invention is it to create wood concrete composite systems with intermediate layers which are equipped with high composite action, various cross sections, various system properties and various physical characteristics. The task of the intermediate layer is to be creating an uncoupling of the totally different materials wood and concrete, without reducing the rigid and/or stiff connection - a sole condition for an effective composite action - of the two materials.

In another feature, the wood concrete composite systems according to this invention can be used i.e. as columns, walls, girders plates, floors, frames, portal frames, covers -, roofs -, and/or bridges. There they are design to withstand mechanical, thermal, chemical penetration and/or loads safely.

Brief Description of the Drawings

FIG. 1 is a perspective view of a section of the wood concrete composite system of the invention.

FIG. **2** is a perspective view of a section of another embodiment of the wood concrete composite system of the invention.

Detailed Description of the Preferred Embodiment

The wood concrete composite system according to this invention includes wooden construction components, a (at least) on one side bordering concrete construction unit and a (at least) single intermediate layer that creates at least a partial separation and/or uncoupling between the materials wood and concrete. The purpose of the intermediate layers is to (at least) partly separate and/or uncouple the wood and concrete in geometry, mechanics and/or physical (i.e. thermal, sound, vibration) performance. This uncoupling does however not reduce the composite action between wood and concrete substantially, since otherwise an economical solution is not to be obtained.

The rigid connection between the wood and concrete is achieved by gluing at least one end of the connecting devices into the wooden construction components. The other end reaches trough the intermediate layer and rests rigidly into the concrete section by mechanical friction after the curing of the concrete.

To the inventors' surprise, it was detected that the composite action can even be increased by connecting two ends of the connection device into the wooden component. It shows both an increase of the individual stability of the connection device itself and also an increase of the overall composite action.

It is up to the user and/or designer to choose a composite action of the connection device with the intermediate layer and/or the intermediate layers. In a further arrangement of the invention it is likewise conceivable that the connecting devices do not exhibit any composite action to the intermediate layers.

It is also possible to build a wood concrete composite system wherein the connection device is connected rigidly to the concrete section by adhesive action.

The connecting devices can be arranged depending upon application in order or arranged chaotically. The term "chaotically" is used in a way that mathematicians use it to describe a state on no order. Exemplarily the following arrangements are possible: one behind the other, next to each other, shifts, lengthwise, crosswise, diagonally, curved, swung and/or strewn.

The connection device is used as flat bodies, lattices and/or nets in straight lines and/or odd forms made out of metals and/or plastics. The connection device can be bent, waved, swung, edged, bent at least partial straight, and/or twisted. The flat bodies can be at least partly punched, bored, roughened up, stretched, pulled and/or distorted.

One arrangement of the wood concrete composite systems uses a hybrid connection device in a way that the end embodied in the wood is made out of plastic and the end that reaches into the intermediate layer and concrete is made of metal.

Another arrangement of the wood concrete composite system would be a variation of the geometries of the connection device itself. This means a change of the form, shape and therefore the mechanical properties of the connection device between wood, intermediate layer and concrete. This would mean that the connection device is used as anisotropic and inhomogeneous arrangement.

A further arrangement shows an increase in the coupling forces by connecting two or more ends of the connection device into and /or onto the wooden construction components. This also the strengthening of the wood concrete composite systems as well as an increase of the stability of the connection device.

A further arrangement of the composite system includes (at least) additional teeth, discontinuities and/or bulges positioned at lest partially on some parts of the connection device.

Surprisingly these arrangements provide a positioning and/or an adjustment of the connection device in the appropriate openings of the wooden construction components and/or prevent the adhesive from leaking out of its mend position. Thus the connection device can be glued into the wooden component and then moved to be transported, temporarily stored and/or installed on the construction side. This allows an application in walls and/or over heads.

The connecting devices are fixed by gluing in appropriate openings in the construction components and/or on the construction components. It is an arrangement of the invention conceivably in the connection device in the construction components to be thus bonded and others on the construction components is glued on.

