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DESCRIPTION

Description

TECHNICAL FIELD

[0001] This invention relates to underfloor fluid conduction.

BACKGROUND

[0002] Underfloor hydronic tubing is commonly used to warm or cool various structures, such as residential homes. However, there are several problems with how the underfloor hydronic tubing is installed.

[0003] First, the underfloor hydronic tubing can be installed such that a thermal energy transfer between the underfloor hydronic tubing and a finished floor is not maximized. For example, if the underfloor hydronic tubing is installed such that a layer of thermally insulating material, such as a wood block, is positioned between the underfloor hydronic tubing and the finished floor, then such configuration reduces the thermal energy transfer between the underfloor hydronic tubing and the finished floor. As such, there is a desire to maximize the thermal energy transfer between the underfloor hydronic tubing and the finished floor.

[0004] Second, the underfloor hydronic tubing can be installed such that the underfloor hydronic tubing is exposed, which often results in puncturing of the underfloor hydronic tubing from a piece of debris, such as a nail or a shard of glass, at a work site. As such, there is a desire to minimize exposure of the underfloor hydronic tubing.

[0005] KR 101386923 B discloses a hot water heating system capable of preventing an interlayer noise and, more specifically, a convenient hot water heating system implemented through a simplified process, while at the same time complexly conducting multiple functions including the prevention of interlayer noise, improving insulation, and blocking humidity. It discloses a convenient hot water heating system, with a simplified process of fixing a conductive floor material on top of a heat-conductive cap and covering the top of a hot water hose after installing the hot water hose in a zigzag along the grooves to install the hose formed on a hot water hose installation panel.

[0006] DE 3411339 A discloses a plate-shaped component with shaped-in channels for optional reception of pipes for floor-heating systems, in particular as a base for floating

flooring, filling pieces covering the shaped-in channels are provided with an upper side ending flush with the surface of the component. Filling bodies which fill the channel can be put in the channel sections free of pipes. The filling body has toothings on the filling-body sides directed towards the lateral channel wall, which toothings produce a press-fit with the associated channel when the filling body is put in. The filling body is advantageously designed as a hollow body. It can be made as a 45 degree bend or as a straight section. The filling pieces can be designed in a plate-like manner and have in their lateral edge region downwardly projecting protuberances which can be pushed through correspondingly arranged slot openings of a step designed in the upper edge region of the channel.

SUMMARY

[0007] This invention at least partially addresses at least one of above inefficiencies. However, this invention can prove useful to other technical areas. Therefore, various claims recited below should not be construed as necessarily limited to addressing any of the above inefficiencies.

[0008] According to a first embodiment of this invention, a system comprises a first plate including a first pair of legs defining a first channel; a second plate including a second pair of legs defining a second channel; a first block supporting the first plate and the second plate such that the first block is positioned between the first channel and the second channel; a second block including a U-shaped trench with a first open end portion and a second open end portion, wherein the first open end portion leads to the first channel, wherein the second open end portion leads to the second channel; a hydronic tube extending within the U-shaped trench; and a U-shaped cover covering the U-shaped trench.

[0009] According to a second embodiment of this invention, a method comprises supporting a first plate and a second plate via a first block, wherein the first plate includes a first pair of legs defining a first channel, wherein the second plate including a second pair of legs defining a second channel, wherein the first block is positioned between the first channel and the second channel; positioning a second block including a U-shaped trench with a first open end portion and a second open end portion such that the first open end portion leads to the first channel and the second open end portion leads to the second channel; and covering a hydronic tube extending within the U-shaped trench with a U-shaped cover.

[0010] According to the first embodiment of this invention, the device may further comprise a spacing jig including a block, a handle, and a plurality of legs, wherein the handle is secured to the block, wherein the legs are secured to the block such that the legs extend transversely to the block and are spaced apart from each other, wherein at least one of the legs is L-shaped.

[0011] According to the second embodiment of this invention, the method may further comprise positioning a first block on a surface, wherein the first block includes a first ledge and a first wall; positioning a first leg of a segment on the first ledge against the first wall, wherein

the segment includes a second leg; positioning a second block on the surface, wherein the second block includes a second ledge and a second wall, wherein the first wall faces the second wall; positioning the second leg on the second ledge against the second wall; and securing the second block to the surface.

[0012] The system may comprise a subfloor; a finished floor; a pair of blocks positioned between the subfloor and the finished floor; and a plate including a pair of legs defining a channel, wherein the pair of blocks are supporting the plate such that the channel extends between the pair of blocks, wherein the pair of legs extends from the plate toward the subfloor, wherein the finished floor faces the pair of blocks and the plate.

[0013] The system may comprise a subfloor; a finished floor; a block positioned between the subfloor and the finished floor, wherein the block defines a well therein; and a plate including a pair of legs defining a channel, wherein the block supports the plate such that the channel extends within the well, wherein the pair of legs extends from the plate toward the subfloor, wherein the finished floor faces the block and the plate.

[0014] This invention is embodied in various forms illustrated in a set of accompanying illustrative drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0015] The set of accompanying illustrative drawings shows various example embodiments of this invention. Such drawings are not to be construed as necessarily limiting this invention which is defined in the appended claims. Like numbers and/or similar numbering scheme can refer to like and/or similar elements throughout.

FIG. 1 shows an embodiment of a tube engagement unit according to this invention.

FIG. 2 shows an embodiment of a tube engagement unit engaging a tube while resting on a block with a well such that the tube is positioned within the well according to this invention.

FIG. 3 shows an embodiment of a tube engagement unit being positioned in context of a subfloor and a finished floor where the tube engagement unit is supported via a pair of tailless blocks according to this invention.

FIG. 4 shows an embodiment of a tube engagement unit being positioned in context of a subfloor and a finished floor where the tube engagement unit is supported via a single block according to this invention.

FIG. 5 shows an embodiment of a tube engagement unit being positioned in context of a subfloor and a finished floor where the tube engagement unit is supported via a pair of tailed blocks according to this invention.

Figs. 6 and 7 shows an embodiment of an installation having a plurality of tube engagement

units according to this invention.

FIG. 8 shows an embodiment of a U-shaped cover according to this invention.

FIG. 9 shows an embodiment of a U-shaped cover covering a U-shaped trench such that a tube is positioned therebetween according to this invention.

FIG. 10 shows an embodiment of a block for supporting a tube engagement device according to this invention.

FIG. 11 shows an embodiment of a block for supporting a tube engagement device according to this invention.

FIG. 12 shows an embodiment of a tube engagement unit being supported via a pair of blocks according to this invention.

FIG. 13 shows an embodiment of a plurality of blocks supporting a plurality of tube engagement units according to this invention.

FIG. 14 shows an embodiment of a block defining a plurality of U-shaped trenches therein according to this invention.

FIG. 15 shows an embodiment of a first mode of installation of underfloor hydronic tubing according to this invention.

FIG. 16 shows an embodiment of a second mode of installation of underfloor hydronic tubing according to this invention.

FIG. 17 shows an embodiment of a third mode of installation of underfloor hydronic tubing according to this invention.

FIG. 18 shows a jig for spacing apart a plurality of blocks according to this invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0016] This invention is now described more fully with reference to the set of accompanying illustrative drawings, in which example embodiments of this invention are shown. This invention can be embodied in many different forms and should not be construed as necessarily being limited to the example embodiments disclosed herein. Rather, the example embodiments are provided so that this invention is thorough and complete, and fully conveys various concepts of this invention that is defined in the appended claims.

[0017] Features described with respect to certain example embodiments can be combined and sub-combined in and/or with various other example embodiments. Also, different aspects and/or elements of example embodiments, as disclosed herein, can be combined and sub-

combined in a similar manner as well. Further, some example embodiments, whether individually and/or collectively, can be components of a larger system, wherein other procedures can take precedence over and/or otherwise modify their application. Additionally, a number of steps can be required before, after, and/or concurrently with example embodiments, as disclosed herein. Note that any and/or all methods and/or processes, at least as disclosed herein, can be at least partially performed via at least one entity in any manner.

[0018] Various terminology used herein can imply direct or indirect, full or partial, temporary or permanent, action or inaction. For example, when an element is referred to as being "on," "connected" or "coupled" to another element, then the element can be directly on, connected or coupled to the other element and/or intervening elements can be present, including indirect and/or direct variants. In contrast, when an element is referred to as being "directly connected" or "directly coupled" to another element, there are no intervening elements present.

[0019] Although the terms first, second, etc. can be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not necessarily be limited by such terms. These terms are used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer, or section discussed below could be termed a second element, component, region, layer, or section without departing from various teachings of this disclosure.

[0020] Various terminology used herein is for describing particular example embodiments and is not intended to be necessarily limiting of this disclosure. As used herein, various singular forms "a," "an" and "the" are intended to include various plural forms as well, unless a context clearly indicates otherwise. Various terms "comprises," "includes" and/or "comprising," "including" when used in this specification, specify a presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence and/or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0021] As used herein, a term "or" is intended to mean an inclusive "or" rather than an exclusive "or." That is, unless specified otherwise, or clear from context, "X employs A or B" is intended to mean any of a set of natural inclusive permutations. That is, if X employs A; X employs B; or X employs both A and B, then "X employs A or B" is satisfied under any of the foregoing instances.

[0022] Example embodiments of this invention are described herein with reference to illustrations of idealized embodiments (and intermediate structures) of this invention. As such, variations from various illustrated shapes as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, various example embodiments of this invention should not be construed as necessarily limited to various particular shapes of regions illustrated herein, but are to include deviations in shapes that result, for example, from manufacturing.

