



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**09.11.2016 Bulletin 2016/45**

(51) Int Cl.:  
**E04F 15/02 (2006.01) E04F 15/10 (2006.01)**

(21) Application number: **15182512.2**

(22) Date of filing: **26.08.2015**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME**  
Designated Validation States:  
**MA**

(71) Applicant: **Admiral Composite Technologies, Inc.**  
**Baldwin, NY 11510 (US)**

(72) Inventor: **CARRUBBA, Vincent F.**  
**Baldwin, NY New York 11510 (US)**

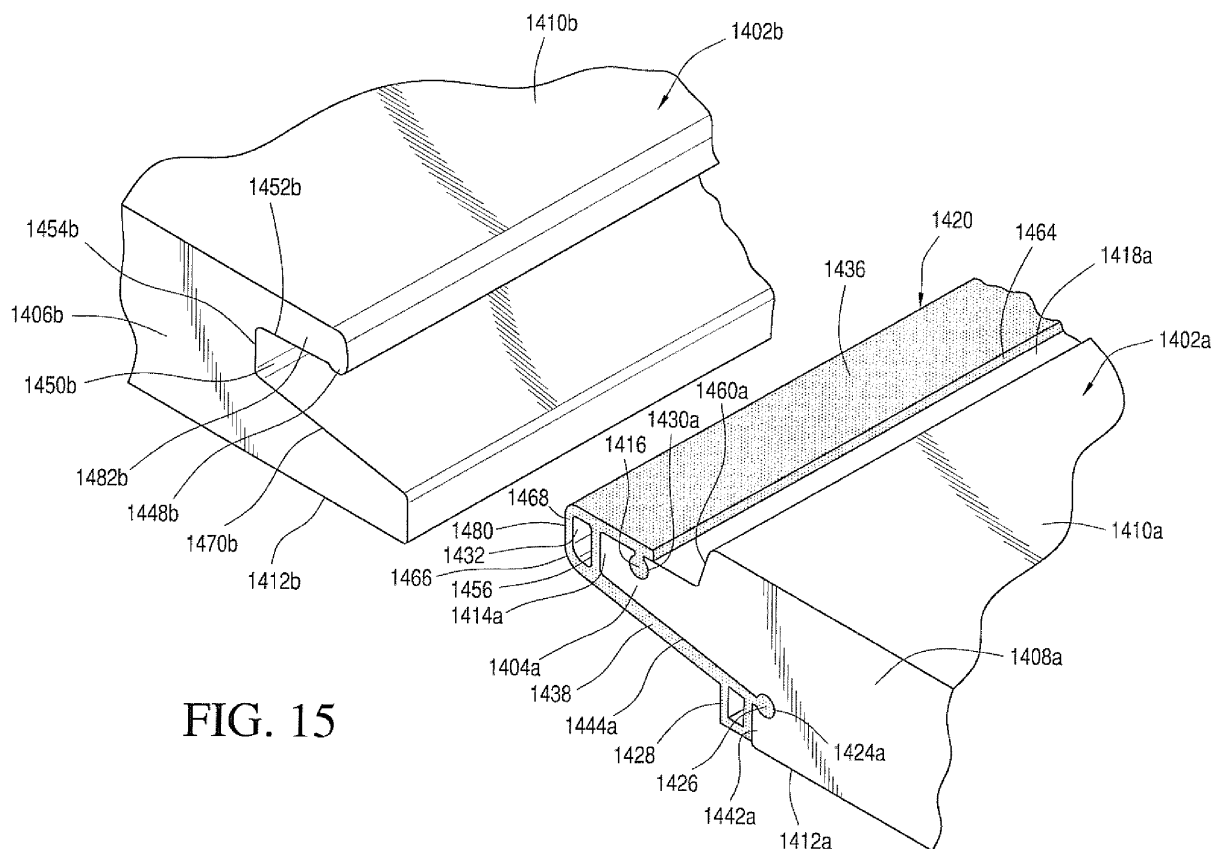
(74) Representative: **ABG Patentes, S.L.**  
**Avenida de Burgos, 16D**  
**Edificio Euromor**  
**28036 Madrid (ES)**

(30) Priority: **05.05.2015 US 201514704466**

(54) **DECK SYSTEM AND COMPONENTS**

(57) A decking system is made up of a variety of decking boards and other components are disclosed. In some aspects, the decking boards are connectable to each other so that adjacent boards will provide a water barrier and a drainage channel. Some versions of the boards may have a hollow region to accept the provision of heat-

ing elements or other accessory structures. A connector piece is disclosed in various embodiments span the gap between the butt ends of the boards to provide a water barrier at the butt ends of the boards. A gutter and downspout system is disclosed, as well as structures for protecting the ends or sides of the deck structure.



**FIG. 15**

## Description

### BACKGROUND

#### Field of the Invention

**[0001]** Various aspects of the invention relate to structures such as floors, roofing and exterior decking, and more specifically, relate to deck boards, deck planks, porch boards, flooring, the connection of adjacent boards to each other, the connection of the end of boards to each other, and various accessories used with such structures.

**[0002]** Certain aspects of the invention relate to the management of rain water & melting snow to keep the underside of a deck system substantially dry, providing for storage of articles and the ability to have a first floor patio/deck area underneath it without rain water affecting the enjoyment of the space or reaching the foundation of the house.

#### Description of Related Art

**[0003]** Deck systems are in wide use in both residential and commercial applications. Some deck systems consist of simple wooden boards having a rectangular cross-section each arranged longitudinally parallel to each other onto a supporting structure. Similar systems are in use with the deck boards being made of manmade material such as a composite or plastic based material.

**[0004]** These known systems sometimes have several disadvantages. For example, the parallel boards usually are spaced apart from each other laterally to some degree, and even if the deck boards are abutting each other along their length, there is generally still some type of gap between them. This gap between the long edges of the boards allows water to pass through. Thus, when natural rain water or a cleaning water, spilled water, melting snow or other liquid contacts the top surface of the deck boards, it will typically leak down through between the deck boards. This can be undesirable in situations where it is preferred that the region under the deck surface be kept dry. Such situations include structures having a deck surface on an upper floor and a residential area on a lower floor beneath the deck surface. Other situations where it is preferred that the region under the deck surface be kept dry include decks having a dirt surface beneath the deck surface. By keeping the dirt surface beneath the deck surface dry, the resident may prevent the dirt beneath the deck surface from becoming a haven for insects and weeds. In other commercial or industrial uses, it is desirable to keep liquids on the upper surface from inadvertently dripping to the lower area. In addition, where deck boards are also end-to-end, there is typically a space between the end surfaces of the deck boards. In some instances a relatively wide space is left between the ends of the deck boards in order to allow for a thermal expansion and contraction of boards placed end to end. This gap also can allow for undesirable fluid

leakage or liquid leakage under the deck as described above.

**[0005]** Another disadvantage of some deck boards is that in some instances it is necessary to screw the deck boards down to the supporting structure and in a conventional rectangular cross-section board, the screw heads are exposed on the top surface which may be undesirable for cosmetic or other reasons.

### SUMMARY

**[0006]** In light of the present need for improved decking systems and accessories, a brief summary of various embodiments is presented. Some simplifications and omissions may be made in the following summary, which is intended to highlight and introduce some aspects of the various embodiments, but not to limit the scope of the invention.

**[0007]** Various embodiments disclosed herein can relate to new and useful decking board constructions. For example, the decking board may feature an extruded cross-section having a generally tongue-and-groove mating fit between lateral and adjacent boards. In various embodiments, the decking board may be a symmetrical, two sided product, with each side optionally having different pattern or color, thereby creating two products in one. One side of the board may feature an upwardly directed U-shaped hook next to a downwardly directed groove or channel. The other side of the decking board may have a complimentary, but opposite shaped, downwardly directed U-shaped hook adjacent to an upwardly directed groove or channel. When the boards are interlocked side-to-side, each hook will mate into each groove thereby providing secure connection between the boards. Further, since the tongues and grooves are overlapping, there is no vertical path for water on the top of the board to pass in between the boards. In various embodiments, the upwardly directed U-shaped tongue forms a primary water channel to collect and direct water along the length of the structure to the end of the structure.

**[0008]** In another aspect, a flashing element may be provided to act as a butt joint to connect the butt ends of the boards. The flashing element has a complimentary shape to the upper surface of the board, and can reside in longitudinal grooves that are cut into the butt ends of the boards. The flashing can also be a sharpened and or hardened element which is installed by tapping the first sharp end of the flashing element into the relatively soft edge of the first board, and then bringing the second board into contact with the second end of flashing element and then tapping the far end of the second board so that the second edge of the flashing element is pushed into the relatively soft first end of the second board. When installed, the flashing prevents water from passing downward between the butt ends of the boards. In various embodiments, the flashing allows for expansion and contraction of the boards due to fluctuations between hot

and cold environments. In one embodiment, a metal flashing that taps into place can be held in place by an integral structure that then presses or affixes onto one or more edges of the board or boards and holds it in place to make assembly easier.

**[0009]** Another embodiment of the butt joint involves installation of a polymer part having a primarily "V-shaped" profile that flexes. The polymer part having a primarily "V-shaped" profile is installed between the butt ends of the planks. The flexing of the polymer part ensures a tight fit is maintained during expansion and contraction of the planks.

**[0010]** In another aspect, the boards may feature one or more longitudinal hollow regions. The longitudinal hollow regions may accept a heating element such as a heatable wire or a heating fluid conduit or hose. Other heating elements such as radiant heating elements or hot air containing passages may reside in or be part of the interior of the board. In some instances, a particular longitudinal hollow shape may be provided, or the heating elements may be embedded in the structure during manufacture.

**[0011]** In addition, at least one flexible member may be added inside the tongue and groove area on either part to align the planks when originally installed tightly together and to also withstand the expansion and contraction of the planks in the widthwise direction during hot and cold weather. Initially, at points of contact between adjacent tongues and grooves of adjacent boards, a bumper protrusion may be provided on one board which will frictionally engage with a complimentary groove on the other board.

**[0012]** In another embodiment, a gutter may be added to the perimeter of the deck surface to collect the water that is shed from the surface and direct it downwards in a controlled fashion to connectors connecting to a leader which guides water away from the underside of the deck.

**[0013]** In another embodiment, the addition of a perimeter element may take the form of a bull nose type extrusion that provides some protection to the end boards when objects come in contact with the end of the deck. This may be particularly useful where the ends of the deck may come in contact with vehicles such as carts or, where the deck is being used as a dock and may come in contact with watercraft.

**[0014]** In another embodiment, the decking board comprises first and second longitudinal sides. The first longitudinal side has a male projecting member with an upwardly directed rib and the second longitudinal side has a female slot defining a downwardly directed rib. The boards can be interlocked adjacent each other with the upwardly directed rib snapped past the downwardly directed rib to form a frictional engagement therebetween. A central main body portion is disposed in longitudinal sides.

**[0015]** In another embodiment, the decking board comprises a first longitudinal side having an extension member including a first surface and an opposing second

surface, the first surface including an upwardly projected abutment defining a first lip. The second surface has a recess formed therein. The second longitudinal side includes a first portion defining a tongue and a second portion including a second lip. The tongue includes a first flexible member extending generally upward from the first portion. The second lip includes a second flexible member extending generally downward from the second portion. The main central body is disposed intermediate to the first longitudinal side and second side. The first portion and second portion of the second longitudinal side define a cavity therebetween to receive an extension member of an associated decking board therein

**[0016]** In another embodiment, a first longitudinal side has a first member extending generally longitudinally outward therefrom. The first member has a top portion, a lower portion formed on an opposing side of the top portion, and an end portion defining a tongue member.

**[0017]** A second longitudinal side includes a top portion, a lower portion and an interior portion, defining a cavity therebetween to receive therein a first member of an associated decking board therein. A sealing assembly including a second sealing member is configured to be positioned within the cavity of the second longitudinal side to receiveably engage a tongue therein.

**[0018]** The second sealing member includes a first notch and a second notch configured for insertion into respective first aperture and second aperture formed on the second longitudinal side. The second sealing member further includes at least one sealing prong formed on an opposing side of the first notch and configured to be inserted into an aperture formed on the first member of an associated decking board.

**[0019]** In another aspect, a dock board may be provided in the form of a relatively simple dock board extrusion.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0020]** In order to better understand various exemplary embodiments, reference is made to the accompanying drawings, wherein:

FIG. 1A shows various elements of a decking system, including decking boards and a flashing element.

FIG. 1B is a cross-section of the embodiment of FIG. 1A.

FIG. 1C is a detailed view of a part of the cross-section of FIG. 1B.

FIG. 1D shows a cross-section of one embodiment of a decking board.

FIG. 1E shows a cross-section of another embodiment of a decking board.

FIG. 1F shows a cross-section of yet another embodiment of a decking board.

FIG. 2A shows a number of decking boards according to the embodiment of FIG. 1F in an installed condition.

FIG. 2B shows additional details of the system of FIG. 2A.

FIG. 2C shows a number of decking boards according to the embodiment of FIG. 1E in an installed condition.

FIG. 3A illustrates a drain and gutter system.

FIG. 3B is an exploded view of the system of FIG. 3A.

FIG. 3C is a further exploded view of the system of FIG. 3A.

FIG. 3D depicts components of the drain and gutter system.

FIG. 3E shows a drain and gutter system corner connector

FIG. 4 shows a cross-section of a component of the drain and gutter system having a bull nose profile.

FIG. 5 shows a simplified decking board in the form of a dock plank.

FIG. 6 shows a bull nose component for mounting to the end of a deck or dock system.

FIGS. 7A and 7B show polymer parts which aid in connecting planks of FIG. 1 in an end-to-end relationship.

FIG. 8A is a cross-sectional view of another embodiment of a decking board.

FIG. 8B shows two decking boards according to FIG. 8A joined together.

FIG. 9A is a cross-sectional view of another embodiment of a decking board.

FIG. 9B shows two decking boards according to FIG. 9A joined together.

FIG. 10A is a cross-sectional view of another embodiment of a decking board.

FIG. 10B shows two decking boards according to FIG. 10A joined together.

FIG. 11A is a cross-sectional view of another embodiment of a decking board.

FIG. 11B is a side view of the board of FIG. 11A.

FIG. 11C is a bottom view of the board of FIG. 11A.

FIG. 11D is a top view of the board of FIG. 11A.

FIG. 11E is a cross-sectional view of two boards according to FIG. 11A mounted together.

FIG. 12A is a cross-sectional view of another embodiment of a dock board.

FIG. 12B is a side view of the dock board of FIG. 12A.

FIG. 12C is a bottom view of the dock board of FIG. 12A.

FIG. 12D is a top view of the dock board of FIG. 12A.

FIG. 13A is a side view of a decking board system, illustrating two decking boards in locking engagement.

FIG. 13B is a cross-sectional view of another embodiment of a decking board.

FIG. 13C is a sectional view of the decking board of FIG. 13B, further illustrating the decking board connection and fastening component.

FIG. 13D is a side view of a decking board system of FIG. 13A illustrating the attachment of plural decking boards.

FIG. 14 is a perspective view of a decking board system, illustrating two decking boards in locking engagement with four seals.

FIG. 15 is an exploded environmental view of the decking board system of FIG. 14.

FIG. 16 is a cross-sectional view of the decking board system of FIG. 14, illustrating showing the decking boards in a detached position.

FIG. 17 is a cross-sectional view of the decking board system of FIG. 14, illustrating the decking boards in an attached position.

FIG. 18 is an exploded environmental view of the decking board system with a dual component sealing member assembly.

FIG. 19 is a cross-sectional view of the decking board system of FIG. 18, illustrating the decking boards in a detached position.

FIG. 20 is a cross-sectional view of the decking board system of FIG. 18, illustrating the decking boards in an attached position.

FIG. 21 is a cross-sectional view of an embodiment of a decking board system with a sealing member provided on a tongue member therein;

FIG. 22 is a cross-sectional view of a decking board system with a sealing member provided in the cavity of the female side of one of the decking boards;

FIG. 23A is a cross-sectional view of another embodiment of a decking board system with a sealing member provided in the cavity of the female side of one of the decking boards;

FIG. 23B is a detailed cross-sectional view of the decking board system of FIG. 23A showing the connection between respective decking boards.

## DETAILED DESCRIPTION

**[0021]** Referring now to the drawings, in which like numerals refer to like components or steps, there are disclosed broad aspects of various exemplary embodiments.

**[0022]** The board is used herein to refer to any type of longitudinal surface or substrate board. Some embodiments are referred to as decking boards, but any embodiments could be used in porches, floors, roofing or other uses as will be understood by one skilled in the art of construction components.

**[0023]** Various embodiments disclosed herein can relate to new and useful decking board constructions. For example, the decking board may feature an extruded cross-section having a generally tongue-and-groove mating fit between lateral and adjacent boards. One side of the board may feature an upwardly directed U-shaped hook next to a downwardly directed channel. The other end of the decking board may have a complimentary, but opposite shaped, downwardly directed U-shaped hook adjacent to an upwardly directed groove. When the boards are interlocked side-to-side, each hook will mate into each groove thereby providing secure connection

between the boards. Further, since the tongues and grooves are overlapping, there is no vertical path for water on the top of the board to pass in between the boards. In addition, the downwardly directed U-shaped tongue forms a water channel to collect and direct water along the length of the structure to the end of the structure.

**[0024]** FIG. 1A depicts a deck system 10 including a plurality of decking boards 12. Each board 12 has a downwardly directed tongue 14 which has an upwardly facing groove 16. Located inward of the downward facing tongue 14 is a downward facing groove 18. A reversed structure is provided on the other side of the board 12 including an upward facing tongue 20 having a downward facing channel 22. Located inward of the upward facing tongue 20 is an upward facing groove 24. Figure 1A also shows the boards interconnected with each other with the downward facing tongue 14 residing in the upward facing groove 24 of an adjacent board. The farthest edge 26 of the downward facing tongue 14 slides against a resilient tab 28. Similarly, the outer surface 30 of the board will abut against a tab 32 in an adjacent board. In the assembled system, therefore, a water collecting channel 40 is provided which appears from the upper surface of the deck as a simple downward rectangular channel. In various embodiments, the boards are symmetrical so the customer can turn the decking boards upside down while still allowing interconnection between the boards. In some embodiments, the symmetrical boards have identical patterns and colors on each side. This contributes to ease of assembly, as each board may be used with either side uppermost. In some embodiments, the symmetrical boards have different patterns or colors on each side. The presence of different patterns or colors on each side of the decking boards allows the customer to choose between two different or complementary surface styles while buying only one board item version.

**[0025]** In another aspect, a flashing element may be provided to connect the butt ends of the boards. The flashing element has a complimentary shape to the upper surface of the board, and can reside in longitudinal grooves that are cut into the butt ends of the boards. When installed, the flashing element prevents water from passing downward between the butt ends of the boards. This is true even if a relatively wide end to end gap is selected to allow for thermal expansion and contraction.

**[0026]** Into the end of each board is cut a slot 42 which extends a predetermined distance into the board, but not all the way through its length. The slot 42 is sized to receive the insertion of a flashing element 50. The flashing element, therefore, resides in the slots 42 in the butt ends of boards 12 placed end to end, and prohibits any water flow between the ends of the boards. To the extent the flashing element 50 is visible between butt end gap between the boards, any liquid that contacts the flashing will be directed into a channel portion 52 of the board and will, once a certain volume of liquid is reached, be carried away by channel 40. The flashing element 50 can be

made from folded or extruded metal and may have its edges sharpened for tapping into place into slots 42 in the butt ends of the boards.

**[0027]** In various embodiments, the flashing can be a sharpened and/or hardened element which is installed by tapping the first sharp end of the flashing element into the relatively soft end of a first board, and then bringing a second board into contact with the second end of flashing element and then tapping the far end of the second board so that the second edge of the flashing element is pushed into the relatively soft first end of the second board. In such embodiments, the presence of slots 42 in the butt ends of boards 12 is optional.

**[0028]** A feature of the boards 12 shown in FIG. 1A is that they can be slid together along their length. That is, rather than snapping the boards in together to mate from the top, which is possible, another assembly option is to slide the boards together end to end, one next to another. Accordingly, boards can be assembled into an overlapping deck without the use of any hardware to hold the boards to each other.