The adhesive preferably used are one or two-component adhesives. Some adhesives (e.g. epoxy resins, PU adhesives) are sensitive to higher temperatures and lose there mechanical properties at approximately 50° C and higher. This is also known as the "glass transition effect". The glass transition effect describes thereby a phenomenon, in which the adhesive loses its firmness at a critical temperature under loading.

An arrangement of the invention provides an energy input of the bonding line (adhesive), the connection device itself and/or the neighbouring wood and/or concrete construction units during the curing of the adhesive or at a later time. By doing so the energy input pushes the critical temperature of the glass transition effect onto a higher temperature level. This increases the overall capacity and security of the composite system. The energy input can be introduced exemplarily by a stationary and/or mobile heat source (e.g. infrared) locally and/or continuously. Another arrangement of the composite systems provides a heat supply through by wirings, in the wooden construction components, the intermediate layers and/or the concrete construction units.

The wooden construction components of the wood concrete composite system are made out of planks, boards, girders, beams, plates or formwork. The aforementioned individual components can be used individually or manufactures to multipart built ups (i.e. box girders). The wooden construction components include grown solid wood, timber materials, engineered

wood products and/or wood composite materials. To show the massive variety of wooden construction components some examples are introduced: Solid wood, resinous wood, hardwood, board laminated wood, veneer laminated wood, veneer strip wood, splinter wood, cement-bound chip boards, chip boards, multi-layer plates, OSB panels, plastic wood composite construction plates, etc..

A further range of the arrangement consists in the reinforcement of the wooden construction components and/or the concrete construction units e.g. by armouring of steel and/or plastic, prestressed steel and/or plastic, etc.. These reinforcements can be positioned within the wooden and concrete components and/or on the wooden and concrete components.

A further range of the variations lies within the local strengthening or retrofit of existing wooden construction components by reinforcement, bypassing, prestressing.

A further range of the solutions lays in the creation of cavities and/or channels within the wooden construction components, the intermediate layers and/or concrete construction units. The cavities can be produced exemplarily by pipes, balls, channels and/or hoses. The lines can be produced exemplarily by cables, pipes, channels and/or hoses.

A further arrangement of the invention exists in predeformation (e.g. increased height, bend, curvature and/or pre-loading) of the wooden construction components, the intermediate layers and/or the concrete construction units before or after the composite is accomplished. The predeformation compensates at leas partial deformations the composite structure will undergo in its lifetime.

The following example will show the benefit of the predeformation of the composite system: Given a single span system with a mid support for the wooden member allows for a negative predeformation (uplift) Once the concrete is cured and the midspan support is reduced a deflection of the dead loads is already compensated by the negative predeformation.

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The intermediate layers can be used in various materials e.g. in the form of liquid, solid and/or gaseous condition and applied e.g. through, layouts, pour, paint and/or foaming. A single intermediate layer consists for example of a plastic foil, an impregnated paper, a bitumen pasteboard, a plastic insulating layer, a mineral insulating layer, an organic insulation material, a regenerating insulating material and up-poured and/or applied materials, which tie and/or harden at a later time, e.g. tar, adhesive, plastic mixtures. Further forms of the single intermediate layers includes all mineral and/or mineral bound materials (e.g. mineral bound light-weight precast plates, mineral-bound and insulated sheets) as well as metallic materials (e.g. trapezoidal sheet metals, sandwich components). The multi-layer levels are a combination of the single intermediate layers described before in arbitrary form and/or arrangement. The choice between a single intermediate layer and/or multi-layer depends thus only on the requirements to the wood concrete composite systems.

The range of concrete for the concrete construction unit includes normal concrete, high-strength concrete, prestressed concrete, composite concrete, lightweight concrete, aerated concrete and/or asphalted concrete. It could be useful to add non mineral additives to the concrete mixture, e.g. plastics, polystyrene and/or wood. The production of the concrete construction units is possible in pre-fabrication or on the building site.

Furthermore the concrete construction units could be partially manufactured on the construction site and partially on the erection site. Furthermore the concrete construction units could be partially prefabricated and partially poured on site.

A preferred arrangement consists in the reinforcement (e.g. armouring of steel and/or plastic, prestressed steel and/or plastic) of the concrete construction units. The reinforcement allows for a higher stresses introduced to the concrete construction unit.