[0023] Any and/or all elements, as disclosed herein, can be formed from a same, structurally continuous piece, such as being unitary, and/or be separately manufactured and/or connected, such as being an assembly and/or modules. Any and/or all elements, as disclosed herein, can be manufactured via any manufacturing processes, whether additive manufacturing, subtractive manufacturing, and/or other any other types of manufacturing. For example, some manufacturing processes include three dimensional (3D) printing, laser cutting, computer numerical control routing, milling, pressing, stamping, vacuum forming, hydroforming, injection molding, lithography, and so forth.

[0024] Any and/or all elements, as disclosed herein, can be and/or include, whether partially and/or fully, a solid, including a metal, a mineral, an amorphous material, a ceramic, a glass ceramic, an organic solid, such as wood and/or a polymer, such as rubber, a composite material, a semiconductor, a nanomaterial, a biomaterial and/or any combinations thereof. Any and/or all elements, as disclosed herein, can be and/or include, whether partially and/or fully, a coating, including an informational coating, such as ink, an adhesive coating, a melt-adhesive coating, such as vacuum seal and/or heat seal, a release coating, such as tape liner, a low surface energy coating, an optical coating, such as for tint, color, hue, saturation, tone, shade, transparency, translucency, opaqueness, luminescence, reflection, phosphorescence, anti-reflection and/or holography, a photo-sensitive coating, an electronic and/or thermal property coating, such as for passivity, insulation, resistance or conduction, a magnetic coating, a water-resistant and/or waterproof coating, a scent coating and/or any combinations thereof. Any and/or all elements, as disclosed herein, can be rigid, flexible, and/or any other combinations thereof. Any and/or all elements, as disclosed herein, can be identical and/or different from each other in material, shape, size, color and/or any measurable dimension, such as length, width, height, depth, area, orientation, perimeter, volume, breadth, density, temperature, resistance, and so forth.

[0025] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in an art to which this invention belongs. Various terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with a meaning in a context of a relevant art and should not be interpreted in an idealized and/or overly formal sense unless expressly so defined herein.

[0026] Furthermore, relative terms such as "below," "lower," "above," and "upper" can be used herein to describe one element's relationship to another element as illustrated in the set of accompanying illustrative drawings. Such relative terms are intended to encompass different orientations of illustrated technologies in addition to an orientation depicted in the set of accompanying illustrative drawings. For example, if a device in the set of accompanying illustrative drawings were turned over, then various elements described as being on a "lower" side of other elements would then be oriented on "upper" sides of other elements. Similarly, if a device in one of illustrative figures were turned over, then various elements described as "below" or "beneath" other elements would then be oriented "above" other elements.

Therefore, various example terms "below" and "lower" can encompass both an orientation of above and below.

[0027] As used herein, a term "about" and/or "substantially" refers to a +/- 10% variation from a nominal value/term. Such variation is always included in any given value/term provided herein, whether or not such variation is specifically referred thereto.

[0028] FIG. 1 shows an embodiment of a tube engagement unit according to this invention. A tube engagement unit 100 includes a plate 102 and a receptacle 104. The plate 102 and the receptacle 104 are unitary, such as monolithic. In some embodiments, the plate 102 is assembled with the receptacle 104, such as via fastening, adhering, magnetizing, mating, or other means or methods. In some embodiments, the unit 100 is structured, manufactured, and used, as disclosed in US Patent 5,424,428.

[0029] The plate 102 is rectilinearly elongated, rectangularly shaped, and includes a thermally conductive material, such as metal, such as copper, iron, aluminum, or others, or an alloy, such as steel, brass, bronze, or others. Note that variations on such structure are possible, such as the plate 102 being non-rectilinearly elongated, such as sinusoidal, arcuate, pulsating, zigzag, or others, the plate 102 being non-rectangularly shaped, such as any polygonal shape, or any other variation in constituency, size, shape, or other characteristics.

[0030] In one or more embodiments, the plate 102 includes a plurality of bores 110 bored therethrough such that the receptacle 104 is positioned therebetween. The bores 110 are circular, but other shapes are possible, such as ovoid, elliptical, or others. The bores 110 are threaded, but may be smooth. The bores 110 are identical in shape and size, but can differ in shape, size, or any other characteristic, including positioning. In one or more embodiments, the plate 102 does not include bores 110.

[0031] The receptacle 104 is defined via a pair of legs 106 and includes a thermally conductive material, such as metal, such as copper, iron, aluminum, or others, or an alloy, such as steel, brass, bronze, or others. The legs 106 extend from the plate 102 away from the plate 102 and longitudinally along a length of the plate 102 such that the legs 106 oppose each other and a channel 108 is defined via the legs 106. Such opposition of the legs 106 enables the receptacle 104 to have a U-shape, C-shape, or V-shape cross-section. At least one of the legs 106 is externally and internally smooth, but can include depressions, projections, grooves, bores, maters, fasteners, magnets, adhesives, or other structures.

[0032] FIG. 2 shows an embodiment of a tube engagement unit engaging a tube while resting on a block with a well such that the tube is positioned within the well according to this disclosure. The tube engagement unit 100 retains a tube 112 in the channel 108 between the legs 106. The tube 112 can be retained via inward pressure via the legs 106 onto the tube 112, such as via friction. In some embodiments, the tube 112 is secured to the receptacle 104 via adhering, magnets, fastening, mating, or other ways. The tube 112 is used for underfloor fluid conduction, such as for radiant heating or cooling. For example, the tube 112 can conduct a

liquid, such as water, or a mixture of liquids, such as water and alcohol or antifreeze or salt.

[0033] The tube engagement unit 100 is supported via a block 114, such as a sleeper, which contains a well 116 therein such that the tube 112 within the channel 108 is positioned within the well 116. The well 116 can be C-shaped, U-shaped, or V-shaped in cross-section. The tube 112 can be in contact with a bottom surface of the well 116 or avoid contacting the bottom surface 116 such that a gap exists therebetween. Similarly, the legs 106 can be in contact with a sidewall of the well 116 or avoid contacting the sidewall such that a gap exists therebetween. The block 114 includes a thermally insulating material, such as wood, such as plywood. Although the block 114 is shown as a single block 114, a pair of the blocks 114 can be positioned immediately adjacent to each other in order to define the well 116. For example, the pair of blocks 114 can be symmetrical to each other, although the pair of blocks 114 can be asymmetrical to each other or be identical to or different from each other in any physical property, such as shape, size, constituency, conductivity, coatings, or others.

[0034] FIG. 3 shows an embodiment of a tube engagement unit being positioned in context of a subfloor and a finished floor where the tube engagement unit is supported via a pair of tailless blocks 114a, 114b according to this invention. The tube engagement unit 100 is positioned in context of a subfloor 118 and a finished floor 120, which oppose each other. Each of the blocks 114a, 114b is tailless, is positioned between the subfloor 118 and the finished floor 120, and includes a ledge 122 and a wall 124 defining the ledge 122. The blocks 114a, 114b are trapezoidal in cross-section, but other shapes are possible, whether symmetric or asymmetric, such as square, a rectangle, a triangle, an oval, a circle, or any other polygonal or non-polygonal shape. The subfloor 118 and the blocks 114a, 114b define the well 116 therebetween, in which the tube 112 extends, while avoiding contact with the subfloor 118 such that a gap exists therebetween. The plate 102 is supported via the ledges 122 such that the plate 102 is between the walls 124. In some embodiments, the plate 102 can be contacting at least one of the walls 124. The legs 106 avoid contact with the blocks 114a, 114b, while extending toward the subfloor 118. The finished floor 120 faces the blocks 114a, 114b and the plate 102. The finished floor 120 can be in contact with the plate 102.

[0035] FIG. 4 shows an embodiment of a tube engagement unit being positioned in context of a subfloor and a finished floor where the tube engagement unit is supported via a single block. In contrast to FIG. 3, the tube engagement unit 100 is supported via a single block 114, which defines the well 116 therein. The tube 112 is in contact with the bottom of the well 116.

[0036] FIG. 5 shows an embodiment of a tube engagement unit being positioned in context of a subfloor and a finished floor where the tube engagement unit is supported via a pair of tailed blocks according to this invention. In contrast to Figs. 3 and 4, the tube engagement unit 100 is supported via a pair of tailed blocks 114a, 114b positioned immediately adjacent to each other, where each of the tailed blocks 114a, 114b includes a first elongated tail 124a, 124b and a second elongated tail 126a, 126b, respectively. As such, the tailed blocks 114a, 114b define the well 116, where the tube 112 avoids contact with the tails 124a, 124b, while the legs 106 avoid contact with the tailed blocks 114a, 114b. In some embodiments, at least one of the tails

124a, 124b, 126a, 126b can be configured for fastening, mating, adhering, interlocking, magnetizing, or other securing ways to other tails, blocks, surfaces, walls, or other structures.

[0037] Figs. 6 and 7 show an embodiment of an installation having a plurality of tube engagement units according to this invention. The tube engagement units 100 are supported via the blocks 114a, 114b, 114c, 114d, where the tube engagement units 100 and the blocks 114a, 114b, 114c, 114d alternate in a rectilinearly parallel manner, although other configurations are possible, as disclosed herein. The tube engagement units 100 and the blocks 114a, 114b, 114c, 114d are positioned between a plurality of blocks 130, such as a plurality of sleepers.

[0038] The blocks 130 define a plurality of bores 138 bored therethrough, such as for fastening to the subfloor 118. The bores 138 are circular, but other shapes are possible, such as ovoid, elliptical, or others. The bores 138 are smooth, but may be threaded. The bores 138 are identical in shape and size, but can differ in shape, size, or any other characteristic, including positioning. The bores 138 host a plurality of fasteners 140, such as screws, bolts, nails, or others, whether identical to or different from each other in structure, function, or positioning. The fasteners 140 fasten the blocks 130 to the subfloor 118. Similarly, the bores 110 host a plurality of fasteners 128, such as screws, bolts, nails, or others, whether identical to or different from each other in structure, function, or positioning. The fasteners 128 fasten the tube engagement units 100 to the blocks 114a, 114b, 114c, 114d.