**[0029]** A device for facilitating formation of watertight butt joints is shown in FIG 7A. It is a polymer part 700 that has a primarily "V-shaped" profile 701 that flexes during installation between the butt ends of the planks. The butt ends of the planks contact the outer surface of the "V-shaped" profile 701. Flexing of the profile 701 ensures a tight fit is maintained during expansion and contraction of the planks. The polymer part 700 may also have a hidden tape or other sealant material to keep the butt joint in place and provide further water sealant ability. The polymer part 700 may have one or more snap provisions to hold it down in place between the ends of the planks. This "V-shaped" profile 701 directs the water that would normally have fallen between the ends of the planks into channel 702, which fits into rain grooves 40 in the planks and bridges rain grooves in two planks in an end-to-end relationship. Channel 702 guides water into the rain groove 40 in FIG 1A.

**[0030]** Another embodiment of the device for facilitating formation of watertight butt joints is shown in FIG. 7B, and is a polymer part 210 that has a primarily "T-shaped" profile 711 installed between the butt ends of the planks, with the vertical member of the "T-shaped" profile 711 fitting between the butt ends of the boards. The polymer part 710 may have a sealant or tape used to keep it in place and may have one or more snap provisions to keep it in place between the ends of the deck planks. The horizontal member of the "T-shaped" profile 711 covers the top surface of the planks and has a "U-shaped" extension forming channel 712 that fits on top of and spanning the space between the ends of the rain grooves 40 of the planks whose ends are being joined. This embodiment may or may not have some sealant, tape or snap fit to help hold it into place.

**[0031]** In an alternate embodiment, a device for facilitating formation of watertight butt joints is a polymer part 710 that has a primarily "I-shaped" profile installed be-

tween the butt ends of the planks, with the vertical member of the "I-shaped" profile fitting between the butt ends of the boards. The "I-shaped" profile has an upper horizontal member which covers the top surface of the planks and has a "U-shaped" extension forming a channel that fits on top of and spans the space between the ends of the rain grooves 40 of the planks whose ends are being joined. The "I-shaped" profile has a lower horizontal member. The butt ends of the boards fit between the upper and lower horizontal members.

**[0032]** Device 700 and 710 for facilitating formation of watertight butt joints may have a snap fit feature for securing them between boards.

**[0033]** Returning to FIG. 1A, the boards may also be assembled by installing a first board having an upwardly facing groove 24, and then connecting a second board having a downwardly facing tongue 14 to the first board. This is done by placing the downwardly facing tongue 14 of the second board over the already installed first board. Then the second board's downwardly facing tongue 14 is aligned over the first board's upwardly facing groove 24 and the second board is dropped down onto and over the top of the edge of the first board so tongue 14 goes into groove 24. The second board then slides into the groove 24 of the first board, tightly against the first board, so that the edge 26 of the downward facing tongue 14 slides against a resilient tab 28 in groove 24. The edge 26 of the downward facing tongue 14 makes tight contact with tab 28. This creates a perfect alignment between the boards as the installer puts screws down onto the surface of grooves 24, securing the boards in place. This also contributes to the water tightness of channel 40, which also has upwardly facing and downwardly facing interconnecting elements. The resilient tab 28 allows for thermal based expansion of the boards after assembly. It may be desirable to mount the boards to an underlying structure (this will be described further with reference to FIG. 2A using the board of FIG. 1F). The board of FIG. 1A provides a conveniently accessible mounting location for such screws through the surface of the groove 24, which may or may not be pre-drilled with holes 63 for ease of installation.

**[0034]** In another aspect, the boards may feature one or more longitudinal hollow regions 62. The longitudinal hollow regions may accept a heating element such as a heatable wire or a heating or cooling fluid conduit or hose. Other thermal elements such as radiant heating elements or hot air containing passages may reside in or be part of the interior of the board. In some instances, a particular longitudinal hollow shape may be provided, or the heating elements may be embedded in the structure during manufacture.

**[0035]** The board 12 also includes a main body region 60. This main body region 60 may be solid or may be provided with one or more hollow regions 62. The hollow region 62 may provide a number of benefits including, for example, reducing the weight of the board compared to a solid board. Further, the hollow region 62 may allow

for the insertion of heating devices. The board depicted in FIG. 1A also features stiffening ribs 64. These ribs 64 can provide stiffening, and can also maintain heater cables separate from each other if they are installed in back and forth rows.

**[0036]** It is also noted that the openings 62 may have a wide variety of shapes as are shown in the other figures, and other cross-sectional shapes. In addition to or instead of containing heating elements, other items such as wires for power outlets, speakers, dog fences, or other wire based products may be passed through the hollow portions 62.

**[0037]** In another aspect, a flexible assembly tab or member such as tab 28, 32 and 128 may be provided on the boards near the tongue and groove region to provide a firm frictional contact between the adjacent tongues and grooves and to align the boards during assembly. Initially, at points of contact between adjacent tongues and grooves of adjacent boards, a bumper protrusion may be provided on one board which will frictionally engage with a complimentary groove on the other board. It is also noted that tabs 28, 32 and 128 provide a stop feature during the assembly process, but further allow for lateral expansion and contraction of the boards during temperature extremes. The tabs 28, 32 and 128 may be referred to as flexible members. The resilient or flexible members may provide for alignment and frictional engagement. They may thus be in a slightly bent configuration in the assembled state. However the tabs may also be sacrificial in that they are designed to be breakable or frangible, that is, they may break off upon application of sufficient force during installation of adjacent boards.

**[0038]** FIG. 1D shows a decking board having a different cross-section from FIG. 1A. This board 112 may be thought of as having a tongue 114 which projects into a groove 124. An upward facing channel 116 is provided that will function similarly to the channel 16 described above. A resilient tab 128 is also provided. Instead of an upwardly directed tongue, this embodiment features a laterally extending tongue 120. The tongue 120 can provide for a screw location similar to that in the channel 24 and may or may not be pre-drilled with holes for easy assembly. The tongue 120 can also nest in a rectangular notch 118 provided on the other side of an adjacent board. An additional relief area 119 is provided on the lower surface of the tongue 114 which permits clearance for a screw head. The embodiment of FIG. 1D features a single central hollow area 162. FIG. 1D also schematically depicts heating elements 170 in hollow portion 162.

**[0039]** FIG. 1E shows a deck board similar to the board of FIG. 1D, but without the central hollow area 162. FIG. 1E shows a decking board having a tongue 114 which projects into a groove 124. A resilient tab 128 is also provided. This embodiment features a laterally extending tongue 120. The tongue 120 can nest in a rectangular notch 118 provided on the other side of an adjacent board. The embodiment of FIG. 1D optionally includes a pivot bump 117, and a pocket 126. Pocket 126 is adapted

to receive a mounting screw. However the pocket 126 can also serve as a track for accepting a longitudinal heating wire 130 as shown.

**[0040]** FIG. 1F shows a deck board having a similar outer profile to that of FIGS. 1D and 1C, but having a central hollow opening 162 that includes stiffening ribs 164. FIG. 1D also illustrates that the lower surface of the hollow region 162 has a parabolic concave upward shape to reflect heat upwards. A fastener 66 is shown being screwed into hole 63 for mounting.

**[0041]** FIGS. 2A and 2B show additional details utilizing the board of FIG. 1F. In this embodiment, the board of FIG. 1F has been further provided with a bump/rib 115 and a corresponding bump/rib 125. Instead of both items 115 and 125 being projecting bumps, one or the other could be a small groove notch, dimple or detent. It will be appreciated that as shown in the lower portion of FIG. 2A, the bumps/ribs 115 and 125 can engage each other to enhance the frictional connection of adjacent boards. Another bump or protrusion 117 may be placed at the edge of the bottom surface next to 118. This bumper creates a pivot point for the plank so that when fastening the board at area 120, the wall tongue 114 is pushed upwards to create a tight fit between the seal elements 115 & 125. Further, FIG. 2A depicts installation screws being placed through the laterally extending tongues 120.

**[0042]** In this embodiment, a top surface 111 of each board 112 has a slightly crowned surface to direct water towards the water channels 140 between the boards. FIG. 2A also shows further details of the interaction between the bump/ribs 115 and 125, and screws 127.

**[0043]** FIG. 2C shows an embodiment in which the board has been further provided with a bump/rib 115 and a corresponding bump/rib 125. In the embodiment of FIG. 2C, the boards are provided with pockets 126, and are assembled so that pockets 126 of the boards are aligned under tongues 114 of an adjacent board. The water channel 140 defined by tongue 114 of the adjacent board is thus positioned above pocket 126. Pocket 126 is provided with heating wire 130. Heating wire 130 provided in one board thus serves to heat channel 140 defined by tongue 114 of the adjacent board. Channel 140 is a groove for carrying rainwater. Heating wire 130 serves to prevent rainwater or melting snow in channel 140 from freezing.

**[0044]** At the end of a board, the wire 130 may be bent and wrapped around the end of the plank to an adjacent plank. The wire then fits into pocket 126 on the adjacent plank, and travels longitudinally along the adjacent plank. Notches 131 may be provided at the ends of the boards to guide the wire from one plank to another. Heating wire 130 can be a cylindrical wire or a flat or rectangular wire having two opposed major surfaces and two opposed edge surfaces. If a flat wire is used, then the wire should be arranged so that the opposed major surfaces are vertical, i.e., perpendicular to the upper surface of the boards. If the opposed surfaces are horizontal, it is more difficult to bend the wire at the end of the plank.

**[0045]** Pocket 126 and heating wire 130 may also be installed in the outer edge of tongue 114 or in groove 124. Each of these locations places the heating wire in proximity to channel 140, allowing the heating wire to heat water in the channel.

**[0046]** In another aspect, a drain system may be provided at the longitudinal end of a deck that is made up of adjacent boards. The drain system may include a main T-downspout piece which collects and directs water to a leader, and individual adjacent gutter pieces that connect to the T-downspout. These can be mounted at the ends of the boards on the supporting structure.

**[0047]** FIGS. 3A, 3B, 3C and 3D depict various components of a gutter system. The gutter system can be used with any deck that can direct and shed surface water, including the decking systems described herein. The gutter system generally includes a main T-downspout 210 and adjacent gutter pieces 212. The main T-downspout 210 can connect with a leader downspout 214. The gutter portions 212 may feature an outwardly curved projecting shape 212a which may provide some bumper protection for the end of the overall decking structure and provide a pleasing appearance by hiding the cut edges of the planks and hiding the heater wire that may be installed and running through and between each plank. Such a rounded outward portion may also be provided on the main T-downspout (although not shown) or this feature may be provided by a separate cover 216 that can be mounted along with T-downspout to cover it as shown. FIG. 3 illustrates these components and further illustrates a corner piece 318.

**[0048]** In another embodiment, the gutter may form a bull nose type extrusion that provides some protection to the end boards when objects come in contact with the end of the deck. This may be particularly useful where the ends of the deck may come in contact with vehicles such as carts or, where the deck is being used as a dock and may come in contact with watercraft. FIG. 4 shows a cross-section of a bull nose structure 400 that can provide a relatively simple gutter and/or bumper item that may be mounted on the edge and the end of a deck system. Alternatively, the lower portion of this type gutter extrusion can be made of various lengths so as to be useful for cutting off and using as a trim board in other areas of the deck as needed.

**[0049]** In another aspect, a dock board may be in the form of a relatively simple dock board extrusion. FIG. 5 shows a deck board in the form of a relatively simple dock plank. This plank 500 features a relatively flat top surface, tilted sides 512, and upwardly directed recesses 514. The recesses 514 may assist with saving weight by still providing longitudinal bending strength.

**[0050]** In another aspect, a bull nose structure may be provided that does not provide water gutter features, but rather provides a projecting cushion structure at the end of the deck similar to the bull nose described above. FIG. 6 depicts a bull nose structure that can be used similar to the bull nose of FIG. 4. However, this structure has a

different cross-sectional shape with structure 600 has a different cross-sectional shape including a mounting tab 612, and a rounded compressible projection 614 that has a central lap 616.

**[0051]** Any or all of the various deck boards, dock boards, downspouts, gutters or bumpers and other components can be manufactured from any suitable material. In many embodiments, the various items can be manufactured by extrusion methods. Any suitable extrudable material may be used. In some embodiments the boards can be manufactured using a compression molding process. In some examples, the items may be manufactured, by extruding or otherwise, from hydrophobic polymers, i.e., PVC or polyolefins, and hydrophobic coconut coir fibers which have been treated to remove coconut coir therefrom. In various embodiments, the composite items may be manufactured without any step chemically modified coconut coir fibers. However, the disclosure herein is not limited to the use of coconut based materials. For example, as an alternative to coir fibers, extruded materials may include ramie or bamboo fibers to reinforce polymeric products. In other embodiments, the materials may simply be extruded or molded from polymeric and/or wood based composite extrudable or moldable materials. Simple plastics may also be used. Further, it may be preferable to manufacture the flashing of a metal such as stainless steel or extruded metals.

**[0052]** The decking boards may be made by extrusion of a thermoplastic material, i.e., polyester, polyvinyl chloride, or polyolefin, preferably polyethylene or polypropylene. The thermoplastic material may contain a filler, including organic fillers such as wood powders, wood fibers, and coir fibers; inorganic fillers, such as glass fibers, carbon fibers, mineral fibers, silica, alumina, titania, carbon black, nitride compounds, and carbide compounds. The decking boards may be uncoated, or coated with a decorative coating of paint. The decking boards may be coated with a protective coating. The protective coating may be applied by coating a mixture of monomers and/or oligomers on the completed board, and then curing the coating to form a protective coating.

**[0053]** Coated decking boards may also be made by coextrusion of:

a core layer comprising a thermoplastic material, i.e., polyethylene or polypropylene, containing optional fillers, including organic fillers such as wood powders, wood fibers, and coir fibers; inorganic fillers, such as glass fibers, carbon fibers, mineral fibers, silica, alumina, titania, carbon black, nitride compounds, and carbide compounds; and  
a coating layer (such as for example PolyEthylene with additives) of a protective thermoplastic polymer. Suitable protective polymers include polyvinyl chloride; acrylic resins, i.e., poly(ethylene-co-methacrylic acid) (Surlyn®); polyester; polycarbonate; and polystyrene.

**[0054]** In various embodiments, the coating layer contains UV stabilizers which reduce the likelihood of the core layer undergoing degradation from exposure to ultraviolet light. Such UV stabilizers include organic light stabilizers, such as benzophenone light stabilizers, hindered amine light stabilizers, and benzotriazoles; and inorganic light stabilizers, such as barium metaborate and its hydrates.

**[0055]** In various embodiments, the coating layer contains antifungal agents which increase resistance of the board to mold and other organisms. The antifungal agents may be incorporated in the coating layer alone, or in both the core and coating layers. Useful antifungal agents for coatings include copper (II) 8-quinolinolate; zinc oxide; zinc-dunethyldithiocarbamate; 2-mercaptobenzothiazole; zinc salt; barium metaborate; tributyl tin benzoate; bis tributyl tin salicylate; tributyl tin oxide; parabens: ethyl parahydroxybenzoate; propyl parahydroxybenzoate; methyl parahydroxybenzoate and butyl parahydroxybenzoate; methylenebis(thiocyanate); 1,2-benzisothiazoline-3-one; 2-meicaptobenzo-thiazole; 5-chloro-2-methyl-3(2H)-isothiazolone; 2-methyl-3(2H)-isothiazolone; zinc 2-pyridinethiol-N-oxide; tetrahydro-3,5-di-methyl-2H-1,3,5-thiadiazine-2-thione; N-trichloromethyl-thio-4-cyclohexene-1,2-dicarboximide; 2-n-octyl-4-isothiazoline-3-one; 2,4,5,6-tetrachloro-isophthalonitrile; 3-iodo-2-propynyl butylcarbamate; diiodomethyl-p-tolylsulfone; N-(trichloromethyl-thio)phthalimide; potassium N-hydroxy-methyl-N-methyl-dithiocarbamate; sodium 2-pyridinethiol-1-oxide; 2-(thiocyanomethylthio)benzothiazole; and 2-4(-thiazolyl)benzimidazole.

**[0056]** The coating layer may help provide scratch resistance to the decking board surface, either by using a coating with a polymer which is harder than the core layer or through the use of certain additives. Additives which help increase scratch resistance in coatings include lubricants and very hard mineral fillers, including carbide and nitride ceramics.

**[0057]** The coating layer may also include inorganic pigments, organic pigments, or dyes as colorants. The coating layer may be embossed with a decorative pattern, i.e., wood grain or imitation stone.

**[0058]** In situations where a coating layer or "capcoat" is applied by coextrusion, the coating layer has a thickness of from about 0.01 to 0.25 inch, preferably from about 0.02 to 0.15 inch, more preferably from about 0.04 to 0.08 inch. The capcoat may cover the entire longitudinal surface of the board; the top and sides of the board, with the bottom surface being uncoated; or the top of the board, with the bottom surface and sides being uncoated.

**[0059]** As discussed above, at least one flexible member may be added inside the tongue and groove area on the decking planks to align the planks to help withstand expansion and contraction of the planks. Also, a bumper protrusion may be provided on a board which will frictionally engage with a complimentary groove on another board. In various embodiments made by coextrusion of



a core material and a capcoat, these flexible members and bumpers may be formed from the same material as the core material, and optionally coated with the capcoat material. In various embodiments made by coextrusion, these flexible members and bumpers may be formed from the capcoat material alone. In certain embodiments, flexible members and bumpers formed from the capcoat material have increased toughness, resistance to breakage, and flexibility, when compared to embodiments in which flexible members and bumpers are made from the core material, i.e., a wood fiber- or coir fiber-filled polyolefin.

**[0060]** A further design for a flexible member produced from a capcoat polymer layer can be envisioned to be attached to the outside edge of the tongue portion, i.e., on the outside edge 26 of the tongue 14, or on the outer surface of rain-groove element 40, as seen in FIG. 1A. The flexible member produced from the capcoat polymer can thereby set the assembly gap between planks during installation. Additionally, a flexible member produced from the capcoat polymer and positioned on edge 26 may contact an inner surface of groove 24, when boards are fitted together as in FIG. 1A. This provides a flexible water seal between boards as boards expand with heat and then contract again.

**[0061]** A further design for a flexible member (not shown in FIG. 1C) produced from a capcoat polymer layer can be envisioned to be attached to the outer edge of the tongue portion 114 or 116, as seen in FIG. 1C, and adapted to contact the interior of groove 124, as seen in FIG. 1C. Contact between flexible members produced from a capcoat polymer layer and groove 124 of FIG. 1C produces a flexible water seal.

**[0062]** Also, a bumper protrusion may be provided on a board which will frictionally engage with a flexible member made of capcoat material on another board. The cap coat material is a tough resilient polymer, and may be used to produce watertight elements.

**[0063]** FIG. 8A is a cross-sectional view of a board 800 having a top cap coat 801 and a lower cap coat 802. A male side of the board 814 includes an upwardly projecting bump 816 and a lower pivot bump 817. A female side 820 of the board includes a projecting bump 822 that can snap over and interlock with the projecting bump 816, a flexible tap 832, which can help hold the boards together in alignment, and accommodate for expansion of the boards, and a water drain channel 824. Further, the female end has an open area to the inside of the flexible tab 832 which can be sized and dimensioned to receive a heating wire or cable. FIG. 8A shows the heating element 870 as having a generally vertical rectangular cross-section.

**[0064]** FIG. 8B shows two of the boards 800 interlocked adjacent to each other.

**[0065]** FIG. 9A is a cross-sectional view of a board 900 having a top cap coat 901 and a lower cap coat 902. This board is narrower than that of FIG. 81 and thus may be more suitable for use as a porch board in some instances.

A male side of the board 914 includes an upwardly projecting bump 916 and a lower pivot bump 917. A female side 920 of the board includes a projecting bump 922 that can snap over and interlock with the projecting bump 916, a flexible tap 932, which can help hold the boards together in alignment, and accommodate for expansion of the boards, and a water drain channel 924. Further, the female end has an open area to the inside of the flexible tab 932 which can be sized and dimensioned to receive a heating wire or cable. FIG. 9A shows the heating element 970 as having a generally vertical rectangular cross-section.