A further arrangement lies in the production of cavities (e.g. by pipes, balls, blocks and/or channels) for weight reduction and/or for the additional introduction of openings for additional pre-loading devices. A further arrangement lies in the introduction of openings (e.g.

cables, pipes, channels and/or hoses) within the concrete construction units, which allow the use of electricity, heat, technique and/or supply lines.

By surprise it was encountered that the aforementioned openings can be used as heating supply units to heat up the wood concrete composite systems and create thereby a status that improves the glass transition temperature of the used adhesives (for the anchorage of the connection device in the construction components).

A further arrangement of the invention includes the possibility to combine multiple layers of wooden and concrete construction units as well as intermediate layers mixed within each other. For better understanding one could built a wall having a wooden unit on the outside and a concrete unit in the inside wherein two intermediate layers separate the materials concrete and wood.

The wood concrete composite systems according to this invention can be used i.e. as columns, walls, girders plates, floors, frames, portal frames, covers -, roofs -, and/or bridges. There they are design to withstand mechanical, thermal, chemical penetration and/or loads safely.

Referring now to FIG. **1**, an example of a section of the wood concrete composite system 100 is shown, which e.g. is representing a floor-, wall-, and/or roof system. The system could be referred to as a box-system.

The wood concrete composite system 100 includes wooden construction components 110, shown as two beams 111 and a timber panelling 112. The beams 111 are connected to the timber panelling 112 rigidly through adhesive action. The timber panelling 112 holds two local reinforcements 120 in the shape of plastic fibre mesh.

The connection device 130 is shown 4 times. They are manufactured as punched and distorted flat bodies (also well known as stretched metal sheets) 131 made of metal, which show

a bend 132 on half height. The bend 132 is altered in the longitudinal direction and creates a forking 133 in form of a Y (forking 133 appears with a front view in longitudinal direction).

Again, by accident, it was discovered that the bend creates a given positioning of the connection device 130 within the channel it is glued in. Furthermore it reduces the risk of a crack within the concrete construction component 150 due to the peak load introduced by the connection device 130. Furthermore the forking 133 provides a position to place additional steel reinforcement bars (not represented here) which increase the overall carrying capacity of the composite system.

The intermediate layer 140 includes a (form-stable) mineral wool 141 positioned between the beams 111 and on the timber panelling 112. On top of the mineral wool 141 there is a diffusion diffusion-open foil 142, which covers the timber beams 111 at the same time and reaches toward the connection devices 130. The intermediate layers 140 shown as a mineral wool 141 exhibit cavities 144 and 145 in cross-sectional and longitudinal direction, which serve as building supply channels.

It was further learned serendipitously, that the cavities 145 in form of a pipe can be manufactured right through the timber beam 111 due to the increase of the overall strength created by the composite action. Therefore it can be shown that the composite action compensates local weakening of the beam 111.

A further component of the intermediate layers 140 is represented by Styrofoam section 143, which is located on the foil 142 between the timber beams 111 within the concrete construction units 150.

The concrete construction unit 150 is shown as a continuous plate 151 with rib-like expansions 152 in the range of the connection device 130. The concrete construction unit 150 exhibit reinforcement 153 in the form of reinforcing steel mats 154, which rest on the connection device 130. The concrete construction unit 150 shows further cavities 155 and lines 156, which

respectively serve as a heat supply and a subsequent reinforcement of the concrete construction units 150. The cavities 155 serve for the introduction of appropriate prestressed steel units, in order to create an additional reinforcement possibility to improve serviceability.

The lines 156 serve as heating unit to increase the material-conditioned glass transition temperature of the adhesive and therefore increase the total load-carrying capacity of the wood concrete composite system 100.

The concrete construction units 150 holds further reinforcement 157 in the form of reinforcing steel bars, located between the connection devices 130. The reinforcing steel bars 157 serve to accommodate additional stress peaks, which can occur within the range of the connection device 130. In addition this creates another interlock between the connection device 130 and the concrete construction unit 150.

Another increase in serviceability can be achieved by guiding the reinforcement steel bar 157 through the opening (e.g. expanded metal openings) of the connector devices 130.