[0039] The blocks 130 define a plurality of U-shaped trenches 132 and a plurality of arcuate trenches 136. Each of the U-shaped trenches 132 includes a first open end portion and a second open end portion. Each of the arcuate trenches 136 includes a first open end portion and a second open end portion. As fully assembled, the first open end portions and the second open end portions of the U-shaped trenches 132 and the arcuate trenches 136 are aligned with the channels 108. Therefore, the tube 112 is routed in a serpentine manner via the tube engagement units 100, as supported via the blocks 114a, 114b, 114c, 114d, and via the U-shaped trenches 132 and via the arcuate trenches 136. Note that a plurality of portions 134 of the tube 112 in the U-shaped trenches 132 and in the arcuate trenches 136 are exposed.

[0040] FIG. 8 shows an embodiment of a U-shaped cover according to this invention. FIG. 9 shows an embodiment of a U-shaped cover covering a U-shaped trench such that a tube is positioned therebetween according to this invention. A U-shaped cover 142 structured to cover the U-shaped trench 132 such that the tube 112 extends between the U-shaped trench 132 and the U-shaped cover 142. The U-shaped cover 142 may be unsecured to the block 130 or adjacent blocks 114 or secured to the block 130 or adjacent blocks 114. For example, such securing can be via fastening, mating, adhering, magnetizing, nailing, or other securing techniques. The U-shaped cover 142 includes a thermally conductive material, such as metal, such as copper, iron, aluminum, or others, or an alloy, such as steel, brass, bronze, or others. The U-shaped plate 142 is solid, but can be perforated. The U-shaped plate 142 is planar and flat, but variations are possible, such as via depressions or projections. The U-shaped cover 142 can include a bore or can include a magnetic area. The U-shaped cover 142 extends

longitudinally as a rectangular strip, but variations are possible, such as trapezoidal or others. In some embodiments, the arcuate trench 136 is covered with an arcuate cover, which may be similar to the U-shaped cover 142, as disclosed herein, such as when the arcuate trench 136 does not return back towards the block 114d and runs rectilinearly along the block 130 or away from the block 130, such as to form an S-shape. Note that the plate 102 and the U-shaped cover 142 shield the tube 112 from puncture, such as from nails or sharp objects, or external pressure, such as a dropped heavy object or a worker foot, or others undesired forces or objects. As such, the plate 102 or the U-shaped cover 142 acts as a heat transfer plate while also providing a structural protection to prevent undesired forces, such as nails or screws, from penetrating into the tube 112 during flooring installation.

[0041] In one or more embodiments, the U-shaped cover 142 is coupled to the tube 112 using a compound, such as, for example, a heat sink compound. In one or more embodiments, the heat sink compound is an adhesive, such as, for example, glue, paste, silicone, gel, epoxy, urethane, acrylate, or other adhesives. In one or more embodiments, the compound includes a thermally conductive, metal oxide powder, such as, for example, aluminum oxide, boron nitride, zinc oxide, aluminum nitride, or other metal or metal oxide, metal boride or metal nitride powders. In one or more embodiments, the heat sink compound is used to couple the tube engagement unit 100 to the tube 112 in place of or in addition to the legs 106.

[0042] In one or more embodiments, each of the blocks 130, includes sub-blocks 131, 133, and 135 positioned between the subfloor 118 and the finished floor 120. Each of the sub-blocks 131 have semi-circular and/or quarter circular cutouts. Each of the sub-blocks 133 are semi-circles, and each of the sub-blocks 135 are quarter circles. In one or more embodiments, each of the sub-blocks includes a ledge and a wall defining the ledge. In one or more embodiments, the sub-blocks 131, 133 and/or 135 have an angular cross-section on the curved edges, but other shapes are possible, whether symmetric or asymmetric, such as square, a rectangle, a triangle, an oval, a circle, or any other polygonal or non-polygonal shape.

[0043] FIG. 10 shows an embodiment of a block for supporting a tube engagement device according to this invention. FIG. 11 shows an embodiment of a block for supporting a tube engagement device according to this disclosure. A block 144, such as a sleeper, is elongated and T-shaped as defined via a pair of ledges 146, 150 extending from a stem as defined via a pair of walls 148, 152. The block 144 includes a thermally insulating material, such as wood, such as plywood. The block 144 is solid, but can be perforated. The block 144 can include a bore or can include a magnet. The block 144 is planar and flat, but variations are possible, such as via depressions or projections. Each of the ledges 146, 150 can support the plate 102.

[0044] FIG. 12 shows an embodiment of a tube engagement unit being supported via a pair of blocks according to this invention. The tube engagement unit 100 is supported via a pair of the blocks 144 such that the tube engagement unit 100 is positioned therebetween.

[0045] FIG. 13 shows an embodiment of a plurality of blocks supporting a plurality of tube

engagement units according to this invention. The tube engagement units 100 are supported via the blocks 144 such that the tube engagement units 100 are alternately positioned therebetween.

[0046] FIG. 14 shows an embodiment of a block defining a plurality of U-shaped trenches therein according to this invention. In context of FIG. 13, the block 130 defines a plurality of U-shaped trenches 132 therein, each of the trenches 132 hosting a tube place holder 154. Each of the U-shaped trenches 132 enabling routing of the tube 112 between a pair of the tube engagement units 100. In context of FIG. 14, each of the sub-blocks 131 and 133 includes a ledge 137 and a wall 139 defining the ledge.

[0047] FIG. 15 shows an embodiment of a first mode of installation 150 of underfloor hydronic tubing according to this invention. FIG. 16 shows an embodiment of a second mode of installation 160 of underfloor hydronic tubing according to this invention. FIG. 17 shows an embodiment of a third mode of installation 170 of underfloor hydronic tubing according to this invention. Each of the first mode of installation 150, the second mode of installation 160, and the third mode of installation 170 is shown in cross-section, with each layer identified in a part list on respective Figs. 15-17.

[0048] FIG. 18 shows a jig for spacing apart a plurality of blocks according to this invention. A jig 180 includes an elongated block 182, a handle 184, and a plurality of legs 186. The handle 184 is secured to the block 182, such as via fastening, mating, magnetizing, adhering, or other securing techniques, whether removably or irremovably. The legs 186 are secured to the block 182 via fastening, but other securing techniques, such as mating, magnetizing, adhering, or others, can be used, whether removably or irremovably. At least one of the legs 186 is L-shaped as defined via a stem and a tail, with the block 182 facing the stem and the tail enveloping the block 182 such that the block 182 contacts the tail or against the tail. The legs 186 are spaced apart from each other and extend transversely to the block 182.

[0049] The block 182 can include wood, plastic, metal, or other materials. The block 182 is shaped as a cuboid, but other shapes are possible, such as pyramid, trapezoidal prism, a cube, a hemisphere, or others. The block 182 is solid, but can be perforated. The block 182, on any surface, can be longitudinally marked with a graduated scale, such as a ruler, whether grooved thereon or written thereon in a visually or touch distinct manner. The handle 184 can include wood, plastic, metal, or other materials. The handle 184 is U-shaped, but can be shaped differently, such as an L-shape, a V-shape, or others. At least one of the legs 186 can include wood, plastic, metal, or other materials. When at least one of the legs 186 is removably secured, then that leg 186 can be moved along the graduated scale and secured along the graduated scale. The jig 180 can include a level, such as a bubble level or a spirit level, including a multi-liquid container level for various measurements. The level can be secured to or integrated with the block 182, the handle 184, or at least one of the legs 186.

[0050] In one mode of operation, the jig 180 is used in a method for establishing a proper spacing of between blocks 114 the tube 112 and the tube engagement unit 100. For example,

in context of FIG. 3, the method includes positioning a first block 114a on a surface, such as the subfloor 118, where the first block 114a includes a first ledge 122a and a first wall 124a. The method includes positioning a first leg 186a of a segment, such as the block 182, on the first ledge 122a against the first wall 124a, where the segment includes a second leg 186b. The method includes positioning a second block 114b on the surface, where the second block 114b includes a second ledge 122b and a second wall 124b, where the first wall 124a faces the second wall 124b. The method includes positioning the second leg 186b on the second ledge 122b against the second wall 124b. The method includes securing the second block 114b to the surface. Therefore, the blocks 114a, 114b can be equally spaced.

[0051] Although various sizes are illustrated in this invention, such sizes are illustrative and can vary based on field conditions.

[0052] The diagrams depicted herein are illustrative. There can be many variations to the diagram or the steps (or operations) described therein without departing from the scope of the invention that is defined in the appended claims.

[0053] The description of this invention has been presented for purposes of illustration and description. Many modifications and variations in techniques and structures will be apparent to those of ordinary skill in an art without departing from the scope of the invention that is defined in the appended claims.

REFERENCES CITED IN THE DESCRIPTION

Cited references

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Patent documents cited in the description

- [KR101386923B](#) **[0005]**
- [DE3411339A](#) **[0006]**
- [US5424428A](#) **[0028]**

PATENTKRAV

1. System, omfattende:

en første plade (102) indbefattende et første par ben (106), der definerer en første kanal;

5 en anden plade (102) indbefattende et andet par ben (106), der definerer en anden kanal;

en første blok (114b), der understøtter den første plade (102) og den anden plade (102) på en sådan måde, at den første blok (114b) er positioneret mellem den første kanal og den anden kanal;

10 en anden blok (130) indbefattende en U-formet rende (132) med et første åbent endeaftsnit og et andet åbent endeaftsnit, hvor det første åbne endeaftsnit fører til den første kanal, hvor det andet åbne endeaftsnit fører til den anden kanal;

et hydronisk rør (112), der forløber inden i den U-formede rende (132); **kendetegnet ved, at** systemet omfatter

15 en U-formet afdækning (142), der dækker den U-formede rende (132).