**[0066]** FIG. 9B shows two of the boards 900 interlocked adjacent to each other.

**[0067]** FIG. 10A is a cross-sectional view of a board 1000 having a top cap coat 1001 and a lower cap coat 1002. A male side of the board 1014 includes an upwardly projecting bump 1016 and a lower pivot bump 1017. A female side 1020 of the board includes a projecting bump 1022 that can snap over and interlock with the projecting bump 1016, a flexible tap 1032, which can help hold the boards together in alignment, and accommodate for expansion of the boards, and a water drain channel 1024. Further, the female end has an open area to the inside of the flexible tab 1032 which can be sized and dimensioned to receive a heating wire or cable. FIG. 10A shows the heating element 1070 as having a generally vertical rectangular cross-section.

**[0068]** FIG. 10B shows two of the boards 1000 interlocked adjacent to each other. In this embodiment, the aperture on the female end is shaped more vertically, so that the heating element can be oriented more vertically.

**[0069]** FIG. 11A is a cross-sectional view of a board 1100 having a top cap coat 1101 and a lower cap coat 1102. A male side of the board 1114 includes an upwardly projecting bump 1116 and a lower pivot bump 1117. A female side 1120 of the board includes a projecting bump 1122 that can snap over and interlock with the projecting bump 1116, a flexible tab 1132, which can help hold the boards together in alignment, and accommodate for expansion of the boards, and a water drain channel 1124. Further, the female end has an open area to the inside of the flexible tab 1132 which can be sized and dimensioned to receive a heating wire or cable. FIG. 11A shows the heating element 1170 as having a generally vertical rectangular cross-section.

**[0070]** FIG. 11B shows two of the boards 1100 interlocked adjacent to each other.

**[0071]** The female sided of the boards of FIGS 8A through 11D form a partially enclosed conduit for holding the heating element 870, 970, 1070, 1170, etc. When the boards are installed adjacent each other the male sides in some embodiments will substantially enclose the female-side conduit so the heating element is not exposed to water.

**[0072]** FIGS. 12A-12D show the cross-sectional and other views of a dock board 1200.

**[0073]** Referring now to FIGS. 13A-13D, there is

shown a decking board system 1312 including plural decking boards, in interlocking position. As shown in FIGS. 13A and 13B, the decking board 1300 generally includes a top cap coat 1301 and lower cap coat 1302, as similarly disclosed in previous embodiments. As further shown, the decking board 1300 includes a male side or first longitudinal side 1306 of the decking board, a female side or second longitudinal side 1308, and a main body 1304 intermediate to the male side 1306 and second side 1308.

**[0074]** In the decking system 1312, the decking boards 1300 are configured for interlocking engagement with each other. As shown, the male side 1306 of the decking board 1300 is configured for cooperative interlocking engagement with the female side 1308 of an associated decking board 1300. To facilitate this engagement, the male side 1306 generally includes an extension member 1314, which extends generally laterally outward from the male side 1306. The extension member 1314 is configured for insertion into the female side 1308 of an associated decking board 1300 in the system 1312.

**[0075]** The extension member 1314 generally includes a first surface 1326 and an opposing second surface 1336 defining a notch 1337. As shown, the extension member 1314 further includes a generally upwardly projecting first lip 1316 positioned, proximate to the first surface 1326. The extension member 1314 further defines an opening 1338 configured to receive a tongue 1320 from an associated decking board 1300 therein. The configuration of the male side 1306 in combination with the extension member 1314 provides a u-shaped configuration 1340.

**[0076]** The female side 1308 of the decking board 1300 generally includes a first portion or tongue 1320 and a second portion 1321 including a second lip 1322 or bump. The first portion 1320 and second portion 1321 have an opening formed therebetween defining a cavity 1362 configured to receive an extension member 1314 of a male side therein.

**[0077]** As shown in Fig. 13B, the second lip 1322 extends in a generally downward direction from the second portion 1321 and is configured for snapping and/or interlocking engagement with a first lip 1316 provided by an associated decking board 1300. The second portion 1321 further includes a second flexible member 1324, positioned generally adjacent to the second lip 1322, along the inner surface 1330 of the second portion 1321.

**[0078]** The second flexible member 1324 extends in a generally downward direction from the inner surface 1330 such that when the decking board 1300 is in locking engagement with an associated decking board, the second flexible member 1324 engages the surface 1326 of the extension member 1314. The second flexible member 1324 has at least one prong extending generally downward. As shown in FIG. 13C, the second flexible member 1324 may have a two-prong configuration for engagement with the extension member 1314. The first prong 1333 of the second flexible member 1324 may

form a second seal, and the second prong 1331 of the second flexible member 1324 may form a third seal. Notably it is contemplated that the second flexible member 1324 can include more than two prongs 1331, 1333, without departing from the scope of the present invention. It is further contemplated that multiple second flexible members 1324 can be provided on the inner surface 1330 to provide additional seals with the extension member 1314, without departing from the scope of the present invention.

**[0079]** The tongue 1320 extends generally laterally outward from the female side 1308. As shown, the tongue 1320 has a generally sloped inner surface 1332. The female side 1308 of the decking board further includes at least one first flexible member 1328, which extends from the surface 1332 in a generally upward direction. As such, the first flexible member 1328 is configured for engagement with an extension member 1314 of an associated decking board 1300. Notably it is contemplated that the first flexible member 1328 can include multiple prongs or members to provide multiple points of engagement with the extension member 1314. Further it is noted that one or more first flexible members 1328 can be provided on the tongue 1320 to provide multiple seals with the extension member 1314 to further block moisture.

**[0080]** FIGS. 13A and 13D shows a decking board system 1312 including a first decking board 1300a and a second decking 1300b, configured to be interlocked adjacent to each other. As shown, the extension member 1314a of decking board 1300a is inserted into cavity 1362b of the decking board 1300b. The second flexible member 1324b and first flexible member 1328b cooperatively engage the extension member 1314a. As such, the second flexible member 1324b engages the surface 1326a of the extension member 1314a forming a seal, and the first flexible member 1328b engages the notch or recess 1337a. The first lip 1316a of the extension member 1314a engages the inner surface 1330b of the decking board 1300b. The second lip 1322b of the decking board 1300b engages the inner surface 1326a of the decking board 1300a. Additionally, the tongue 1320b is inserted below the surface 1338a.

**[0081]** As shown in Fig. 13C, the decking board 1300 provides an opening 1342 for receiving a fastening member or component, such as a bolt or screw. As such, the decking board 1300 may be secured to an adjacent surface. Additionally, FIG. 13C illustrates that when the decking boards are in engagement, channel 1340 is formed between the decking boards 1300a, 1300b to facilitate fluid removal from the decking board surfaces.

**[0082]** The decking board 1300 wherein a first longitudinal side 1306 has an extension member 1314 including a first surface 1326 and an opposing second surface 1336. The first surface 1326 includes a first lip 1316a the second surface having a recess formed therein. A second longitudinal side 1336 includes a first portion 1320 defining a tongue and a second portion 1321 includes a second lip 1322. The second longitudinal side further includ-

ing a first flexible seal member 1314. A main central body is disposed intermediate to the first longitudinal side and second side; wherein the first portion 1320 and second portion 1321 of the second longitudinal side define a cavity 1362 therebetween to receive an extension member 1314 of an associated decking board therein.

**[0083]** The decking board 1300 wherein, the tongue includes a first flexible seal member extending generally upward from the first portion 1320 and the second portion 1321 includes a second flexible seal member 1328 extending generally downward from the second portion 1321. The decking board 1300, wherein the first flexible seal member 1328 is configured to operatively engage the second surface of an associated extension member 1314 when the associated extension member 1314 is inserted in the cavity 1362.

**[0084]** The decking board 1300 wherein the second flexible seal member 1324 is configured to operatively engage a first surface of an associated extension member when an extension member is inserted in the cavity 1362. The decking board 1300 includes the second flexible seal member 1324 has a flexible prong extending generally downward from the second portion 1321 of the second longitudinal side. The decking board 1300 includes a second flexible member 1324 includes a first prong extending generally downward from the second portion 1321 of the second longitudinal side and a second prong 1331 defining a third flexible seal member extending generally downward from the second portion 1321 of the second longitudinal side.

**[0085]** The decking board 1300 includes the first portion 1320 of the second longitudinal side includes an opening formed therein to receive a fastening member to secure the decking board to an associated surface. The decking board 1300, wherein the first flexible member 1328 is configured to engage a recess of an associated decking board.

**[0086]** The decking board 1300, wherein the first portion 1320 of the second longitudinal side and extension member 1314 of the first longitudinal side are configured such that when a first decking board and a second decking board are interlocked, a channel is formed between the first portion 1320 of the second decking board and the extension member first lip 1316 of the first decking board.

**[0087]** The decking board 1300 wherein the first lip 1316 is an upwardly projected abutment. The decking board 1300 wherein the second lip 1322 is a downwardly projected abutment.

**[0088]** The decking board 1300 comprising, a first body portion, a central body portion; and, a second body portion including a first portion 1320 including a first flexible member 1328, and a second portion 1321 including a second flexible member 1324, wherein the first flexible member 1328 and second flexible member 1324 are configured to cooperatively engage an extending member of an associated decking board.

**[0089]** The decking board 1300, wherein the first por-

tion 1320 and second portion 1321 provide a cavity therebetween to receive the extending member. The decking board 1300, wherein the first flexible member 1328 is configured to engage a lower portion of an extending member 1314 of an associated decking board. The decking board 1300, wherein the second flexible member 1324 is configured to engage an upper portion of an associated extending member 1314.

**[0090]** The decking board 1300, wherein the second flexible member 1324 has at least one flexible prong extending generally downward from the first portion 1320. The decking member 1300 wherein the second flexible member 1324 has two-prongs extending generally downward from the first portion 1320. The decking board 1300, wherein first flexible member 1328 is a resilient tab. The decking board of 1300, wherein the first portion 1320 provides an opening for receiving a fastening member therein to secure the decking board to an adjacent surface.

**[0091]** In an embodiment shown in FIG. 14, the decking board system 1400 generally includes one or more interconnected decking boards 1402, and a sealing member assembly 1420 provided between each decking board 1402, and may be removably affixed therein. The decking board system may use Cellular PVC as the board core for the decking board 1402 with a flexible seal material, such as silicone, for example as a sealing member. Notably, it is contemplated that the sealing member may also be made of other materials capable of co-extrusion, such as PVC, for example. The sealing member may be provided on a tongue member, which will be described later herein

**[0092]** The sealing member assembly 1420 is configured to provide four or more sealing connections between connectable decking boards 1402a, 1402b to prevent water and/or moisture from entering between the joints. In general, each decking board 1402a, 1402b has a top surface 1410a, 1410b, a bottom surface 1412a, 1412b a first longitudinal side 1408a, 1408b, and a second longitudinal side 1406a, 1406b and a central body portion 1407a, 1407b disposed intermediate to the first longitudinal side 1408a, 1408b and second longitudinal side 1406a, 1406b. As shown, in a connected configuration, the decking boards 1402a and 1402b form the decking system 1400 adapted to provide support.

**[0093]** Continuing now to FIG. 15, there is shown in an exploded perspective view of the decking board system 1400, with decking boards 1402a and 1402b depicted in a detached position. As illustrated, the first longitudinal side 1408a includes a tongue member 1404a or first member, which extends generally outward longitudinally from the first longitudinal side 1408a. The second longitudinal side 1408b includes a cavity 1450b or chamber, which is configured to receive the tongue member 1404a from the adjacently positioned decking board 1402a.

**[0094]** The top portion 1418a of the tongue member 1404a, and the top surface 1410a of the decking board 1402a, are separated by a generally vertically disposed

first shoulder 1460a extending upwardly therebetween. As shown, the top portion 1418a of the tongue member 1404a has a generally flat planar surface, which is generally parallel to the top surface 1410a of the decking board 1402a. The bottom portion 1444a of the tongue member 1404a has angled surface extending between the end portion 1414 of the tongue member 1404 and a second shoulder 1442a. The second shoulder 1442a has a generally vertical configuration, and is positioned generally between the bottom portion 1444a of the tongue member 1404a and the bottom portion 1412a of the decking board 1402a.

**[0095]** The tongue member 1404a is configured to receive locking connection of the sealing member assembly 1420 thereto. The tongue member 1404a further includes a first notch 1430a or opening formed generally on the top portion 1418a of the tongue member 1404a, generally centrally between the end portion 1414a and the first shoulder 1460a. The first notch 1430 is configured to receive a portion of the sealing member assembly 1420 therein. As shown, the first notch 1430a may have a generally cylindrical shape with a circular cross-section, configured to receive a first insert 1416 of the sealing member assembly 1420 therein. Notably, the first notch 1430a may also have an arrowhead-shaped configuration, which will be described later herein. The tongue member 1404a further includes a second notch 1424a formed generally on the bottom portion 1444a of the tongue member 1404a, proximate to the intersection of the bottom portion 1444a and the second shoulder 1442a. Similar to the first notch 1430a, the second notch 1424a has a generally cylindrically-shaped configuration with a circular cross-section.

**[0096]** The sealing member assembly 1420 is configured for providing a secure locking connection to the tongue member 1404a. Moreover, in a locked position between the decking boards 1402a, and 1402b, the sealing member 1420 provides a plurality of seals between the connected decking board members 1402a and 1402b. As illustrated in FIG. 15, the sealing member 1420 has a top portion 1436 adapted for engagement with the top portion 1418a of the tongue member 1404a, a bottom portion 1438 configured for engagement with a bottom portion 1444a of the tongue member 1404a, and a first end portion 1480 provided generally between the first top portion 1436 and second bottom portion 1438, and configured for receivable connection to the end portion 1414 of the tongue member 1404a. Notably, the first end portion 1480 may be made of silicone foam, which permits the end portion 1480 to compress when placed in contact with another structure.

**[0097]** As previously indicated, the sealing member 1420 further includes a first insert 1416 configured for locking engagement with the first notch 1430a of the tongue member 1404. As such, the first insert 1416 has cylindrically shaped body, which extends generally along the width of the sealing member 1420. The sealing member 1420 further includes a second insert 1426. Similar

to the first insert 1416, the second insert 1426 extends general along the width of the sealing member 1420, and is configured for locking engagement with the second notch 1424a. Notably, the second insert 1426 also may be made of silicone foam, which permits the insert 1426 to compress when placed in contact with another structure

**[0098]** As shown, the first end portion 1480 of the sealing member 1420 has an aperture 1432 formed between portions 1456 and 1468, defining a first compressible member 1466. The first compressible member 1466 may be compressed when a force is applied to the member 1466. Specifically, the compressible member 1466 is configured for sealing compression when placed in contact with back portion 1454b of the cavity 1450b of a second longitudinal side 1406b. The sealing member 1420 further includes a second compressible member 1428, provided generally at the end 1422 of the sealing member bottom portion 1438. In a connected position with the tongue member 1404a, the second compressible member 1428 is positioned adjacent to the lower portion 1444a of the tongue member 1404a and the second shoulder 1442a.

**[0099]** As illustrated, the second longitudinal side 1406b has a cavity or chamber 1450b formed therein and configured to receive the tongue member 1404a of an adjacent decking board 1402a. As previously indicated, the cavity 1450b generally includes a back portion 1454b, an interior top portion 1482b with interior portion 1452b, or inner wall and a bottom portion 1470b, which in cooperation define the cavity 1450b.

**[0100]** The top portion 1482b includes a lip member or abutment 1448b, provided generally at the end of the top portion 1482b, extending generally downward therefrom. The abutment 1448b is configured to cooperatively engage the edge 1464 of the sealing member 1420, when the decking boards 1402a and 1402b, and sealing member 1420 are in an engaged position. The engagement of the abutment 1448 and edge 1464 form a seal therebetween.

**[0101]** Continuing now to FIGS 16 and 17, there is depicted the decking boards 1402a and 1402b provided in mating sealed engagement. The decking boards 1402a, 1402b may be co-extruded with a foam core of PVC, with a coextruded cap coat, weatherproof material. The cap coat provides a sealant, which may be ASA, for example. The cap coat may be weatherproof, and may be fused by heat to connect the cap coat to the board.

**[0102]** The decking board system 1400 provides a tongue 1404 and groove 1450 configuration which permits the decking boards 1408 and 1406 to be assembled by sliding the respective boards towards each other horizontally, with the tongue 1404 inserted into the groove 1450. This makes installation of the decking boards easier. Sealing member 1420 may be comprised of co-extrusion silicone. The advantages of the silicone composition are that it is relatively resilient, good for forming a watertight seal between the decking boards 1402a and

1402b. It is further contemplated that portions of the sealing member 1420 may be formed with foamed silicone to provide a more soft feel. The second longitudinal side 1406b further includes a lower base portion 1476b, which extends from the second longitudinal side 1406b, defining a foot member 1462b. The foot member 1462b, is configured for sealing engagement with the second shoulder 1442a and the second compressible member 1428 of the sealing member 1420, provided on the first longitudinal side 1408a.

**[0103]** As shown, the tongue member 1404a of the first longitudinal side 1408a of the decking board 1402a is inserted in the inner cavity 1450b of the second longitudinal side 1406b of the decking board 1402b. The end portion member 1480 of the sealing member 1420 is pressed against the back portion 1454b of the cavity 1450b, forming a first seal. The first compressible member 1466, positioned between the decking boards 1402a, 1402b, is compressed from the connecting forces applied between the back portion 1454b of the inner cavity 1450b and the end portion 1414a.

**[0104]** Further, the second compressible member 1428 is positioned between the second shoulder 1442a and the foot 1462b. The connecting forces between the decking boards 1402a and 1402b compress the second compressible member 1428, forming a second seal. The top portion 1436 of the sealing member 1420, connected to the top surface 1418a of the tongue member 1404a, engages the inner portion 1452b of the top portion 1482b and cavity 1450b forming a third seal. Further, the lower portion 1438 of the sealing member 1420, connected to the bottom portion 1444a of the tongue member 1404a, engages the lower portion 1470b of the cavity 1450, forming a fourth sealing connection between the first longitudinal side 1408a of the decking board 1402a and the second longitudinal side 1406b of the decking board 1402b. Additionally, in an engaged position, the abutment 1448b engages the edge 1464 of the sealing member 1420 forming a fifth seal therebetween. In an engaged configuration one or more composite screws (not shown) maybe inserted into the foot 1462b or angled ledge.

**[0105]** In an embodiment shown in FIGS. 18-20, the sealing member assembly 1520 has a flexible outer thickness configured for compression when a force is applied. Similar to the previously discussed sealing member assembly, the sealing member assembly 1520 includes a top portion 1536, which engages a top portion 1418a of the tongue member 1404a, and a bottom portion 1538, which is configured for engagement with a bottom portion 1444a of the tongue member 1404a. The sealing member assembly 1520 further includes an end portion 1580, and a second compressible member 1528 configured to provide sealing engagement between the second shoulder 1442a and foot member 1462b.

**[0106]** The sealing member assembly 1520 further includes a separate second sealing member 1570. The second sealing member 1570 is configured for positioning in the interior cavity 1550b of the second longitudinal

side 1406b. The second sealing member 1570 has a compressible body and is retained in the interior cavity 1550b by an upper lip member 1572b provided on the top member 1582b and a lower lip member 1584b, and engages the back portion 1554b of the interior cavity 1550b.

**[0107]** FIG. 20 depicts the first longitudinal side 1408a and the second longitudinal side 1406b in an engaged position. The sealing member 1520 and tongue member 1404a cooperatively contact the second sealing member 1570, forming a first seal with the inner cavity 1450b and sealing member 1570. As shown, contact forces applied by the tongue member 1404a and inner cavity 1450b compress the sealing member 1570.

**[0108]** The sealing member 1520 has a first thickness provided at the top portion 1536 of the sealing member 1520. In an inserted position, the top portion 1536 is compressed by the top inner wall 1552b of the cavity 1550b and the top portion 1418a of the tongue member 1404a, forming a second seal. The sealing member 1520 may be comprised of co-extrusion silicone.

**[0109]** The bottom portion 1538 of the sealing member 1520 engages a top portion 1578b of the lower base portion 1576b forming a third seal therebetween. The second compressible member 1528 is positioned between the second shoulder 1442a of the first longitudinal side member 1408a, and foot member 1462b of the second longitudinal side member 1406b. As such, in an engaged position, the second compressible member 1528 is compressed therebetween, forming a fourth seal. Further, the lip portion 1448b of the second longitudinal side member 1406b engages the outer edge 1564 of the sealing member 1520, further locking the first longitudinal side member 1408a to the second longitudinal side member 1406b, forming a fifth seal therebetween.