The wood concrete composite system 100 is manufactured on building site as a floor system. First the individual construction components (e.g. wooden construction component 110, intermediate layers 140) were positioned with a negative bending through a mid-span support. After the curing of the concrete on the site the mid-span support was removed. Due to the negative deflection the composite beam now serves almost as a straight beam due to the natural deflection given by the dead load a life load of a structural system.

Referring now to FIG. **2**, an example of a section of the wood concrete composite system 200 is shown, which e.g. is representing a bridge structure or floor system. The system could be referred to as a slim-floor-system.

The wood concrete composite system 200 includes wooden construction component 210, shown as gluelam plate 211 with an external reinforcement 212 in the form of carbon fibre

reinforcement which is rigidly connected to the gluelam plate 211 by adhesive action. The gluelam plate 211 shows exemplarily cavities 213 and lines 214, which respectively are used for electrical supply and heat supply units. The cavities 213 serve for the introduction of appropriate electrical cable lines which appear invisibly within the wood concrete composite systems 200. The lines 214 serve as heating pockets for the adhesive used to glue the connection devices 220 within the gluelam plate 211. The heating increases the material-conditioned glass transition temperature of the adhesive and thereby increases the load-carrying capacity of the connection device 220 within the gluelam plate 211.

The connection devices 220 are exemplarily shown as curved form-stable plastic meshes 221 and curved metal lattices 223. The metal lattices 223 are used exemplarily in a section of the wood concrete composite system 200 with high shear forces.

The plastic meshes 221 reach approximately one third of their height into the gluelam plate 211 and are secured through adhesive action. The plastic mesh 221 was design in a way that the portion that reaches into the gluelam plate 211 and the intermediate layer 230 shows smaller openings 222 (compared to the openings within the concrete section 240) to create higher stiffness values within the intermediate layer 230 (which provide no support) and fewer openings within the gluelam plate 211 to reduce the use of adhesive.

The curved shape of the plastic meshes 221 surprisingly creates additional specimen stability and increases the mechanical friction/connection teeth between the gluelam plate 211 and concrete unit 240.

Two ends of the metal lattices 223 are exemplarily embedded (within pockets in form of slots) into the gluelam plate by adhesive action. This procedure provides a high degree of rigidity within the metal lattice 223 as well as a high degree of connection stiffness between the gluelam plate 211 and concrete unit 240. The metal lattice 223 holds a bulge (here not shown) on cutting

edge between the gluelam plate 211 and the intermediate layer 231 to prevent the adhesive from withdrawal.

The intermediate layers 230 consists exemplarily of a multi-layer bitumen (painted on) with embedded plastic foil 231 and a PU foam layer 232 on top. The PU foam layers 232 includes individual panels which are placed individually on top of the plastic foil 231.

The concrete construction unit 240 is exemplarily shown as a continuous plate 241. The concrete construction unit 240 exhibit reinforcement 242 in the form of reinforcing steel mats 243, which rest exemplarily only on the connection device 220. The concrete plate 241 holds in addition a local reinforcement 244 in form of a reinforcing steel bar 245 which will be connected to the plastic mesh 221 (exemplarily by wire) prior to the assembling of the reinforcing steel mats 243 and the pouring of the concrete.

The concrete construction unit 240 holds cavities 246 and lines 247, which respectively provide subsequent reinforcement and climate control supply for the concrete construction unit 240.

The cavities 246 serve for the introduction of appropriate prestressing steels in order to allow a subsequent reinforcement of the concrete construction unit 240. The location of the cavities 246 dependents on the structural requirements and can exemplarily be on top, between and/or next to then connection device 220 (repres. 221 and 223).

The lines 247 allow exemplarily the coupling to an appropriate central air-conditioning unit to create an adequate climatic supply for the wood concrete composite system 200 and its environment. Thus exemplarily energy-saving solutions are made possible for above private commercial and industrial buildings.

The wood concrete composite system 200 was exemplarily prefabricated as one construction element and transported and installed on the job site to create an overall floor

system. The prefabrication permits therefore a rapid production of the building without introducing humidity (e.g. poring wet reinforced concrete on sight) into the wood concrete composite system 200 and/or buildings.