2. Systemindretning ifølge krav 1, yderligere omfattende en afstands-jig (180) indbefattende en blok (182), et håndtag (184) og en flerhed af ben (186), hvor håndtaget er fastgjort til blokken (182), hvor benene (186) er fastgjort til blokken (182) på en sådan måde, at benene (186) forløber vinkelret på blokken (182) og er
20 anbragt i en afstand fra hinanden, hvor i det mindste et af benene er L-formet.

3. System ifølge krav 1, hvor den U-formede afdækning (142) omfatter en eller flere forlængelser, hvor den ene eller flere forlængelser er koblet til det hydroniske rør.

4. System ifølge krav 1, hvor den U-formede afdækning (142) omfatter en eller flere forlængelser, hvor den ene eller flere forlængelser er konfigureret til at
25 blive koblet til det hydroniske rør.

5. System ifølge krav 1, hvor den U-formede afdækning er konfigureret til at blive koblet til det hydroniske rør via en støtte.

6. System ifølge krav 1, hvor den U-formede afdækning er koblet til det hydroniske rør.

7. System ifølge krav 6, hvor koblingen gennemføres via en varmeafledende forbindelse.

5 8. System ifølge krav 7, hvor forbindelsen indbefatter et klæbemiddel.

9. System ifølge krav 5, hvor støtten er U-formet.

10. Fremgangsmåde omfattende:

støtte af en første plade (102) og en anden plade (102) via en første blok (114b), hvor den første plade (102) indbefatter et første par ben (106), der
10 definerer en første kanal, hvor den anden plade (102) indbefatter et andet par ben (106), der definerer en anden kanal, hvor den første blok (114b) er positioneret mellem den første kanal og den anden kanal;

positionering af en anden blok (130) indbefattende en U-formet rende (132) med et første åbent endeafsnit og et andet åbent endeafsnit på en sådan måde, at
15 det første åbne endeafsnit fører til den første kanal, og det andet åbne endeafsnit fører til den anden kanal; **kendetegnet ved, at** fremgangsmåden omfatter

afdækning af et hydronisk rør (112), der forløber inden i den U-formede rende (132), med en U-formet afdækning (142).