**[0110]** In an embodiment shown in FIG. 21, the decking board system 1600 includes decking boards 1402a and 1402b, and a sealing member assembly 1620, configured to provide sealing engagement between the respective decking boards 1402a, 1402b. The sealing member assembly 1620 includes a top portion 1636, which engages a top portion 1618a of the tongue member 1404a, and a bottom portion 1638, which is configured for engagement with a bottom portion 1444a of the tongue member 1404a. The sealing member assembly 1620 further includes an end portion 1680 having a first compressible member 1670 formed generally at the end of the end portion 1680, and a second compressible member 1628 provided generally at a lower portion of the sealing member 1620, and configured to provide sealing engagement between a second shoulder 1442a of the decking board 1402a and a foot member 1462b of the decking board 1402b.

**[0111]** As illustrated, the sealing member assembly end portion 1680 includes a first compressible member 1670 which is configured for positioning in the interior cavity 1650b of the second longitudinal side 1406b. The first compressible member 1670 is configured for en-

gement with a back portion 1654b of the interior cavity 1650b. The first compressible member 1670 may include a nipple portion 1671 formed thereon. The cavity 1650b includes a notch 1651b, formed in the back portion 1654b of the interior cavity 1650b. The notch 1651b is configured to receive the nipple portion 1671 of the sealing member 1620 therein, thereby providing a first seal. The sealing member 1620 may be comprised of co-extrusion silicone

**[0112]** As shown, when the first longitudinal side 1408a and the second longitudinal side 1406b are in an engaged position, the sealing member 1620 and tongue member 1404a cooperatively contact the inner cavity 1450b. As shown, contact forces applied by the tongue member 1404a and inner cavity 1450b compress the first compressible member 1670 therein, providing a seal between the decking boards 1402a and 1402b.

**[0113]** The sealing member 1620 has a first thickness provided at the top portion 1636 of the sealing member 1620. In an inserted position, the top portion 1636 may be compressed by the top inner wall 1652b of the cavity 1650b and the top portion 1618a of the tongue member 1404a, forming a seal therebetween. The sealing member 1620 further includes a first insert 1616 configured for locking engagement with the first notch 1630a formed in the tongue member 1404a. The first insert 1616 may have an arrow-shaped configuration, but other configurations may be used. The first insert 1616 includes one or more barbs 1621a, 1621b which cooperatively engage the interior of the first notch 1630a. The sealing member 1620 further includes a second insert 1626. Similar to the first insert 1616, the second insert 1626 is configured for locking engagement with the second notch 1424a. In this embodiment the second insert 1626 has a generally bulbous configuration, however notably the second insert 1626 may have virtually any configuration.

**[0114]** The bottom portion 1638 of the sealing member 1620 engages a top portion 1578b of the lower base portion 1576b forming a seal therebetween. The second compressible member 1628 is positioned between the second shoulder 1442a of the first longitudinal side member 1408a, and foot member 1462b of the second longitudinal side member 1406b. As such, in an engaged position, the second compressible member 1628 is compressed therebetween, forming a seal. Further, the lip portion 1448b of the second longitudinal side member 1406b engages the outer edge 1664 of the sealing member 1620, further locking the first longitudinal side member 1408a to the second longitudinal side member 1406b, forming a seal therebetween.

**[0115]** In an embodiment shown in FIG. 22, the decking board system 1700 board members 1702b and 1702a may be connected with a sealing member assembly 1720 provided therebetween. The sealing member 1720 may be made of co-extrusion silicone. In this embodiment, the sealing member 1720 is provided in the cavity 1750b of the second longitudinal side. The cavity 1750b includes a first notch 1751b formed in the back wall 1754b

of the cavity 1750b. The cavity 1750b may further include a second notch 1753b formed in an upper portion 1752b of the cavity 1750b.

**[0116]** As illustrated, the sealing member assembly 1720 is configured for positioning in the cavity 1750b. The sealing member 1720 generally includes a first insert 1716 configured for engagement with the first notch 1753b and a second insert 1751b configured for locking engagement with the second notch 1751b. As shown the sealing member 1720 is retained in the interior cavity 1750b and engages the back portion 1754b of the interior cavity 1750b.

**[0117]** As illustrated, when the first longitudinal side 1708a and the second longitudinal side 1706b are in an engaged position, the sealing member 1720 positioned in the cavity 1750b receives the tongue member 1704a. As shown, contact forces applied by the tongue member 1704a and inner cavity 1450b compress the sealing member 1720, forming a seal therein.

**[0118]** The bottom portion 1738 of the sealing member 1720 engages a top portion 1778b of the lower base portion 1776b forming a seal therebetween. The lower portion of the sealing member 1728 is positioned on the foot member 1762b of the second longitudinal side member 1706b. As such, in an engaged position, the lower portion 1728 is compressed therebetween, forming a seal between the foot member 1762b and the shoulder 1742a of the first longitudinal side.

**[0119]** As shown in FIGS. 23A and 23B, the sealing member 1720 may further include one or more sealing projections 1745a, 1745b which extend from an intermediate portion of the sealing member 1720. As shown, the sealing projections 1745a, 1745b extend outward into the cavity 1750 and are configured to engage respective apertures 1747a and 1747b formed in the tongue member 1704a forming additional respective seals between the board 1708a and board 1706b.

**[0120]** Although the various embodiments have been described in detail, it should be understood that the invention that the invention is capable of other embodiments and its details are capable of modifications in various obvious respects. As is readily apparent to those skilled in the art, variations and modifications can be affected while remaining within the spirit and scope of the invention. Accordingly, the foregoing disclosure, description, and figures are for illustrative purposes only and do not in any way limit the invention, which is defined only by the claims.

## Claims

1. A decking board system, comprising:

a first longitudinal side having a first member extending generally longitudinally outward therefrom, the first member having a top portion, a lower portion formed on an opposing side of

- the top portion and an end portion positioned between the top portion and lower portion; and, a sealing assembly configured to provide a seal between the decking board system and an associated decking board system.
2. The decking board system of claim 1, wherein the sealing assembly is configured to engage one of the top portion, lower portion or end portion of the first member of the first longitudinal side. 5
  3. The decking board system of claim 1 or 2, including a second longitudinal side including a top portion, a lower portion and an interior portion, defining a cavity therebetween to receive a first member of an associated decking board therein, and the sealing assembly configured to engage the top portion, end portion and the lower portion of the first member of the first longitudinal side. 10
  4. The decking board system of any of claims 1 to 3, wherein the sealing assembly includes a first sealing member including first compressible member configured to engage a cavity formed in an associated decking board. 15
  5. The decking board system of claim 4, wherein the first compressible member has an aperture formed therein for facilitating compression when placed in contact with the cavity formed in the associated decking board. 20
  6. The decking board system of claim 3, wherein the sealing assembly includes a second sealing member configured to be inserted in the interior portion of the second longitudinal side. 25
  7. The decking board system of claim 6, wherein the second longitudinal side has a second upper lip portion and a first lower lip portion configured to engage the second sealing member, thereby securing the second sealing member in the cavity. 30
  8. The decking board system of claim 2, wherein the sealing assembly includes a first sealing member that engages the top portion, lower portion and end portion of the first member of the first longitudinal side. 35
  9. The decking board system of claim 4 or 8 wherein the first sealing member includes a second compressible member configured to operatively engage a second shoulder of a first longitudinal side. 40
  10. The decking board system of claim 9, wherein the second compressible member of the first sealing member has an aperture formed therein facilitating compression when placed in contact with a second shoulder and a foot member of an associated decking board. 45
  11. The decking board system of claim 4 or 8, wherein the first sealing member has a first insert configured to lockingly engage a first notch formed on the top portion of the first member. 50
  12. The decking board system of claim 4 or 11, wherein the first sealing member has a second insert configured to lockingly engage a second notch formed on a lower portion of the first sealing member. 55
  13. The decking board system of claim 11, wherein the first insert has at least one barb configured to engage the first notch.
  14. The decking board system of claim 13, wherein the first insert has two barbs configured to engage the first notch.
  15. The decking board system of claim 8, wherein the first sealing member has a first compressible member provided at the end portion of the sealing assembly.

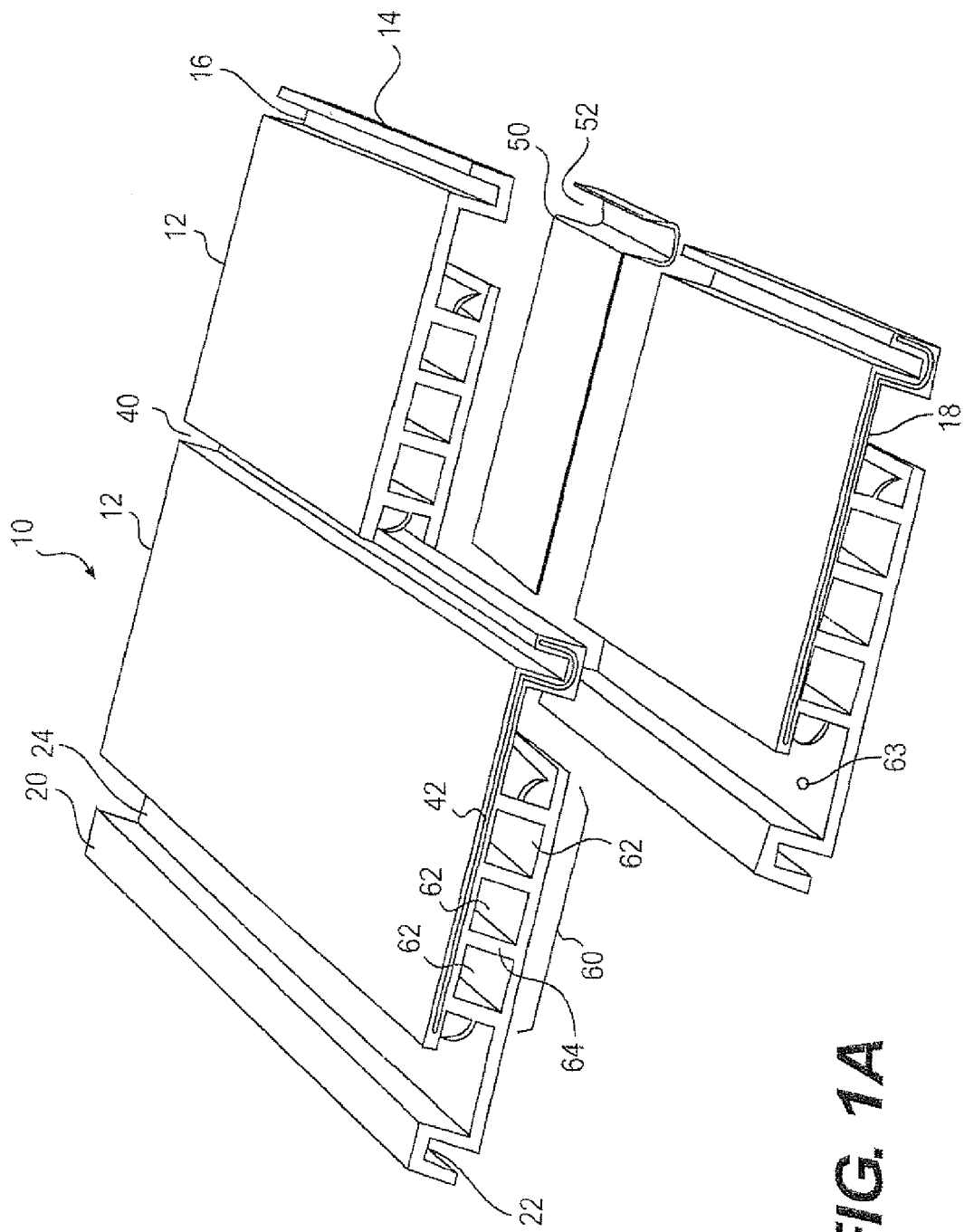


FIG. 1A



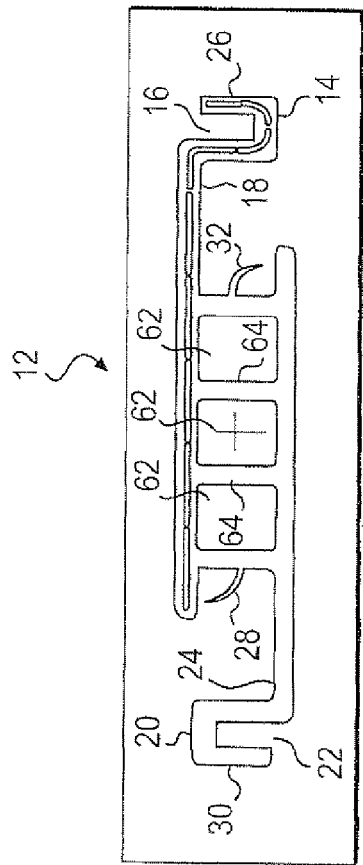


FIG. 1B

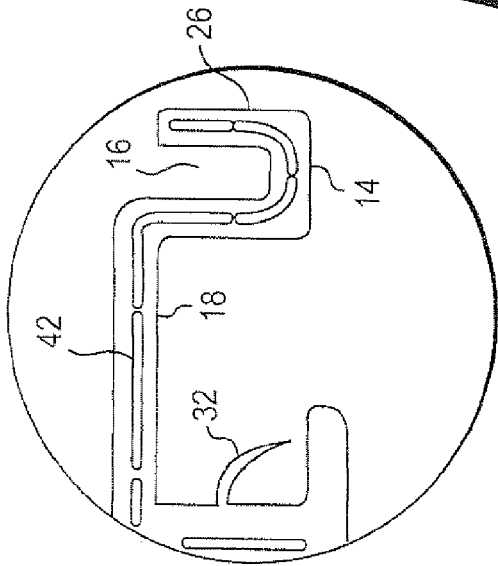
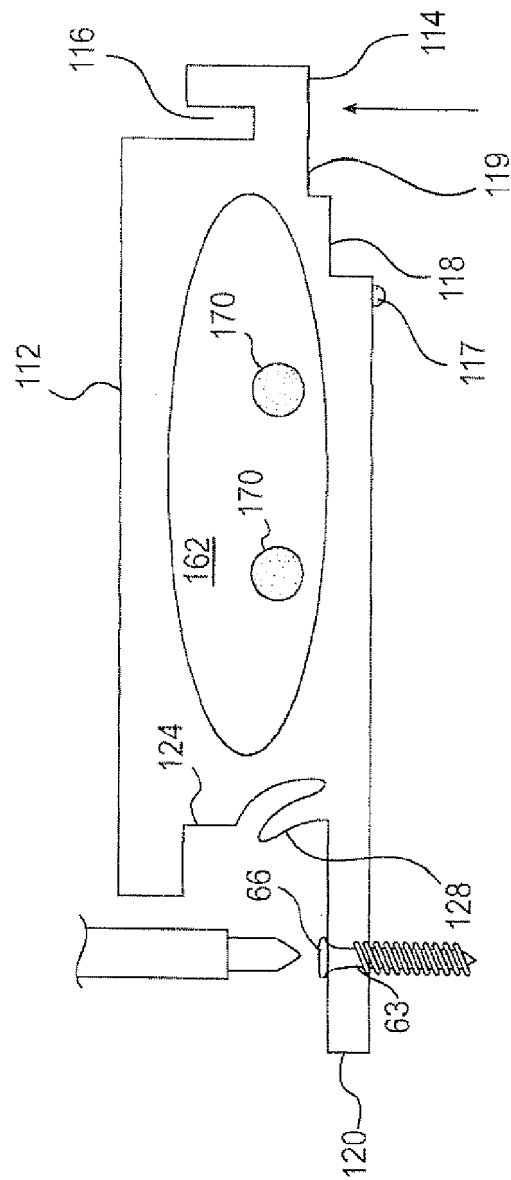
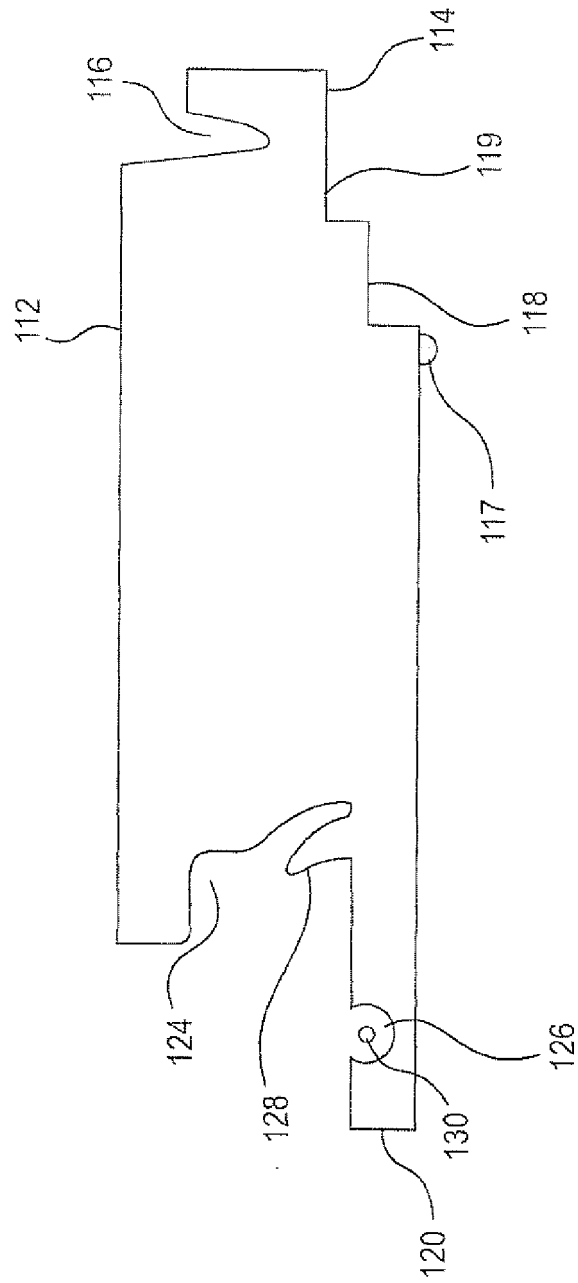