The individual wood concrete composite systems 200 can be connected with each other during erection time or at a later time. In this way also diaphrame effects can be achieved with segmented wood concrete composite systems 200.

Multiple variations and modifications are possible in the embodiments of the invention described here. Although certain illustrative embodiments of the invention have been shown and described here, a wide range of modifications, changes, and substitutions is contemplated in the foregoing disclosure. In some instances, some features of the present invention may be employed without a corresponding use of the other features. Accordingly, it is appropriate that the foregoing description be construed broadly and understood as being given by way of illustration and example only, the spirit and scope of the invention being limited only by the appended claims.

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Claims

What is Claimed Is:

1. A wood concrete composite system (100,200) comprising:
   a wood construction component (110, 111, 112, 210, 211), a at least single intermediate layer (140, 141, 142, 143, 230, 231, 232) and a concrete construction unit (150, 151, 152, 240, 241)
   where the concrete construction unit (150, 151, 152, 240, 241) faces at least with one side towards the wood construction component (110, 111, 112, 210, 211)
   the at least single intermediate layer (140, 141, 142, 143, 230, 231, 232) creates at least a partial uncoupling between the wood and concrete.

2. The wood concrete composite system (100,200) of claim 1 comprising:
   at least one connection device (130, 220, 223) within the wood construction component (110, 111, 112, 210, 211) which creates a coupling to the intermediate layer (140, 141, 142, 143, 230, 231, 232) and the concrete construction unit (150, 151, 152, 240, 241).

3. The wood concrete composite system (100,200) of claim 1 comprising:
   at least one connection device (130, 220, 223) within the wood construction component (110, 111, 112, 210, 211) which creates a coupling to the concrete construction unit (150, 151, 152, 240, 241)
   and shows no force transmitting coupling to the intermediate layer (140, 141, 142, 143, 230, 231, 232).

4. The wood concrete composite system (100,200) of claim 1 comprising:
   a pattern of the connection device (130, 220, 223) within a given arrangement and/or chaotically (e.g. one behind the other, next to each other, shift, lengthwise, crosswise, diagonally, curved, swung and/or strewn).

5. The wood concrete composite system (100,200) of claim 4 comprising:
   a connection device (130, 220, 223) in straight and/or unstraight form as flat bodies, lattices and/or nets
   with at least one end partially connected within and /or partially within and on top of the wood construction components (110, 111, 112, 210, 211).

6. The wood concrete composite system (100,200) of claim 1 comprising:
   a connection device (130, 220, 223) which show equal and/or different geometries characteristics and shapes (isotropic/homogenise or anisotropic/inhomogeneous) within the wood construction component (110, 111, 112, 210, 211), intermediate layers (140, 141, 142, 143, 230, 231, 232) and/or concrete construction unit (150, 151, 152, 240, 241).

7. The wood concrete composite system (100,200) of claim 1 comprising:
   a connection device (130, 220, 223) with additional anchors, teeth and/or bulges within the individual sections of wood construction component (110, 111, 112, 210, 211), intermediate layers (140, 141, 142, 143, 230, 231, 232) and/or concrete construction unit (150, 151, 152, 240, 241).

8. The wood concrete composite system (100,200) of claim 1 comprising:
   a connection device (130, 220, 223) which are connected within and/or atop of the wood construction component (110, 111, 112, 210, 211) by adhesive action
   Experience an energy- and/or heat treatment at a given time to overcome the glass transition temperature of the adhesive and therefore increase the coupling forces

9. The wood concrete composite system (100,200) of claim 1 comprising:
a wood construction component (110, 111, 112, 210, 211) of at least one element of planks, boards, girders, beams, plates or formwork
and/or a composition of the aforementioned single elements.

10. The wood concrete composite system (100,200) of claim 1 comprising:
a wood construction component (110, 111, 112, 210, 211) are made out of grown solid wood, timber materials, engineered wood products and/or wood composite materials.