11. Fremgangsmåde ifølge krav 10, yderligere omfattende kobling af
20 afdækningen (142) med det hydroniske rør (112).

DRAWINGS

Drawing

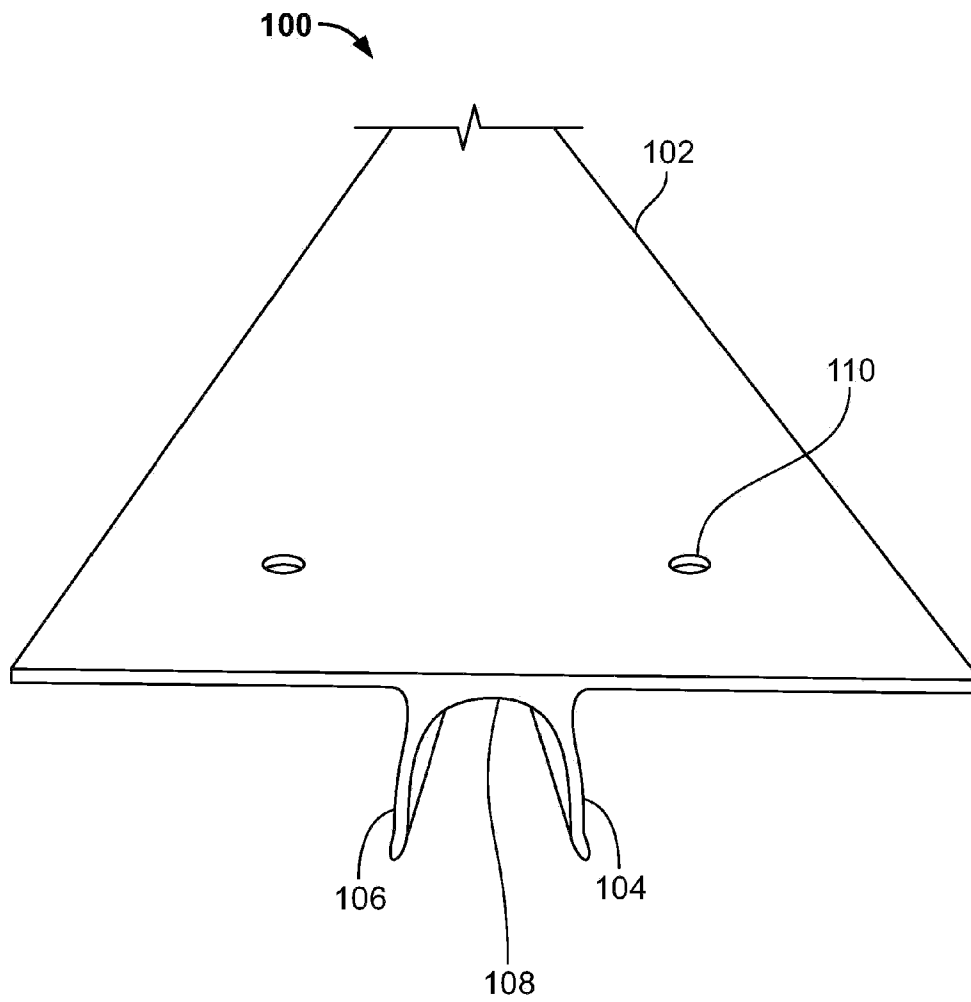


Fig. 1

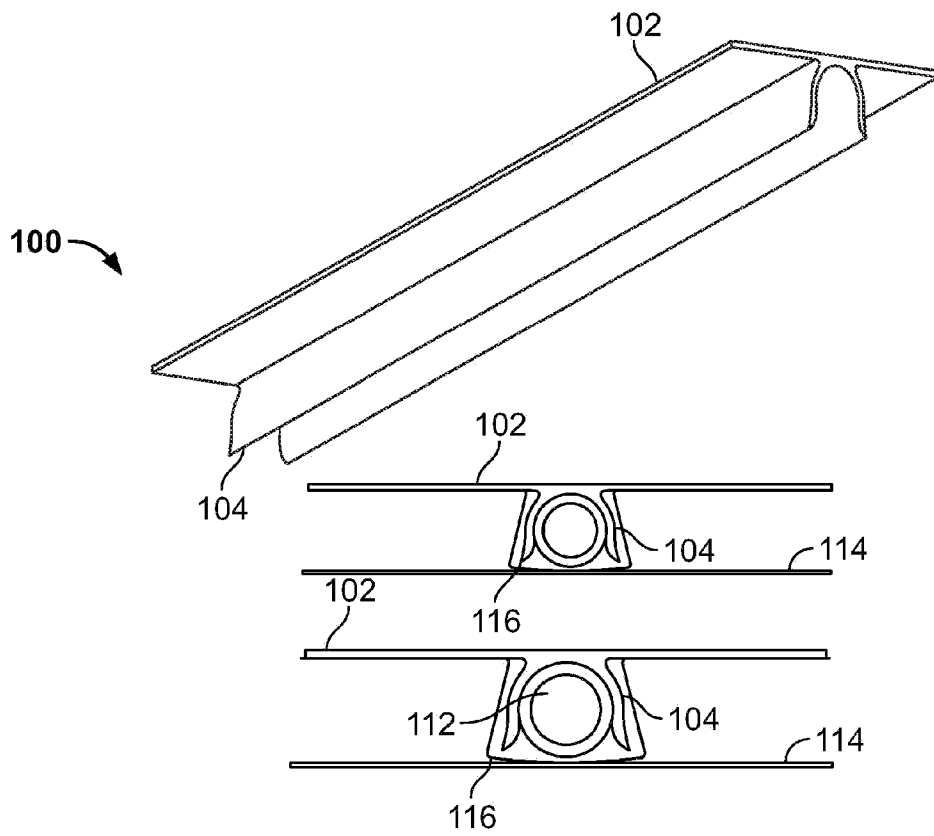


Fig. 2

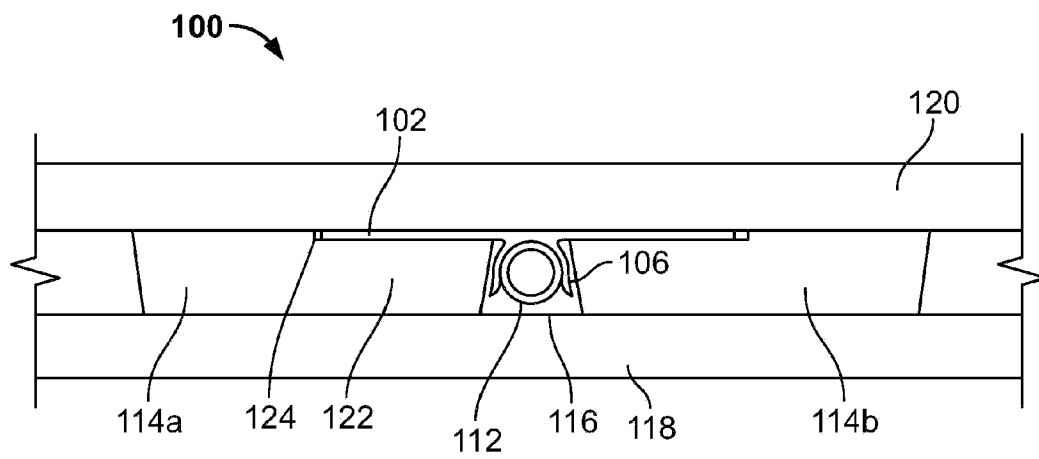