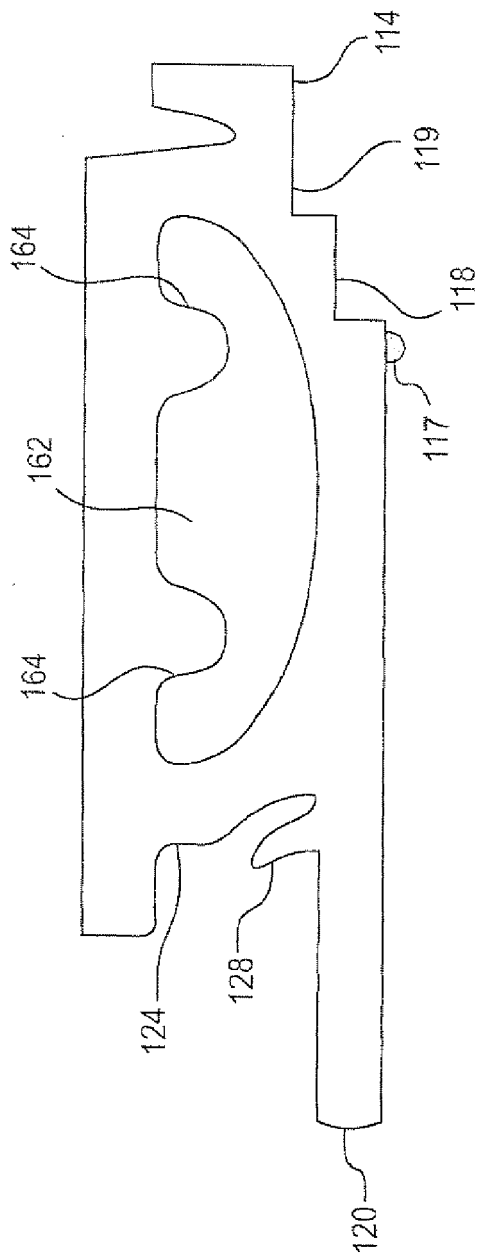
FIG. 1C



**FIG. 1D**



**FIG. 1E**



**FIG. 1F**

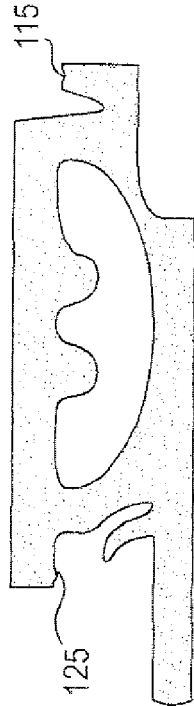


FIG. 2B

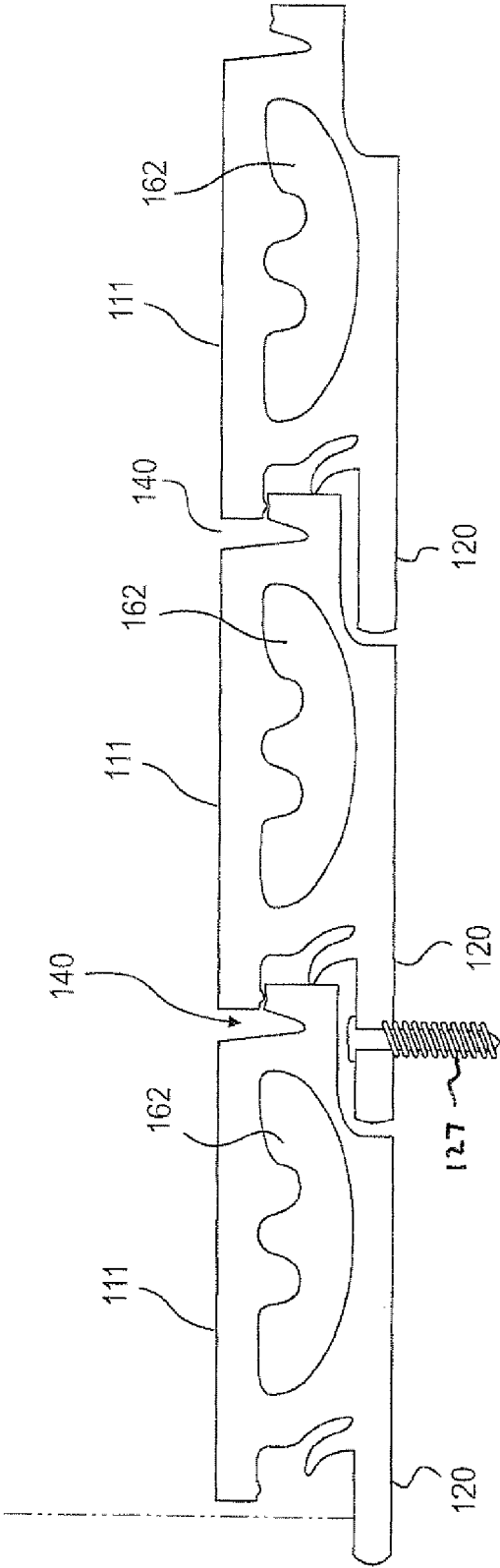
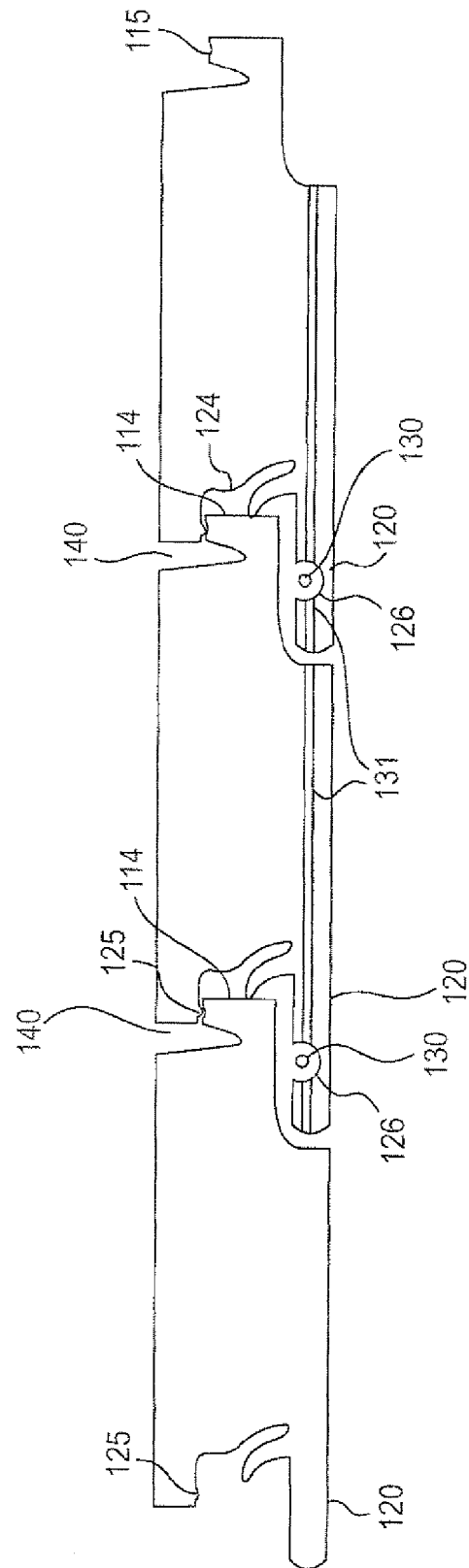


FIG. 2A



**FIG. 2C**

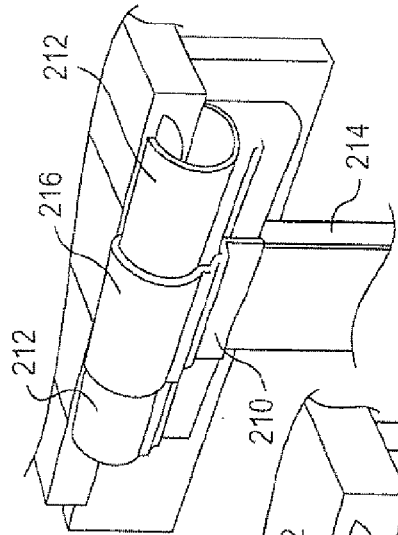


FIG. 3A

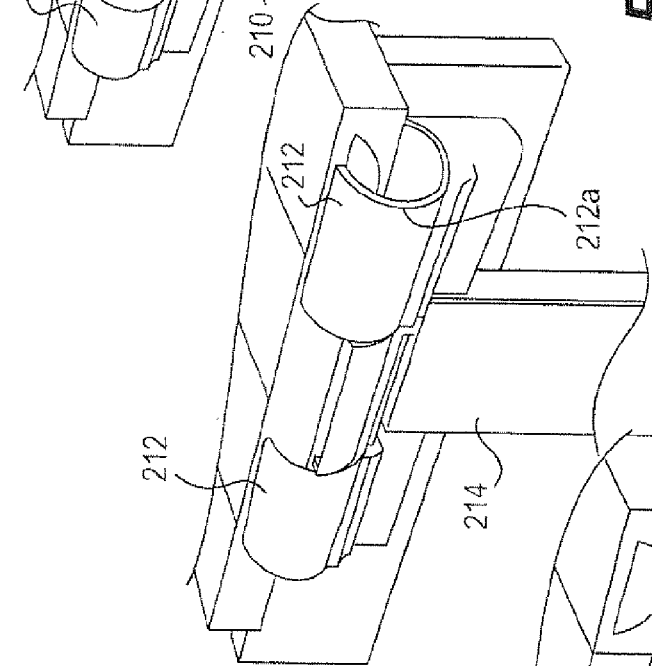


FIG. 3B

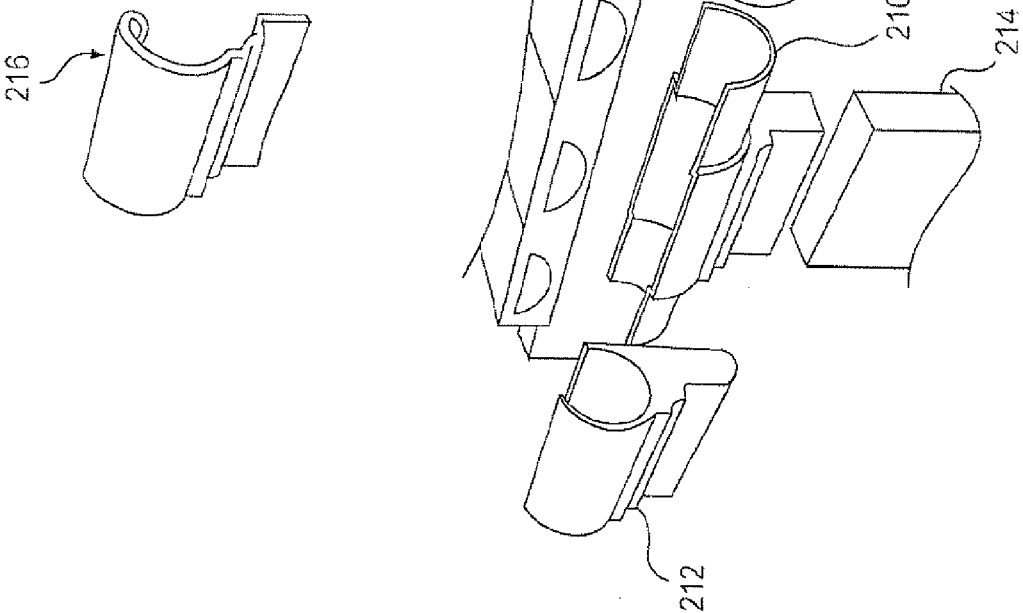
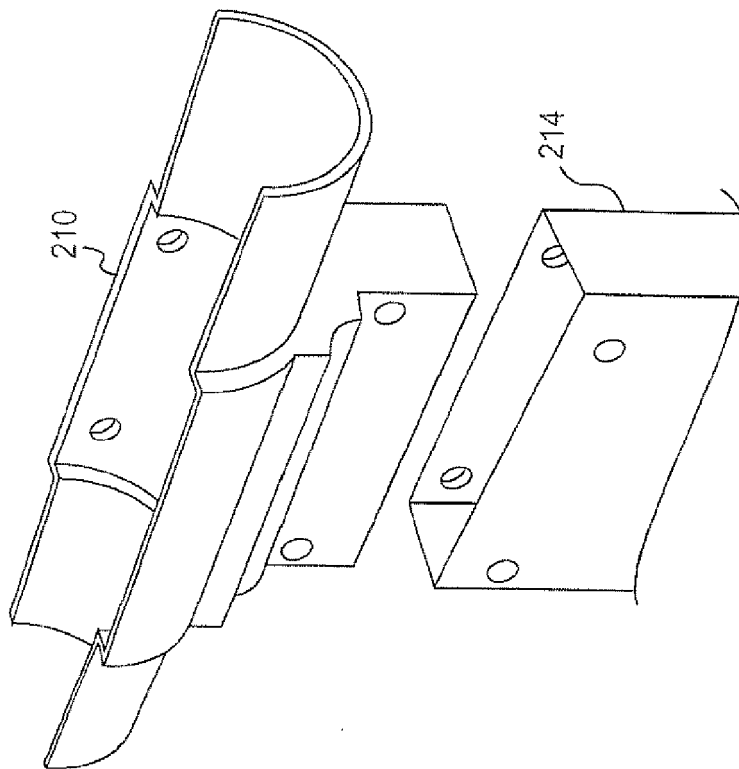
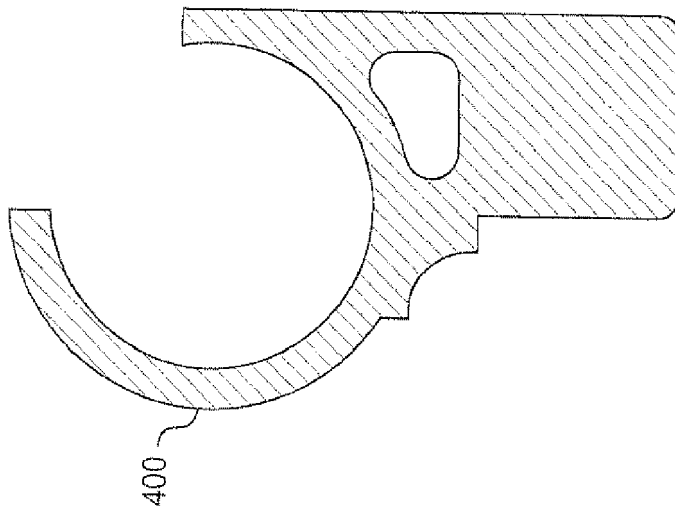