11. The wood concrete composite system (100,200) of claim 1 comprising:
a wood construction component (110, 111, 112, 210, 211) with reinforcement 120 (made of steel and/or plastic)
cavities (213, 214, e.g. by pipes, channels and/or hoses), and/or lines (e.g. cables, pipes, channels and/or hoses).

12. The wood concrete composite system (100,200) of claim 1 comprising:
a wood construction component (110, 111, 112, 210, 211) with additional measures to overcome the natural and/or technical weak points of the construction components (110, 111, 112, 210, 211) by further measures, e.g. reinforcement, prestressing.

13. The wood concrete composite system (100,200) of claim 1 comprising:
a wood construction component (110, 111, 112, 210, 211) that shows a pre-deformation prior to the assembling of the intermediate layers (140, 141, 142, 143, 230, 231, 232) and/or concrete construction unit (150, 151, 152, 240, 241)

the pre-deformation can be achieved through a negative deflection a curvature a bending at a given time during the building process and therefore compensates possible deflections that occur in the lifetime of the system.

14. The wood concrete composite system (100,200) of claim 1 comprising:
the use of single and/or multiple intermediate layers (140, 141, 142, 143, 230, 231, 232) loosely and/or interconnected.

15. The wood concrete composite system (100,200) of claim 1 comprising:
the application of the intermediate layers (140, 141, 142, 143, 230, 231, 232) as: rolled, poured, painted and/or squirted and applied as firm, liquid and/or gaseous material at a given time.

16. The wood concrete composite system (100,200) of claim 1 comprising:
an intermediate layer (140, 141, 142, 143, 230, 231, 232) holding cavities (144, 145) (e.g. by pipes, channels and/or hoses), and/or lines (e.g. cables, pipes, channels and/or hoses) which create a weight reduction as well as openings that hold subsequent either supply systems (i.e. electricity, water) and/or heating /cooling devices.

17. The wood concrete composite system (100,200) of claim 1 comprising:
a concrete construction unit (150, 151, 152, 240, 241) made out of normal concrete, high-strength concrete, prestressed concrete, composite concrete, lightweight concrete, aerated concrete and/or asphalted concrete
which may hold additional adding's like non mineral material e.g. plastic, polystyrene, wood.

18. The wood concrete composite system (100,200) of claim 1 comprising:

a concrete construction unit (150, 151, 152, 240, 241) which is manufactured on the construction side or is pre-fabricated prior to erection or partially on the construction side and partially as pre-fabricated.

19. The wood concrete composite system (100,200) of claim 1 comprising:
a concrete construction unit (150, 151, 152, 240, 241) that holds reinforcement (153, 154, 157, 243, 244, 245) (e.g. steel and/or plastic, prestressed steel/plastic), cavities (155, 246) (e.g. by pipes, balls, cubes, channels and/or hoses), and/or lines (156, 247) (e.g. cables, pipes, channels and/or hoses).

20. The wood concrete composite system (100,200) of claim 1 comprising:
a concrete construction unit (150, 151, 152, 240, 241) where the cavities (155, 246) act as weight reduction, an opening which allows the introduction supply lines and/or structural strengthening units at a given time.

21. The wood concrete composite system (100,200) of claim 1 comprising:
a concrete construction unit (150, 151, 152, 240, 241) where the lines (156, 247) act as openings to hold electrical-, water-, heat -, technique and/or supply lines or
which also supply heating to overcome the glass transition temperature of the adhesive used to anchorage the connection device (130, 220, 223).

22. The wood concrete composite system (100,200) of claim 1 comprising:
a on site manufacturing as well as prefabrication along with a partial on site manufacturing and/or partial prefabrication.

23. The wood concrete composite system (100,200) of claim 1 comprising:

a pre-deformation which can be achieved through a negative deflection, a curvature, a bending at a given time during the building process and therefore compensates possible deflections that occurs within the lifetime of the system.

24. The wood concrete composite system (100,200) of claim 1 comprising:

a possibility to combine multiple layers of wood construction components (110, 111, 112, 210, 211), intermediate layers (140, 141, 142, 143, 230, 231, 232) and concrete construction units (150, 151, 152, 240, 241)

to create a layered composite system that allows a broughter variety of applications.