Fig. 3

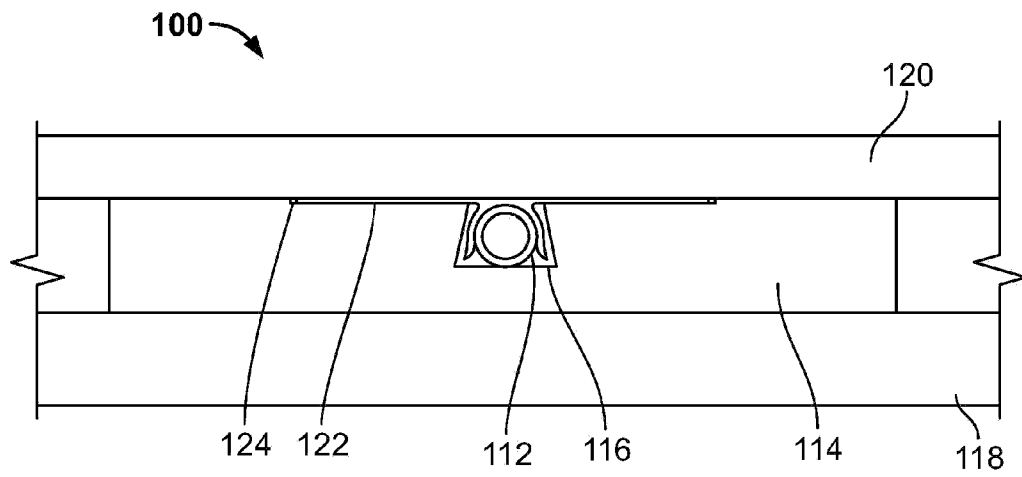


Fig. 4

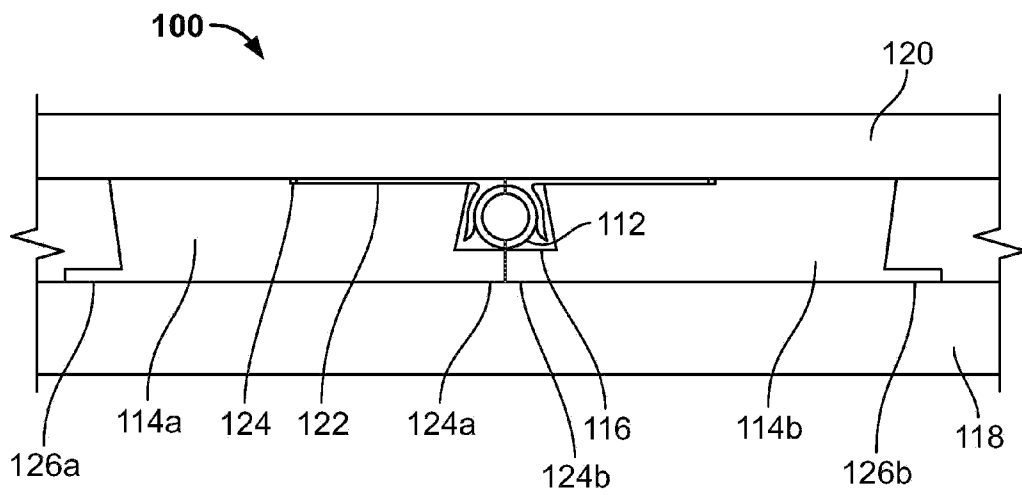


Fig. 5

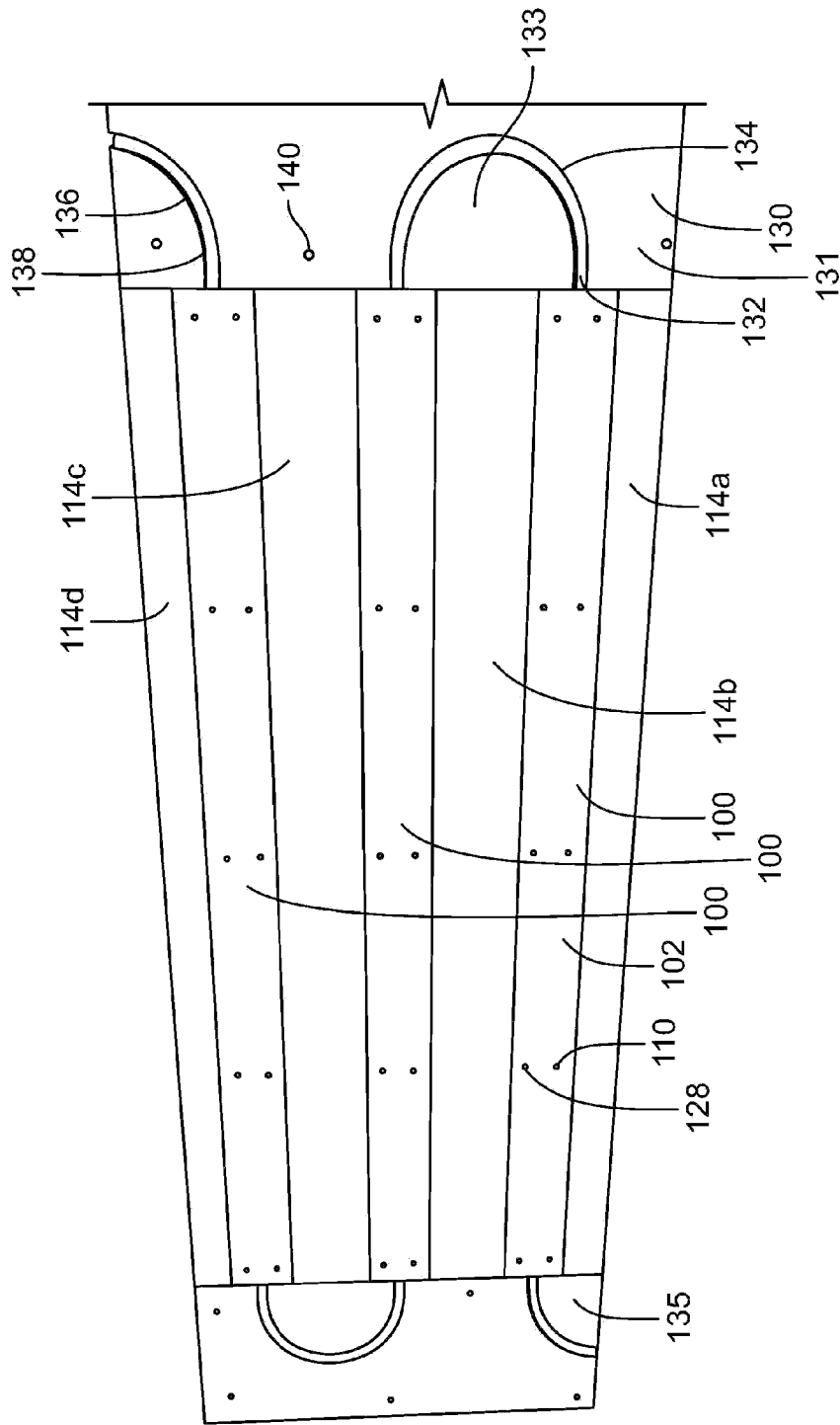


Fig. 6

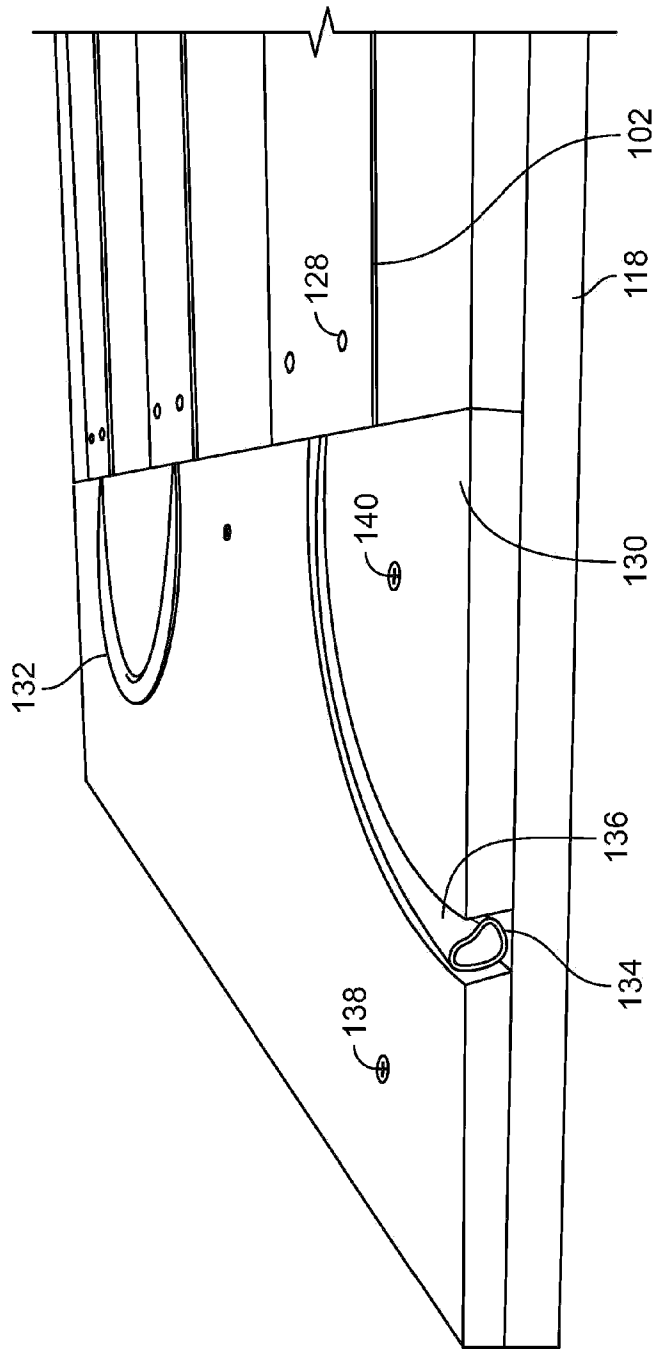


Fig. 7

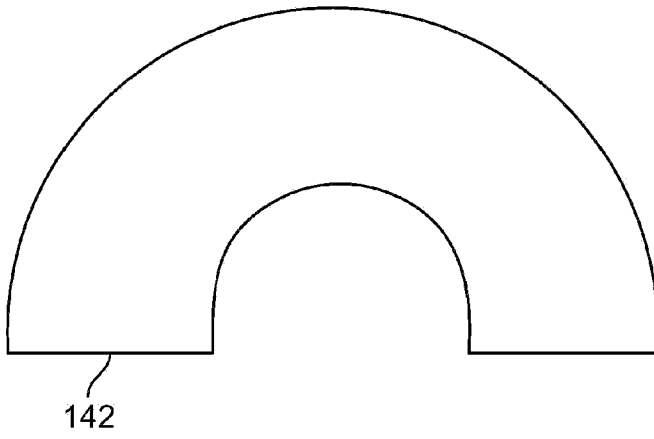