FIG. 3C

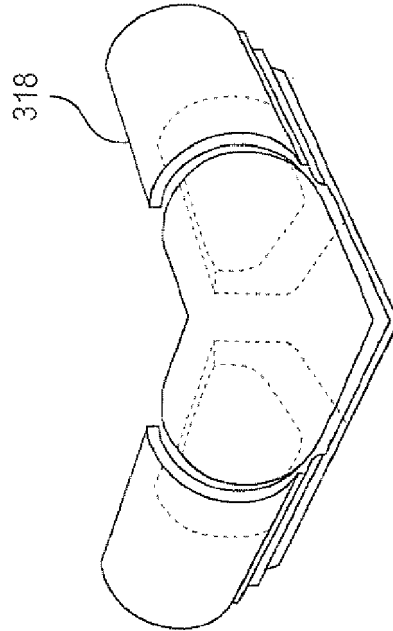


**FIG. 3D**

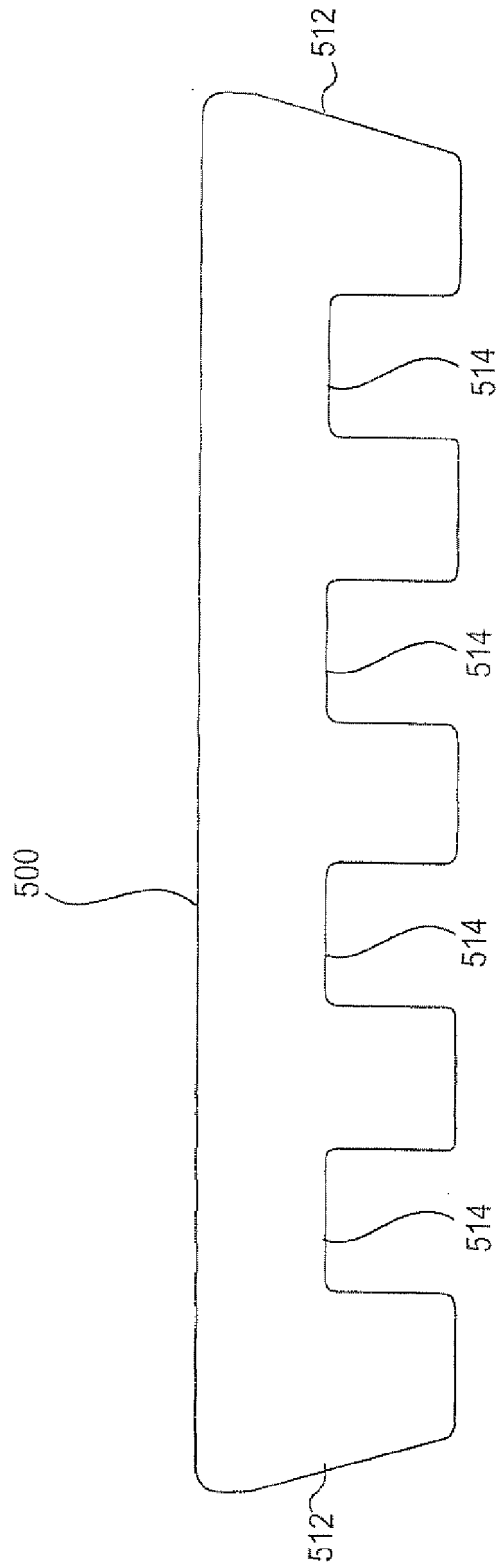




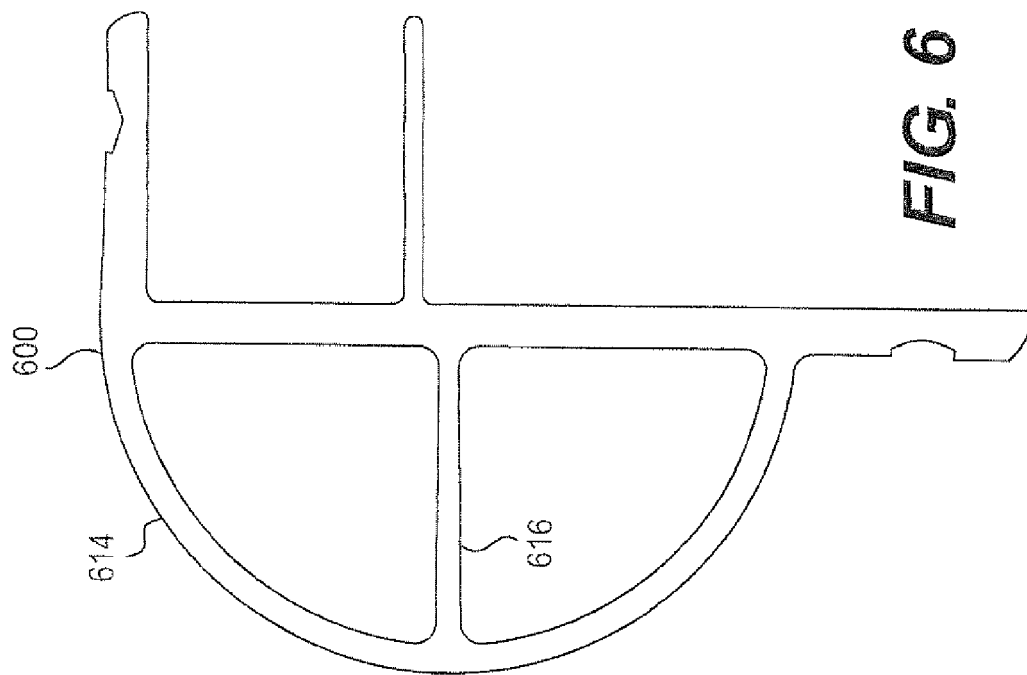
**FIG. 4**



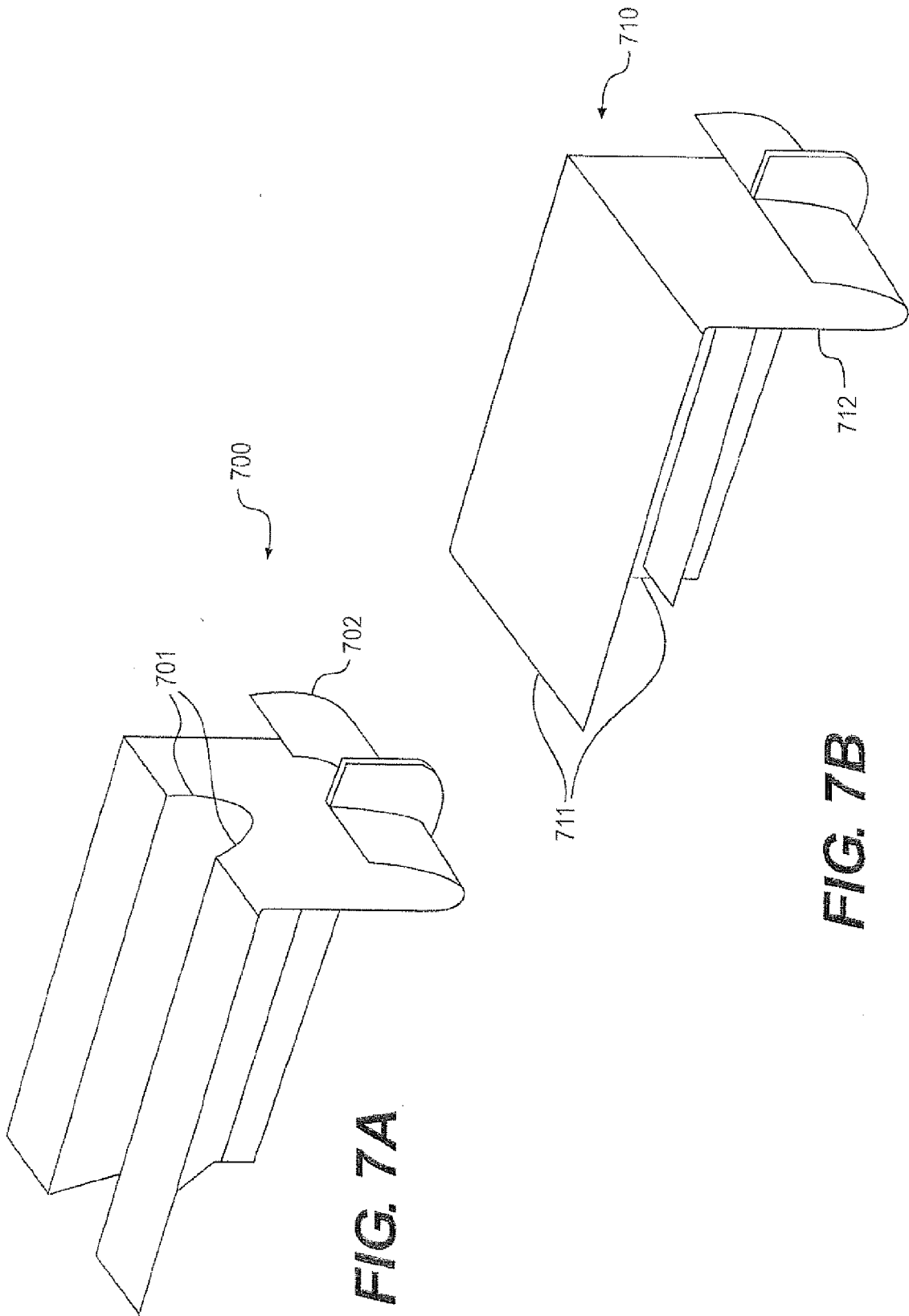
**FIG. 3E**

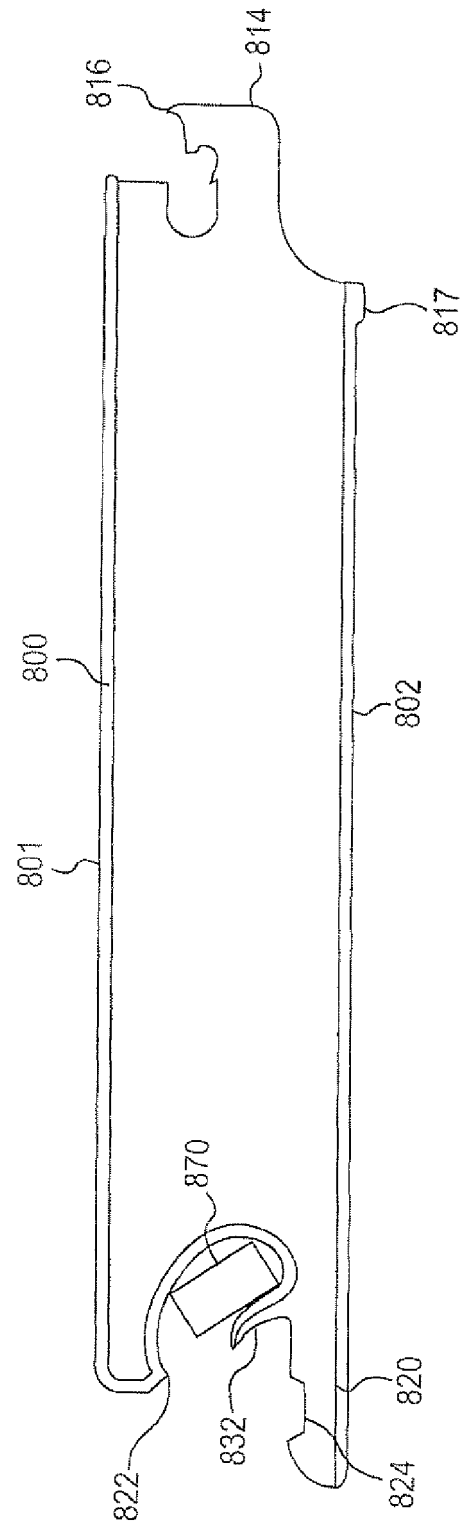


**FIG. 5**

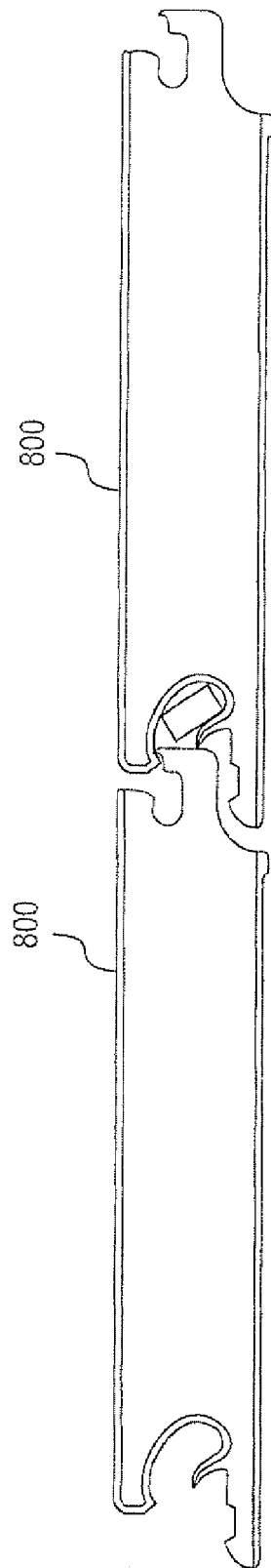


**FIG. 6**

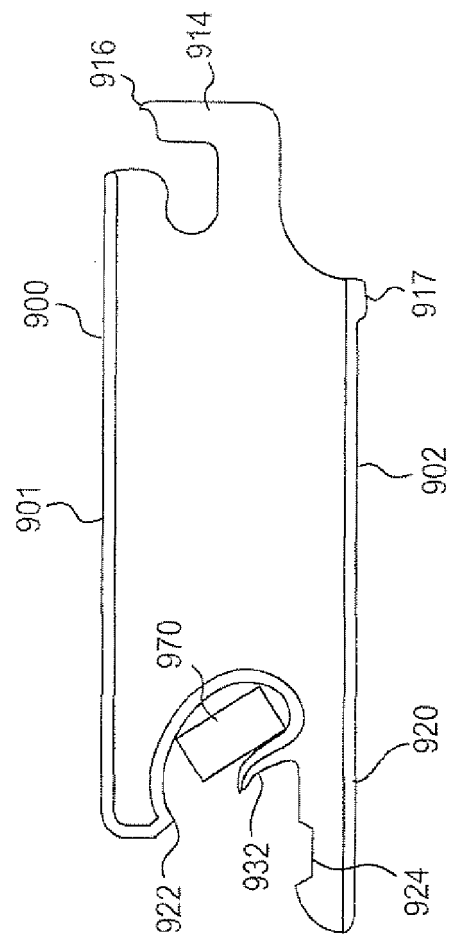




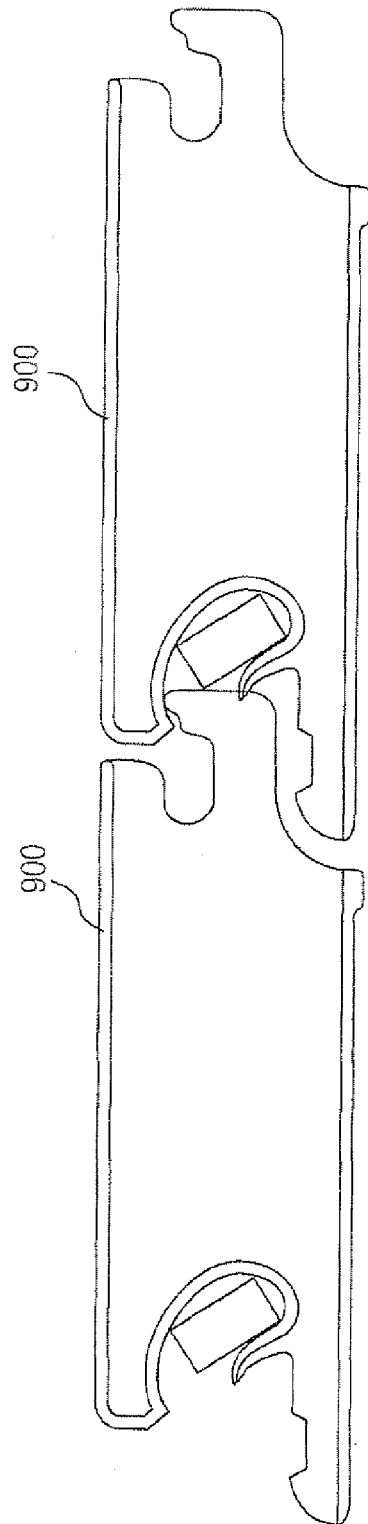
**FIG. 8A**



**FIG. 8B**

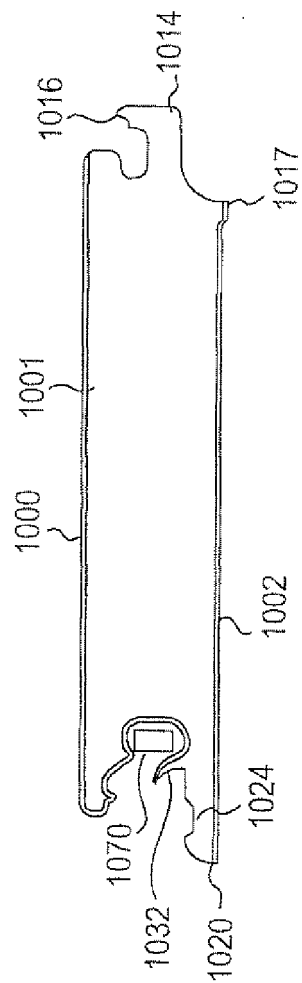


**FIG. 9A**

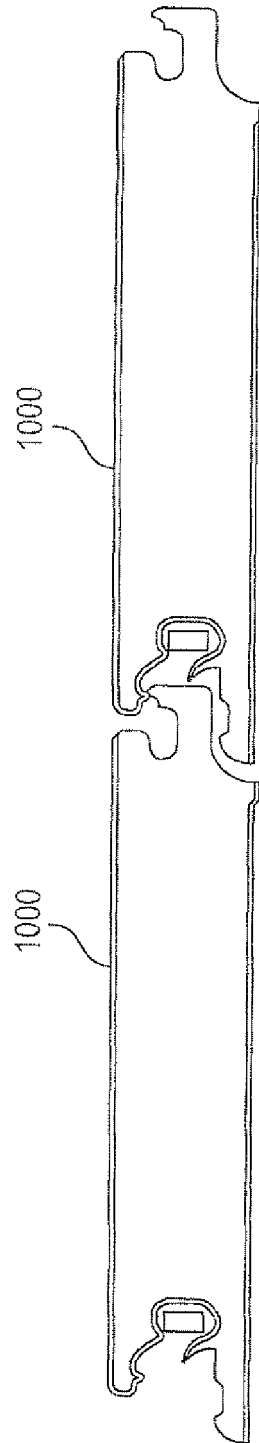


**FIG. 9B**

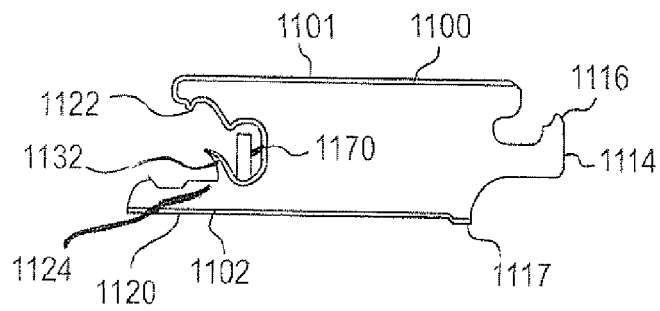




**FIG. 10A**



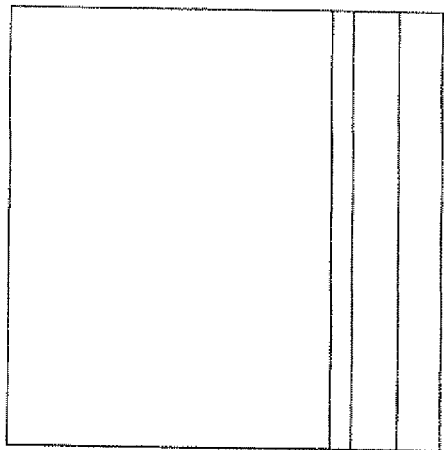
**FIG. 10B**



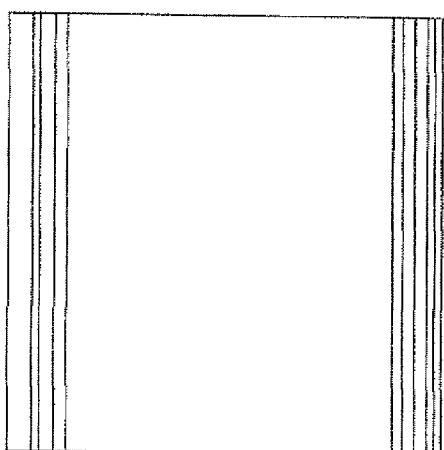
**FIG. 11A**



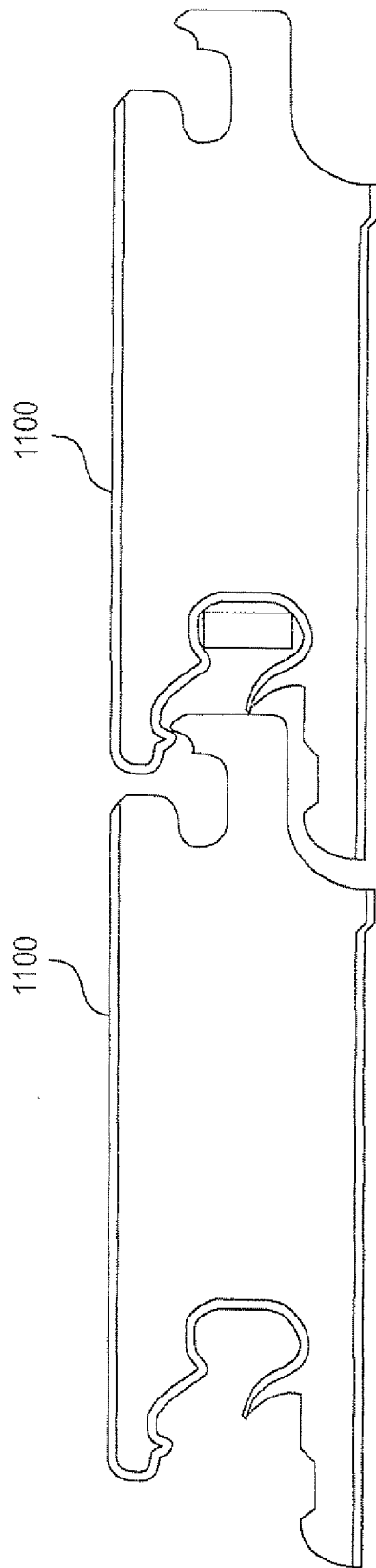
**FIG. 11B**



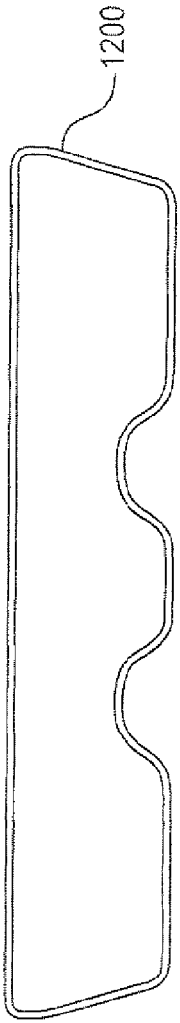
**FIG. 11C**



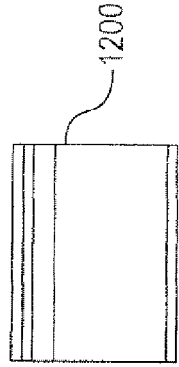