25. The wood concrete composite system (100,200) of claim 1 comprising:

the use i.e. as columns, walls, girders plates, floors, frames, portal frames, covers -, roofs -, and/or bridges.

In a way that withstand mechanical, thermal, chemical penetration and/or loads.

Application number/numéro de demande: 2485804

Figures: 2

Pages:

DRW-IP

Unscannable items
received with this application
(Request original documents in File Prep. Section on the 10th Floor)

Documents reçus avec cette demande ne pouvant être balayés
(Commander les documents originaux dans la section de préparation des dossiers au 10ième étage)

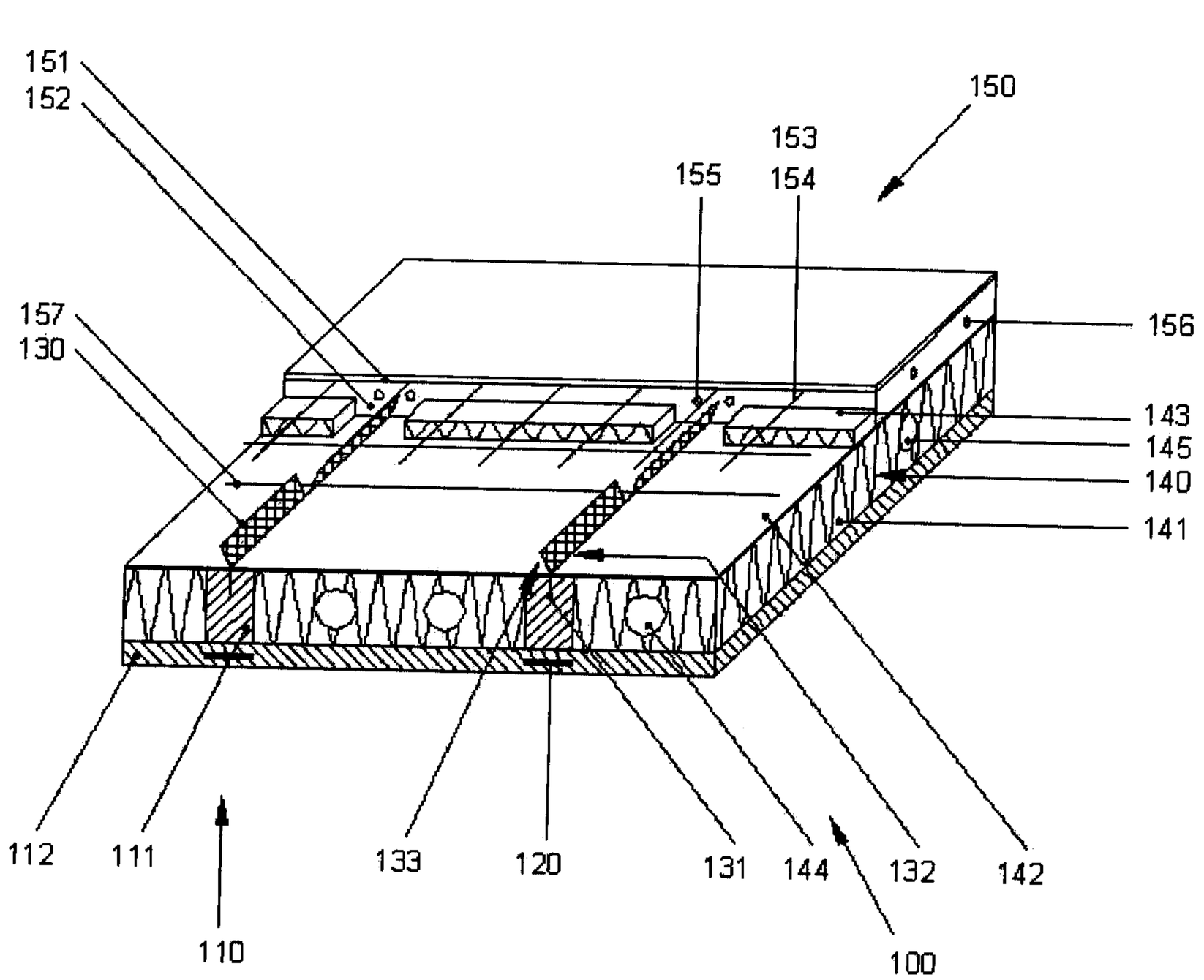
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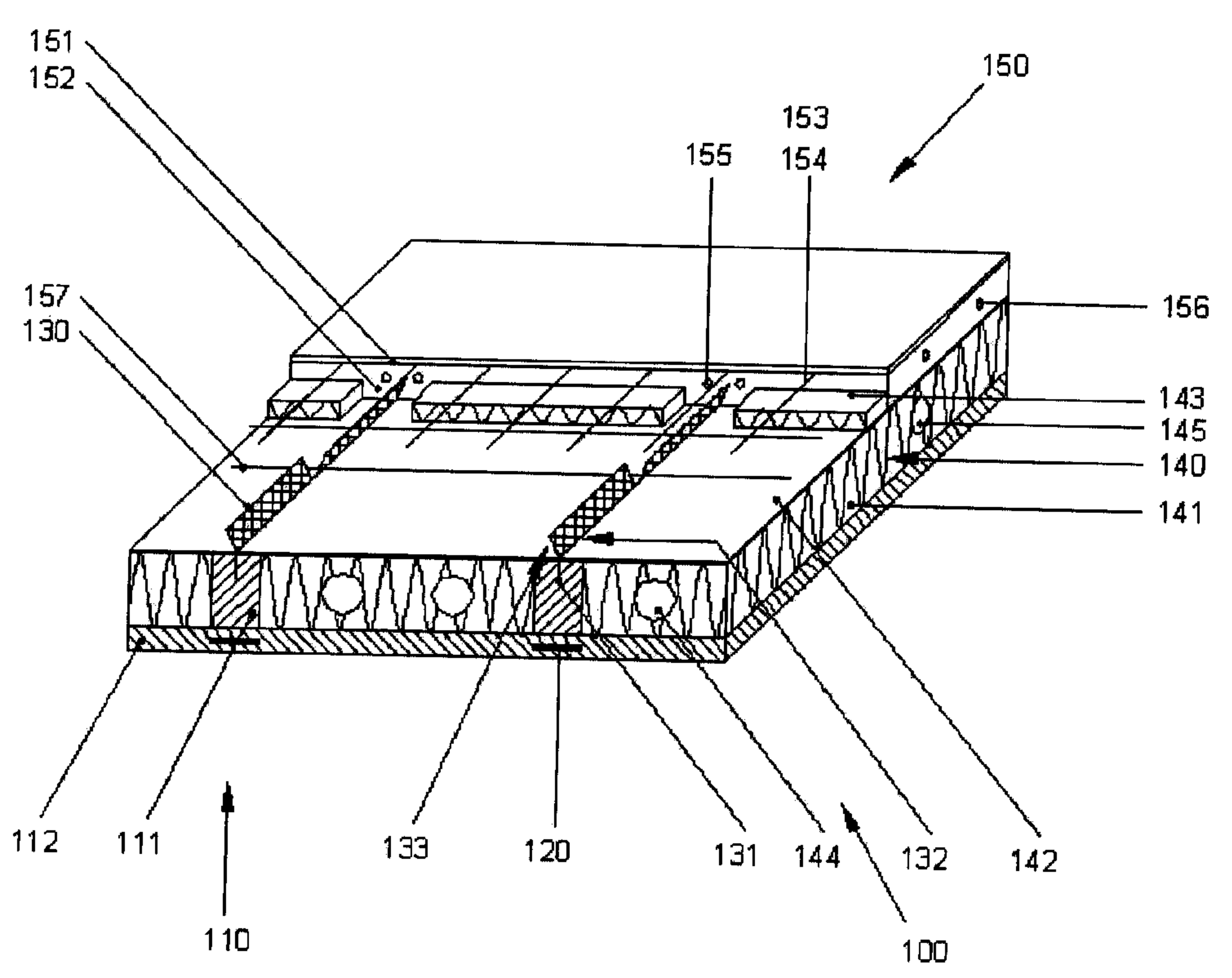
Fig. 1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