Fig. 8

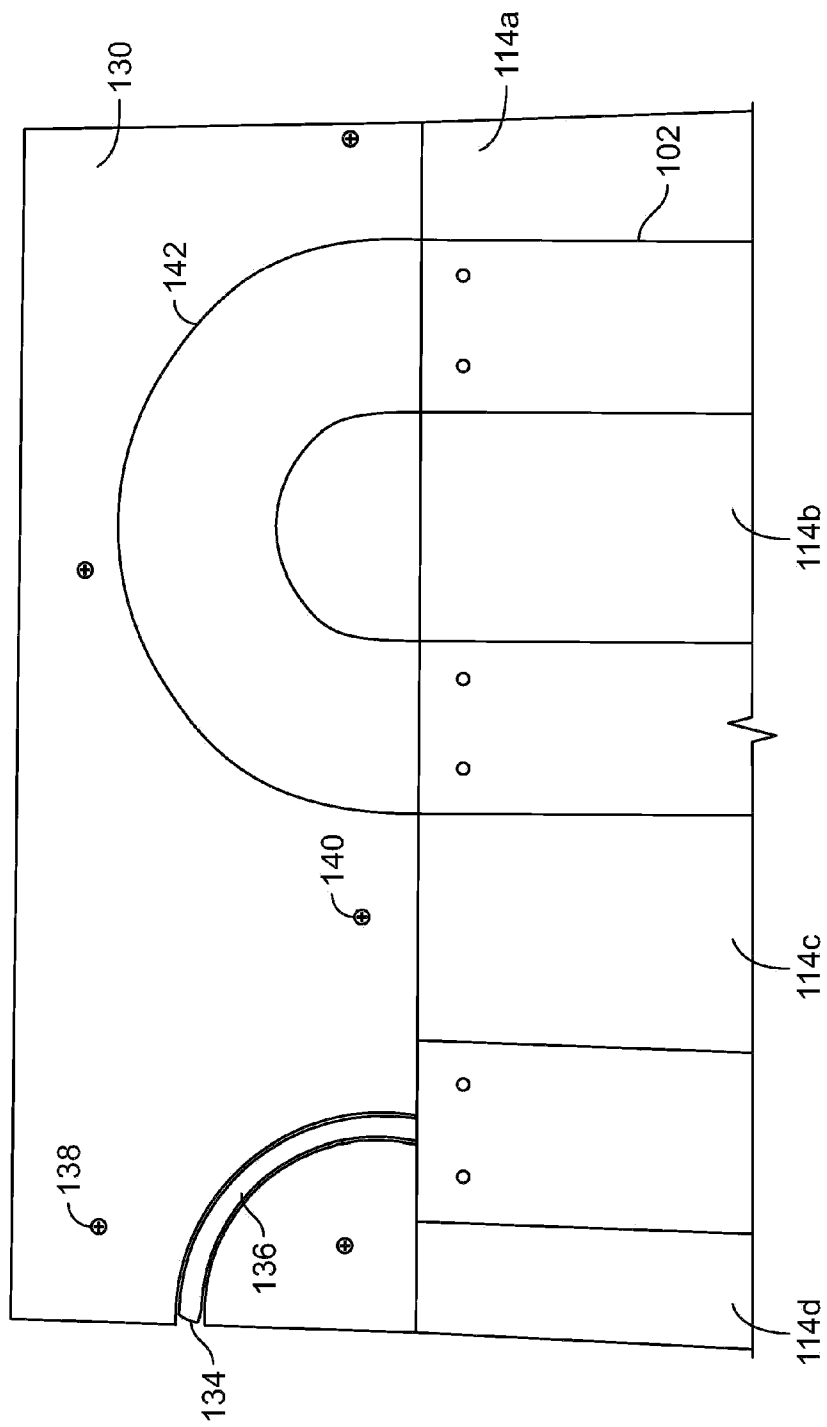


Fig. 9

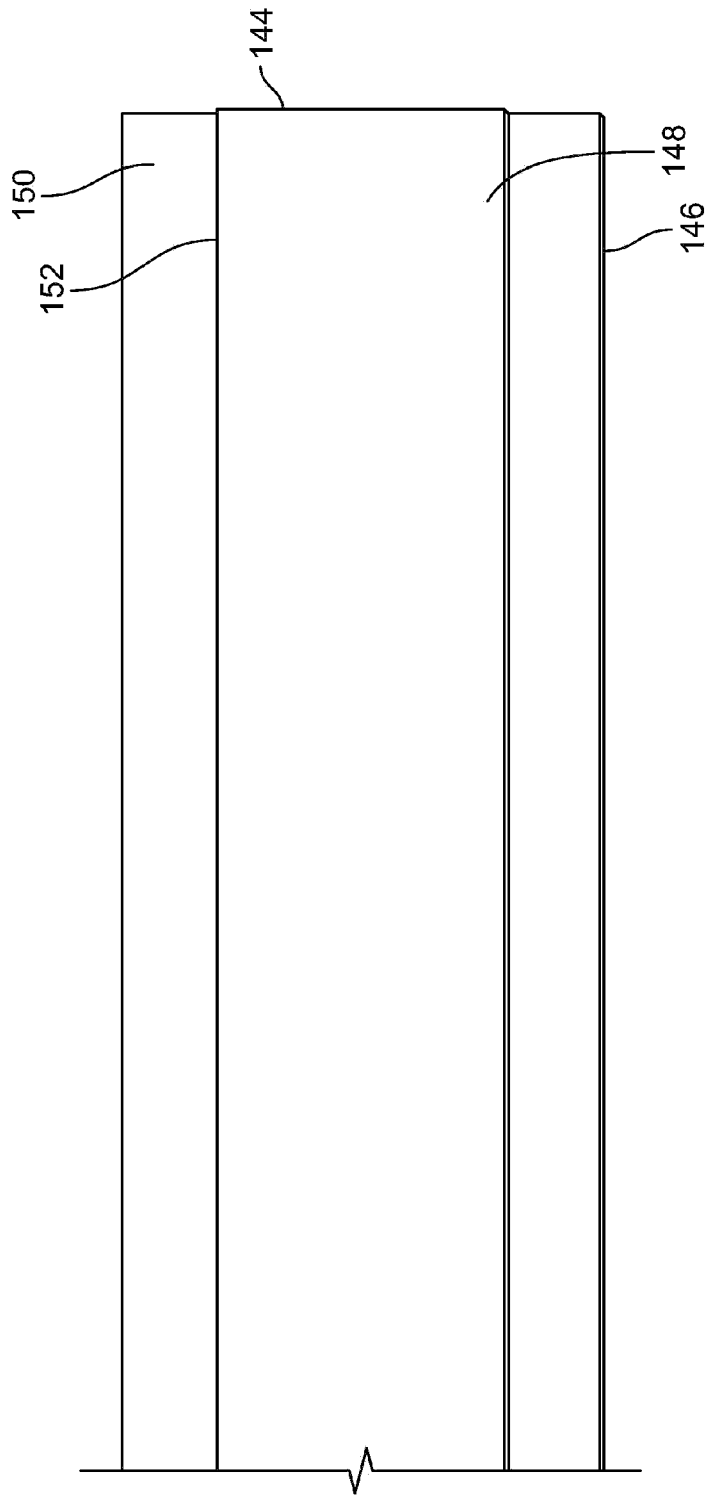


Fig. 10

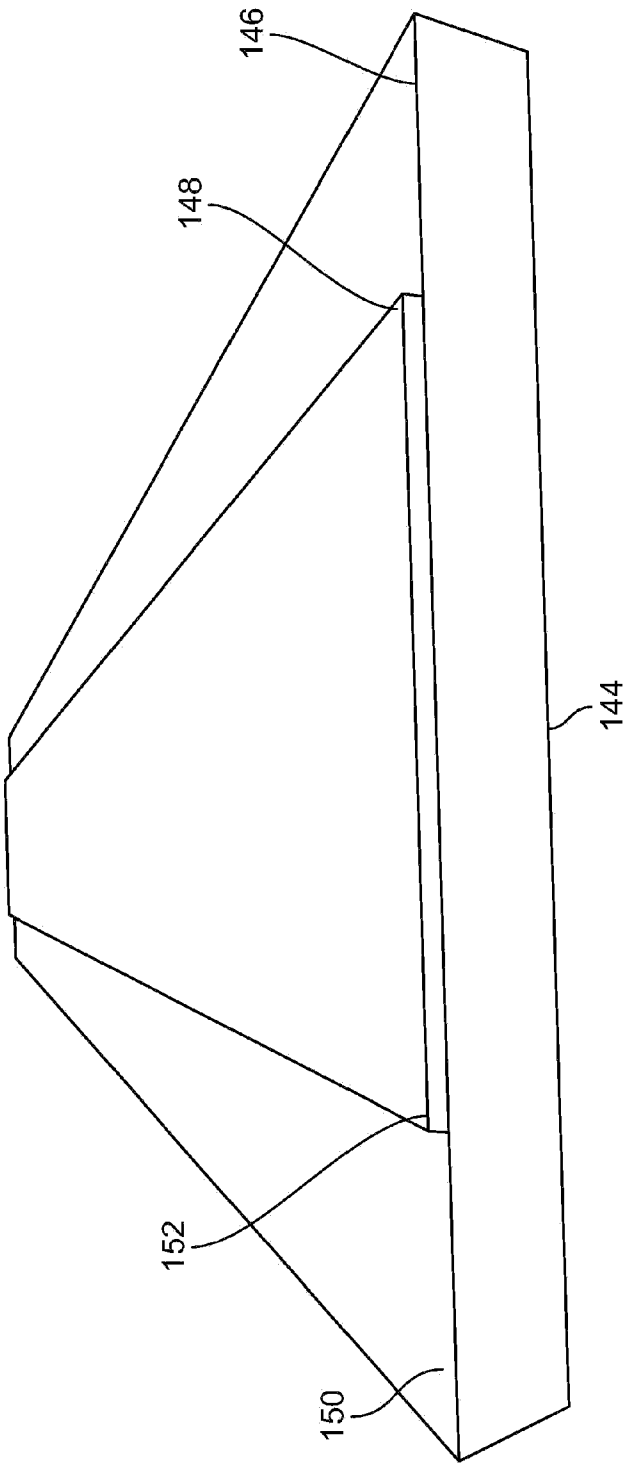


Fig. 11

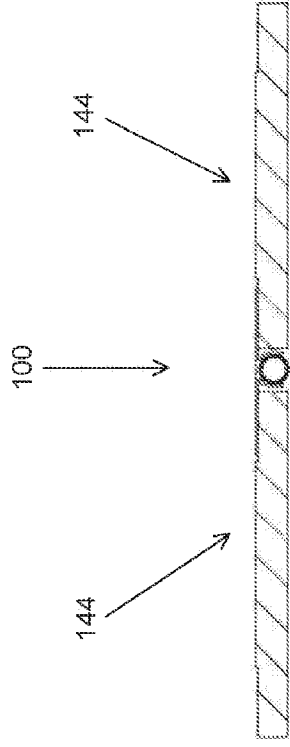


Fig. 12

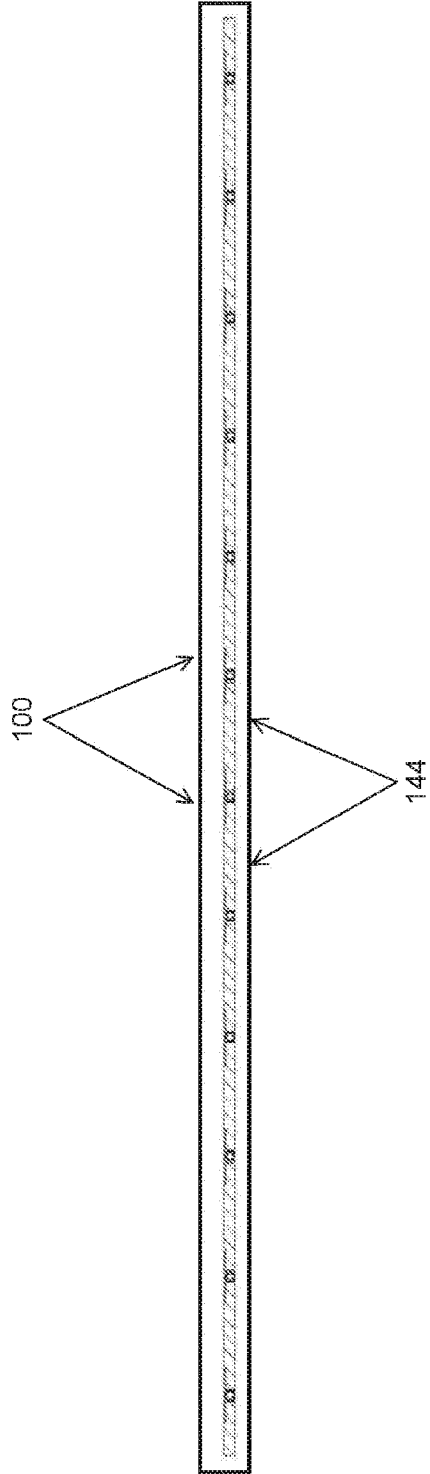