**FIG. 11D**



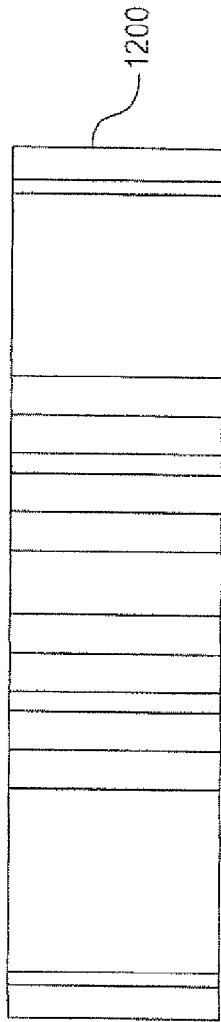
**FIG. 11E**



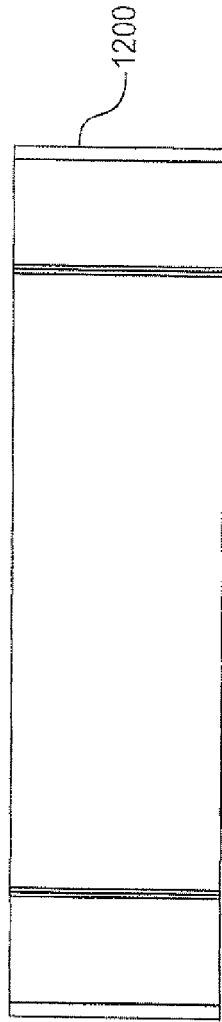
**FIG. 12A**



**FIG. 12B**



**FIG. 12C**



**FIG. 12D**

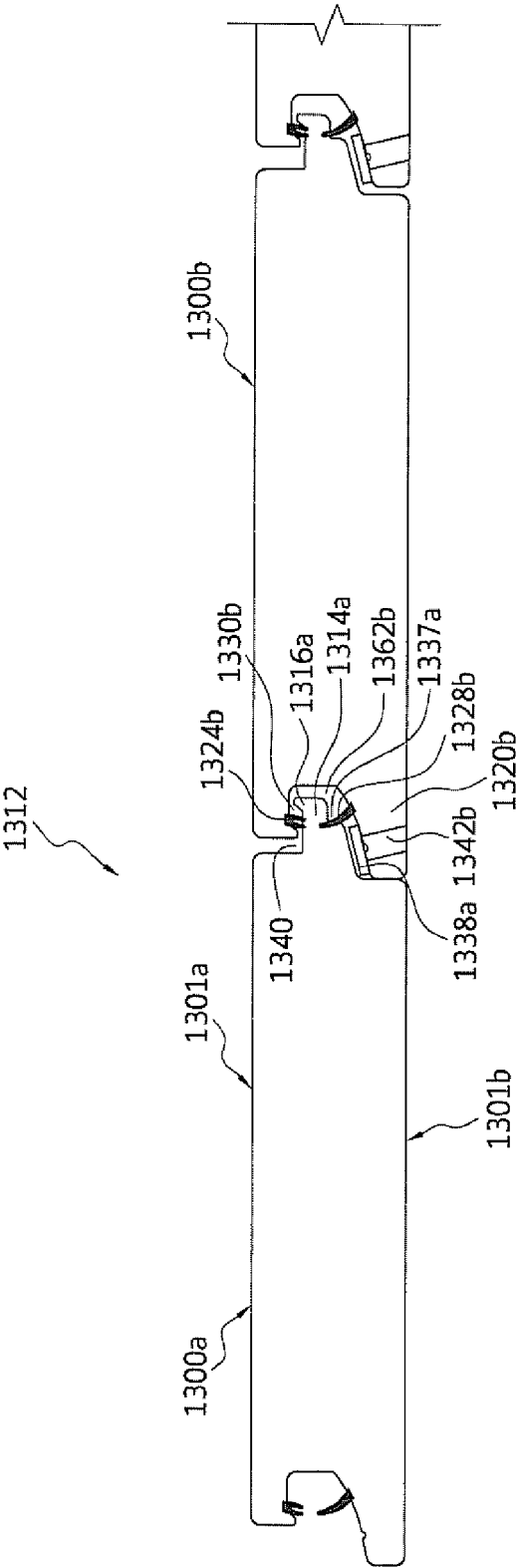


FIG. 13A

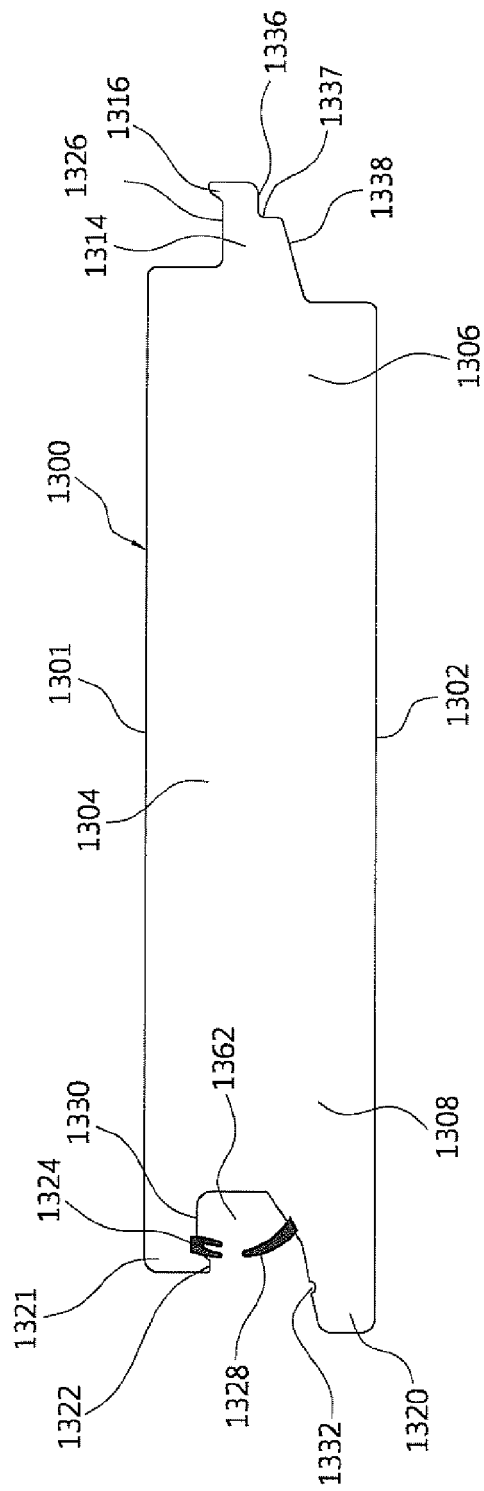


FIG. 13B

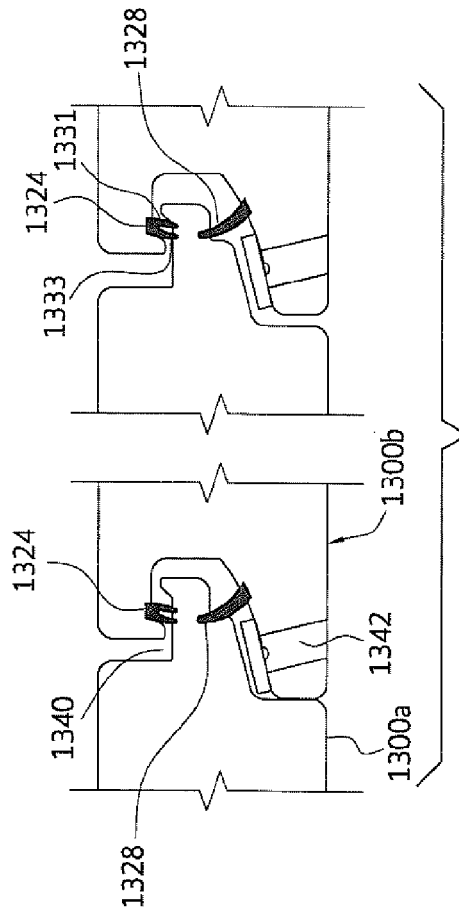


FIG. 13C

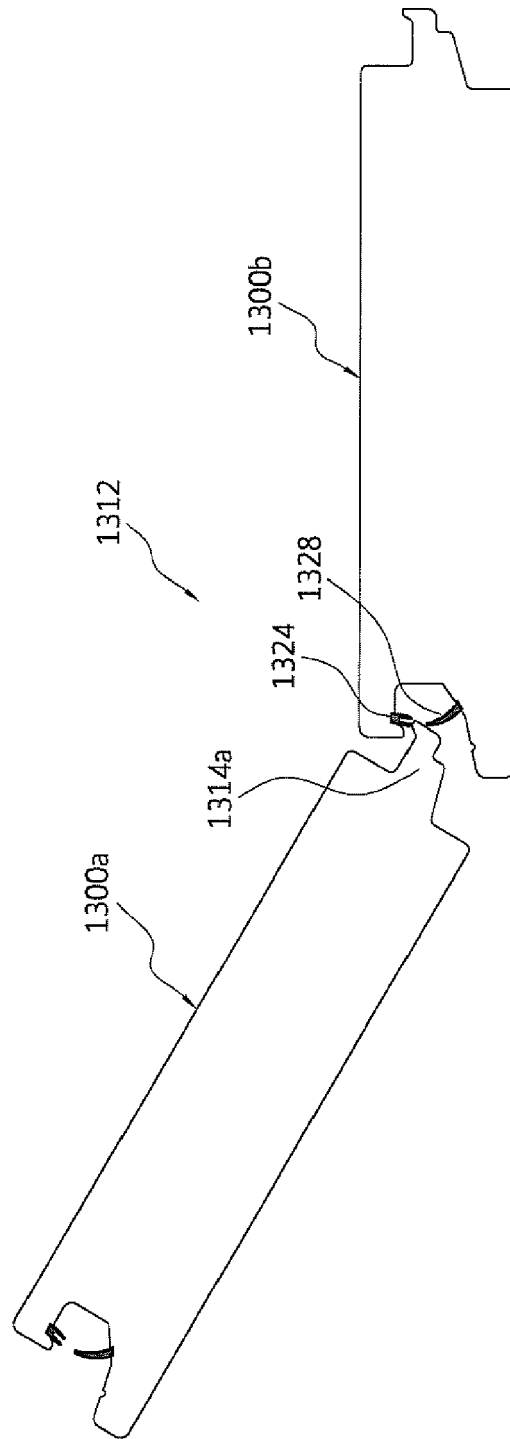


FIG. 13D



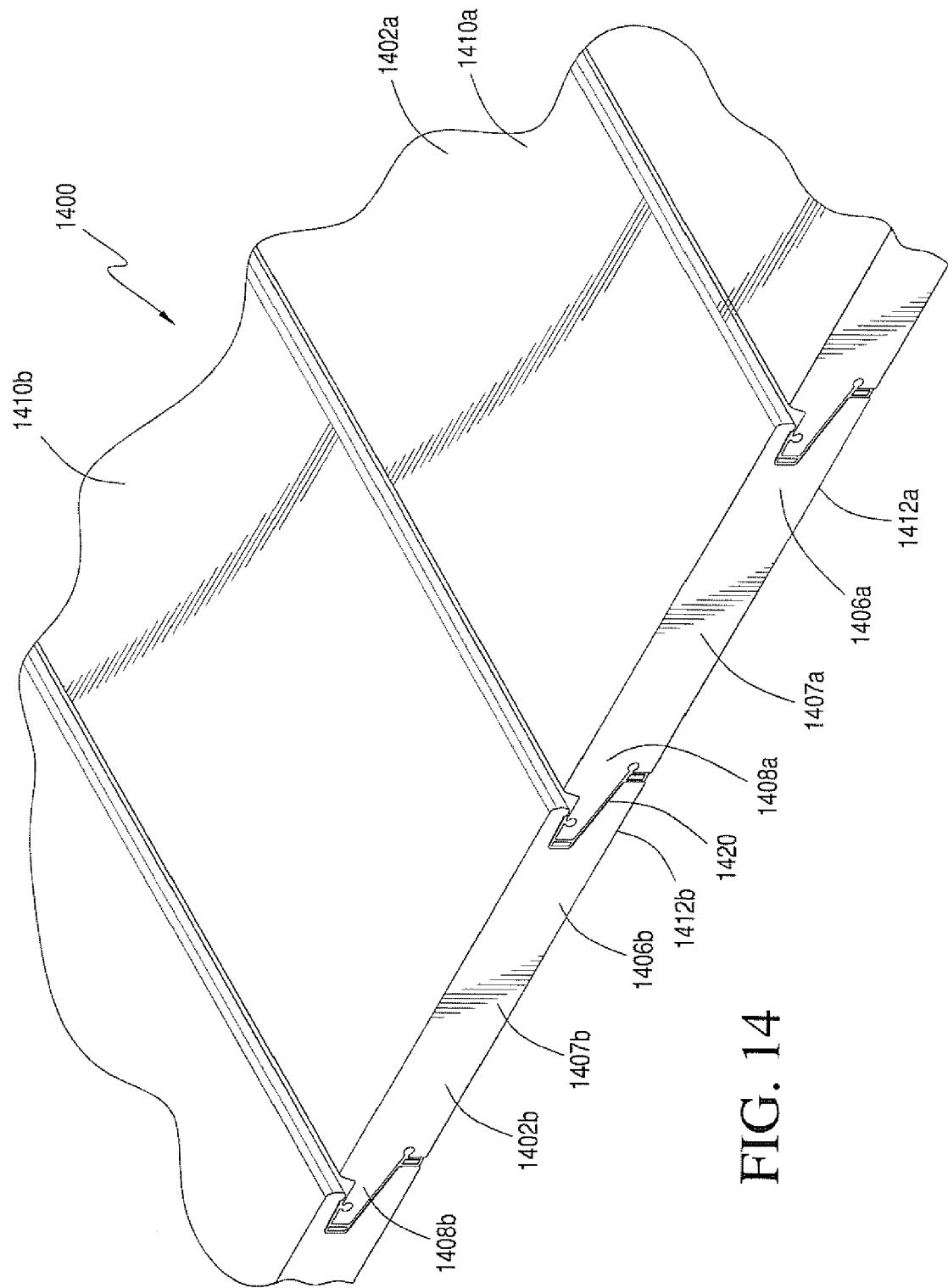


FIG. 14

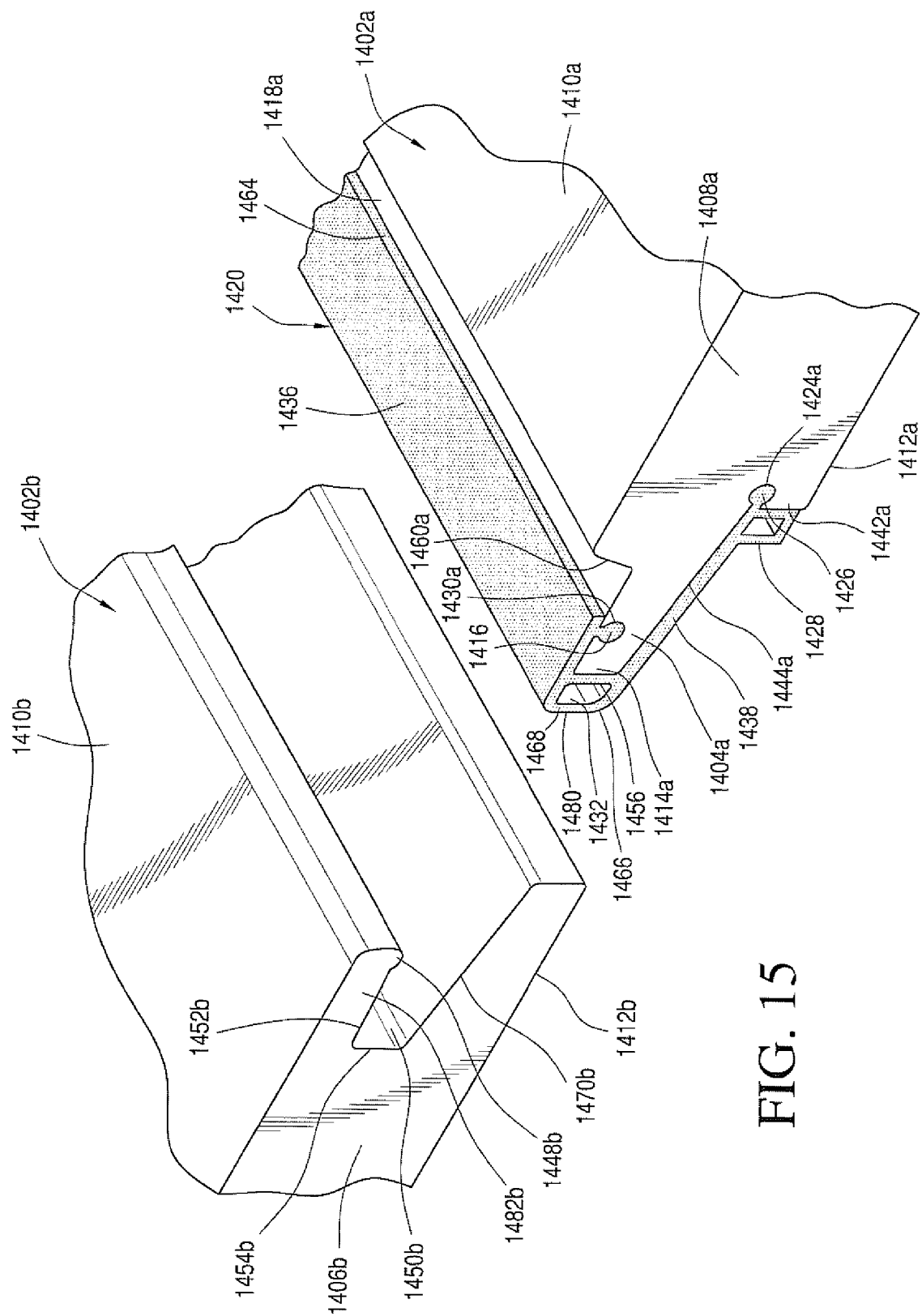


FIG. 15

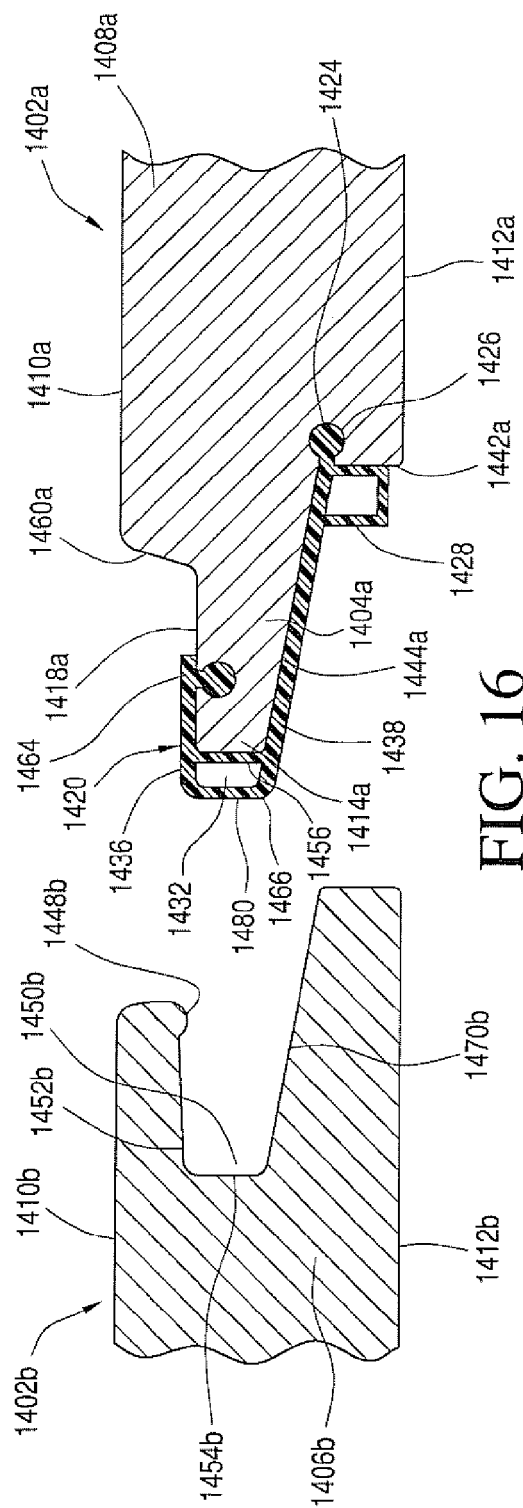


FIG. 16

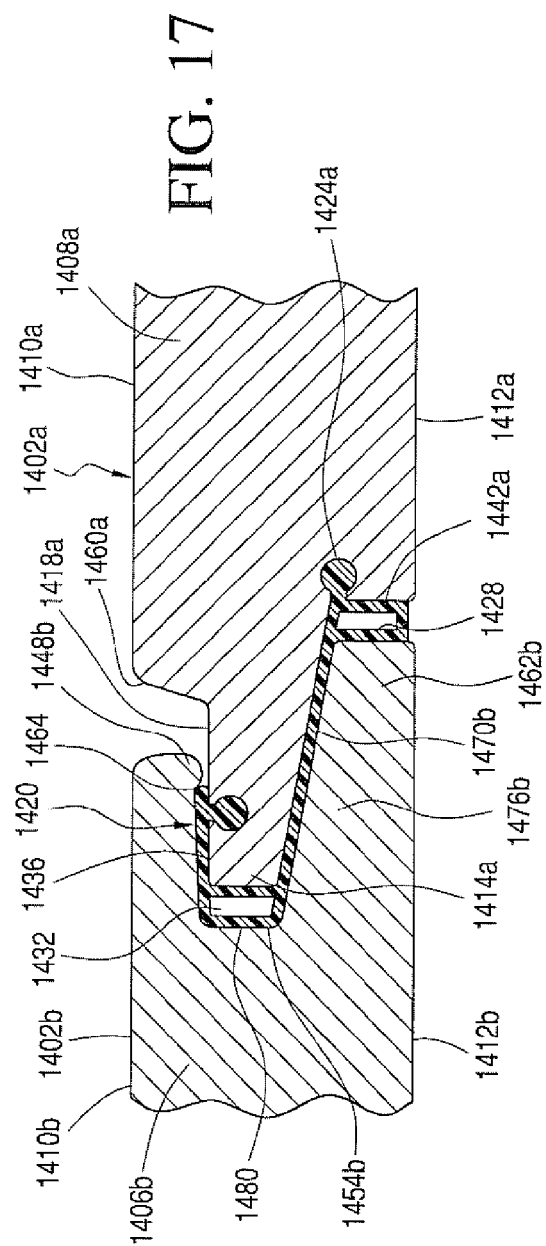


FIG. 17

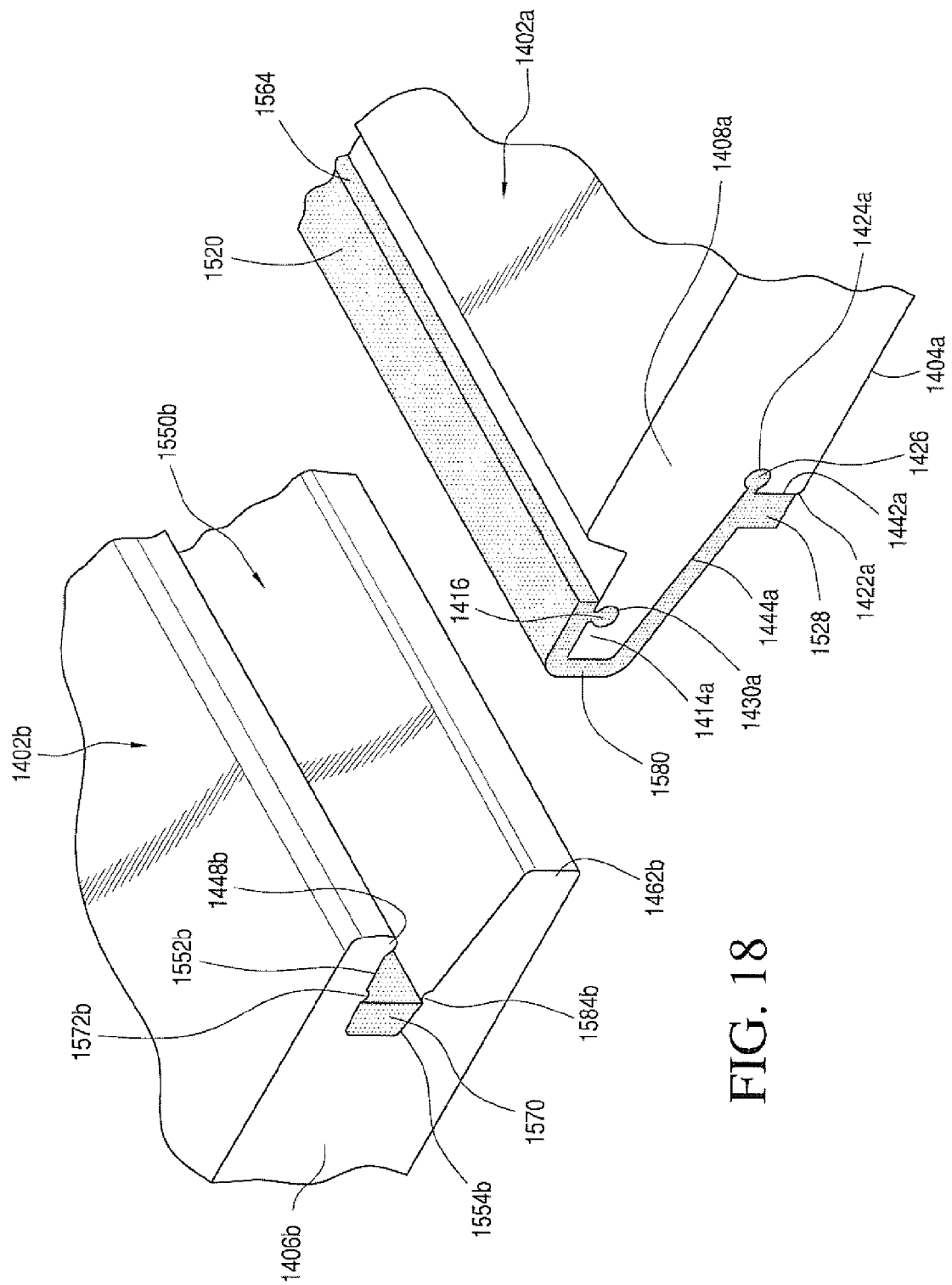


FIG. 18

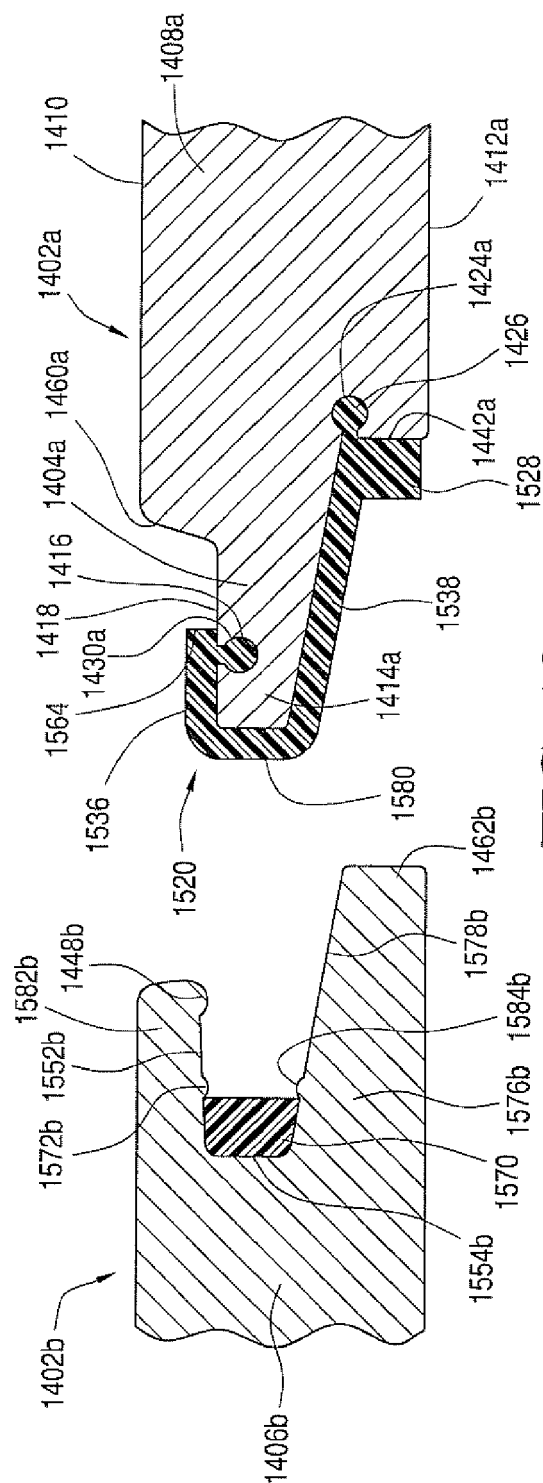


FIG. 19

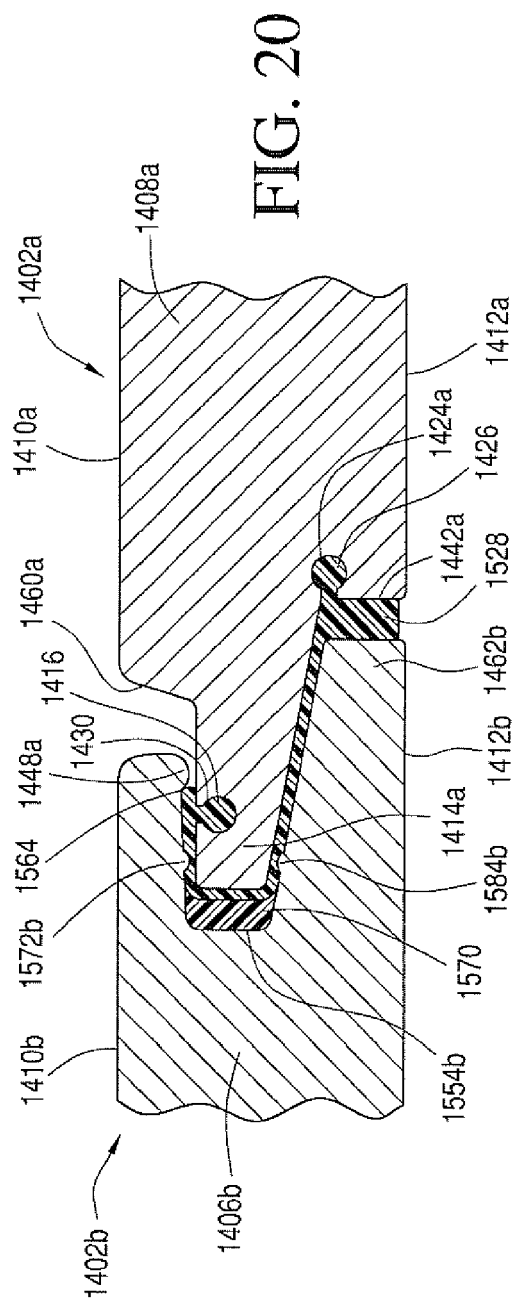


FIG. 20

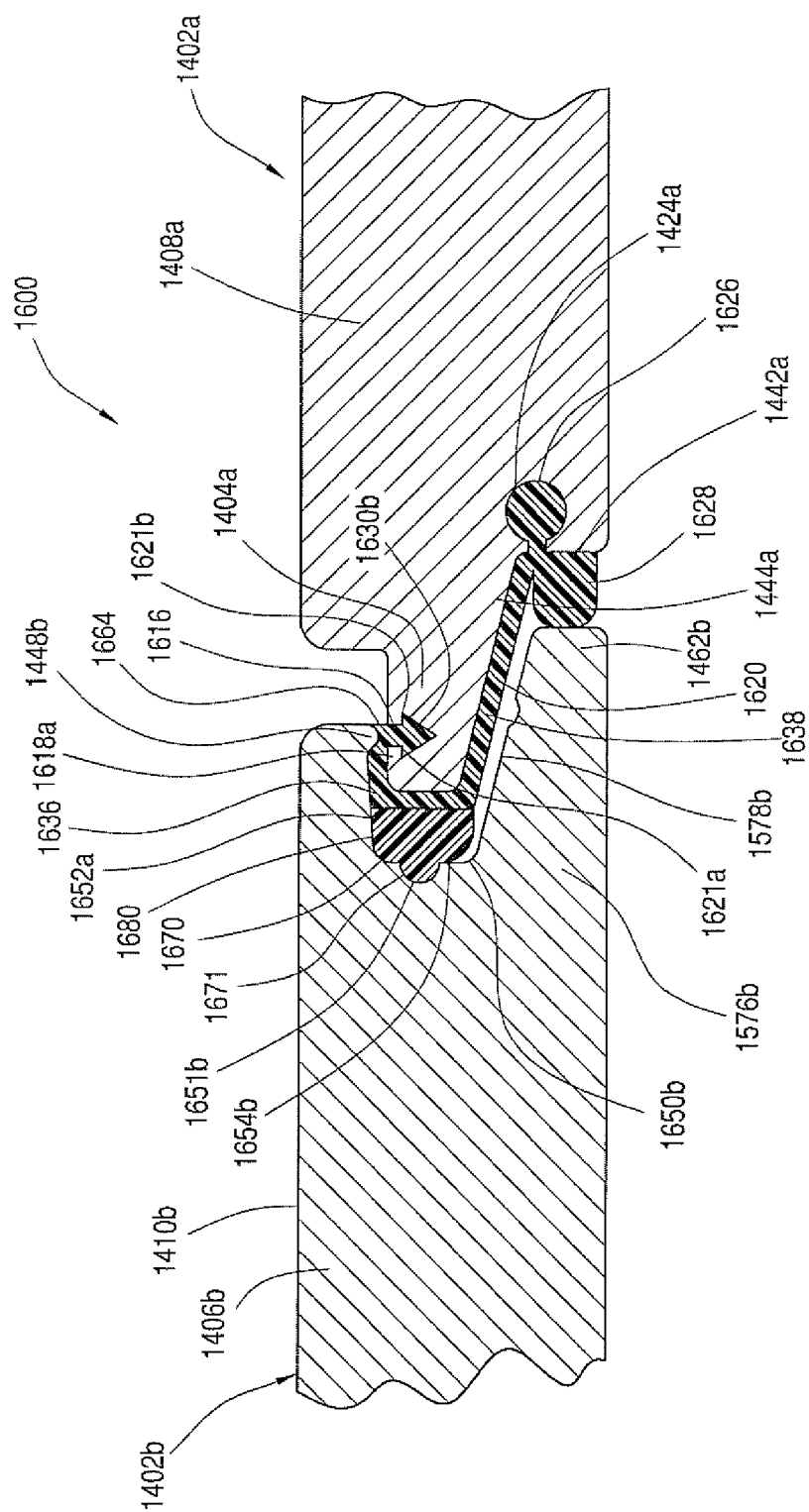


FIG. 21

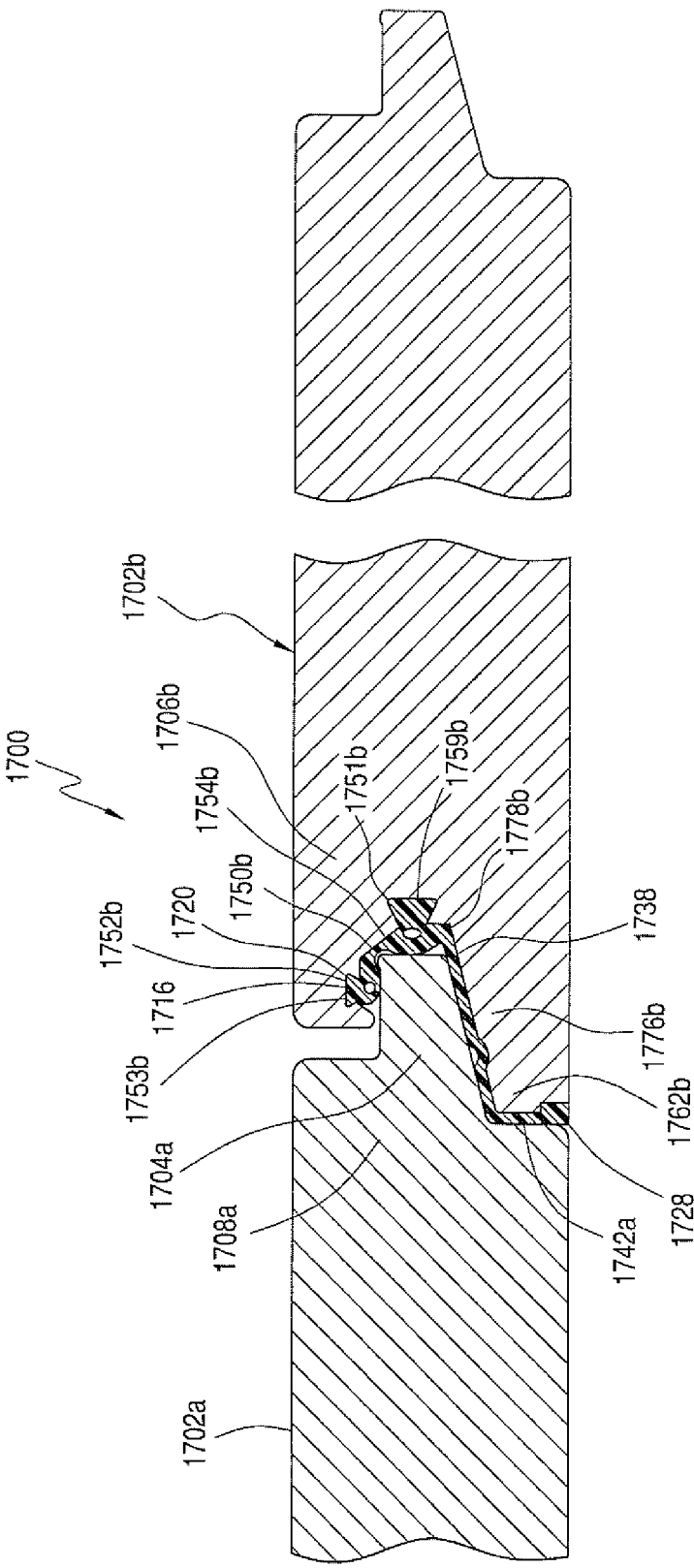