Fig. 13

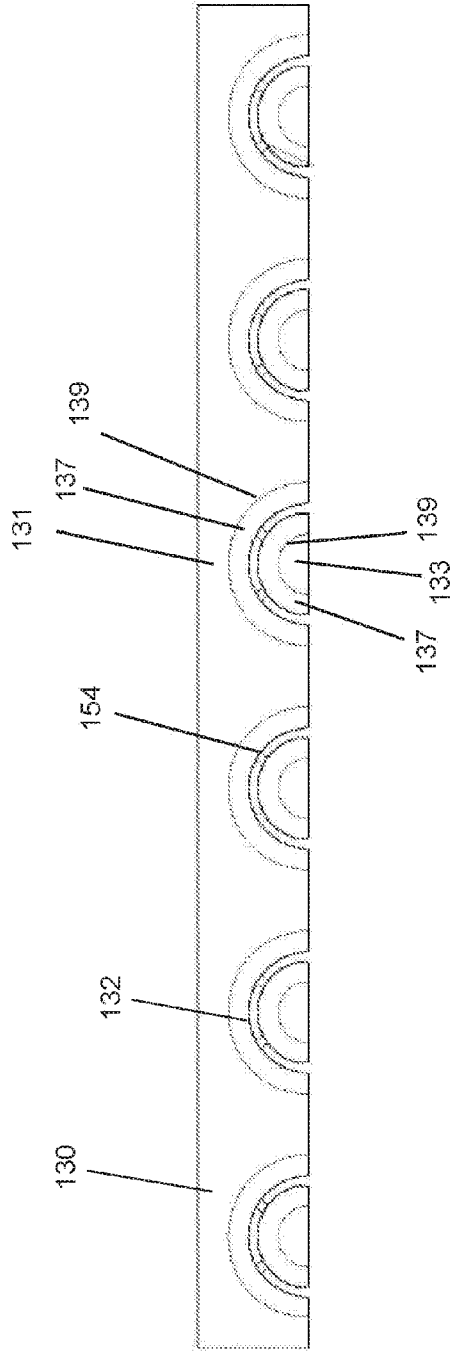


Fig. 14

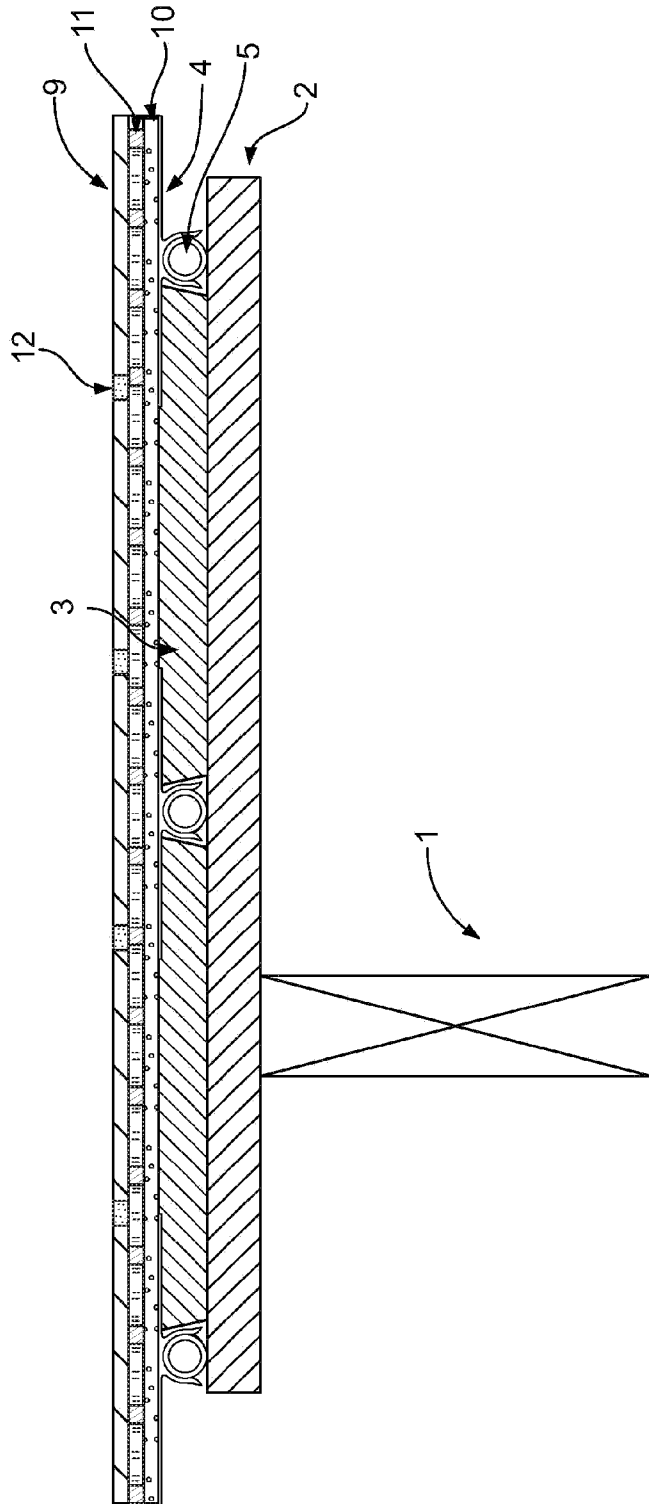


Fig. 15

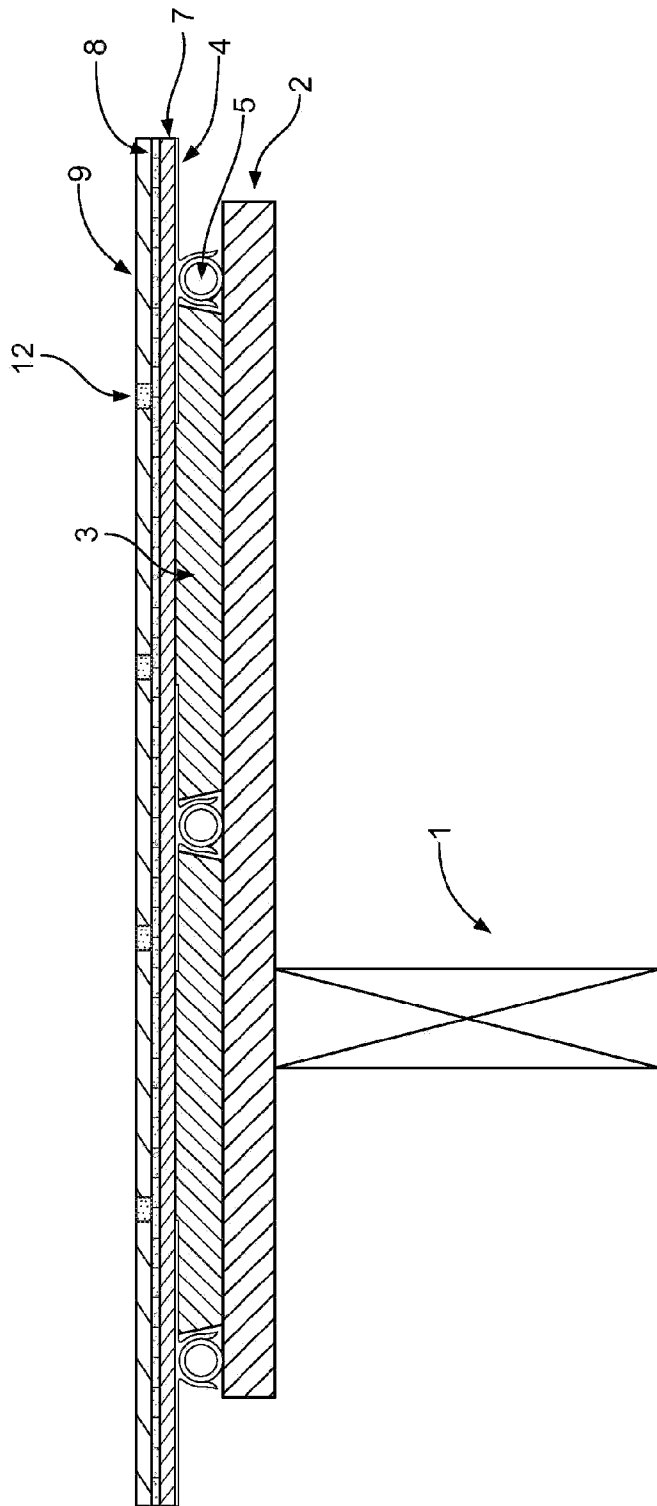


Fig. 16

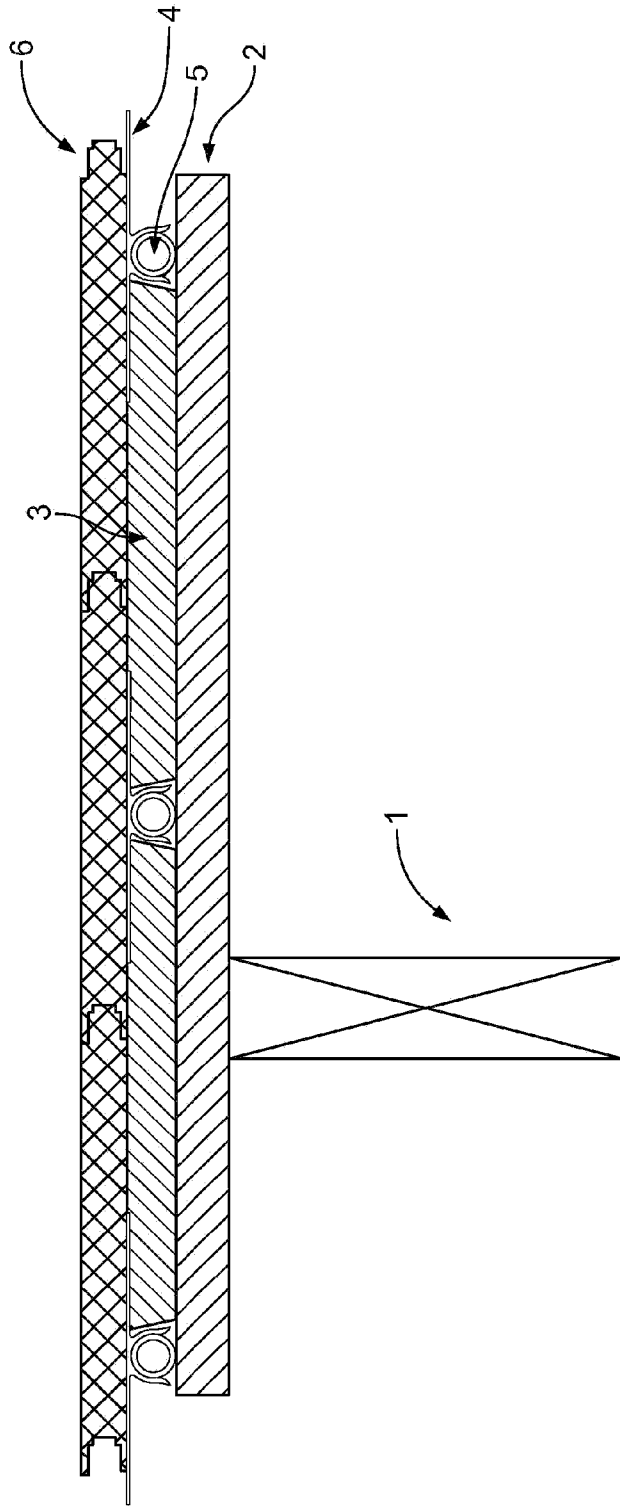


Fig.17

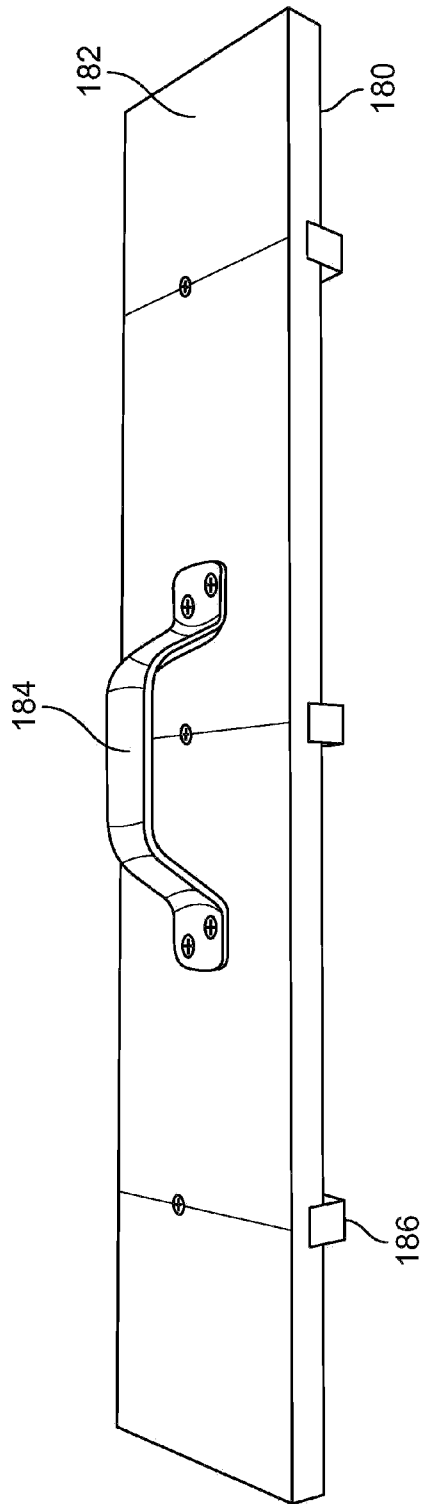


Fig. 18