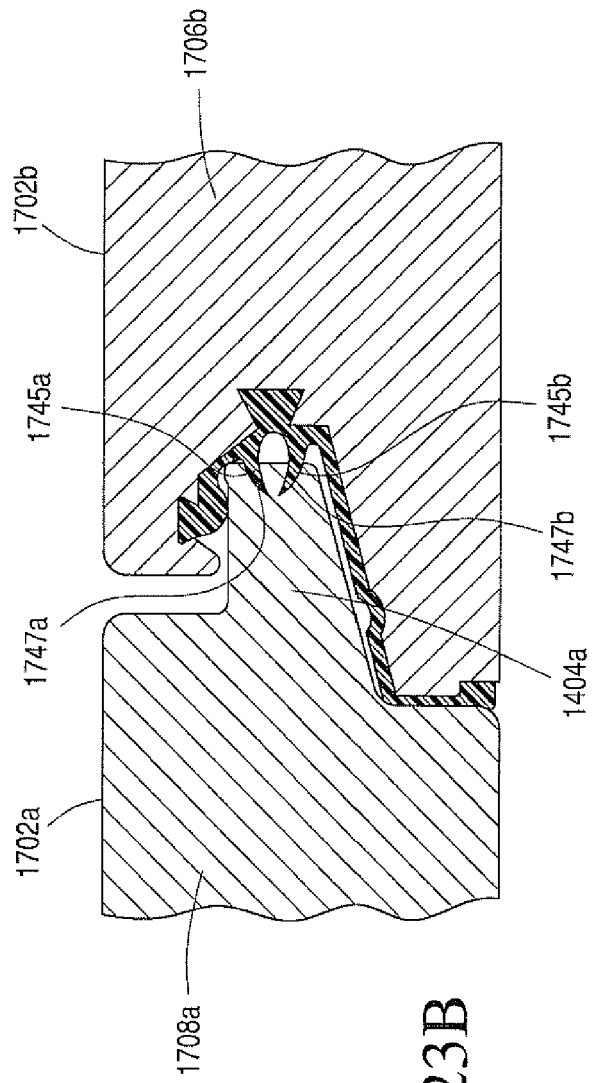
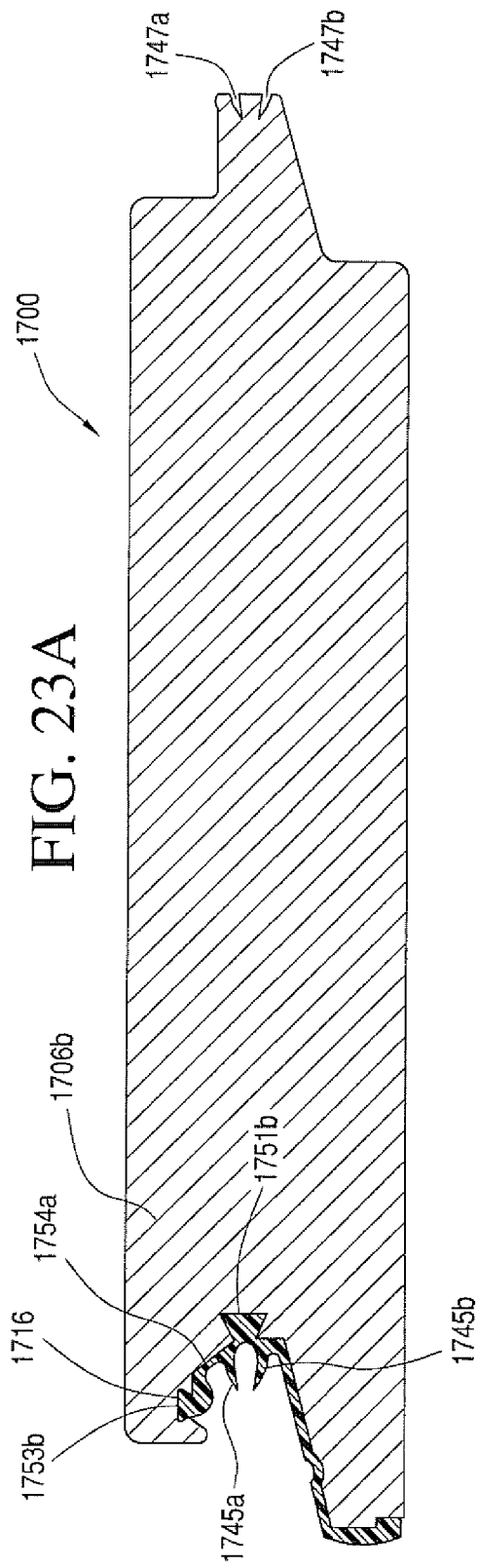


FIG. 22







## EUROPEAN SEARCH REPORT

 Application Number  
 EP 15 18 2512

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2013 100629 U1 (GEISLER FRANZ [DE]) 17 May 2013 (2013-05-17) * paragraphs [0001] - [0003], [0007], [0023], [0043], [0045], [0047] * * figures 1-4 *	1,2,4,5, 9,11	INV. E04F15/02 E04F15/10
X	US 6 324 796 B1 (HEATH RANDALL N [US]) 4 December 2001 (2001-12-04) * column 1, line 4 - line 11 * * column 3, line 1 - line 10 * * figures 1-4 *	1,2,4	
X	AT 511 712 A4 (SCHLAGER FENSTERBANK GMBH [AT]) 15 February 2013 (2013-02-15) * page 3, paragraph 5 * * page 5, paragraph 7 * * page 10, paragraph 3 * * figure 1 *	1,2,4	
X	US 2013/111837 A1 (DEVOS PIETER [BE] ET AL) 9 May 2013 (2013-05-09) * paragraphs [0021], [0035] - [0039], [0126], [0194] * * figures 5,14,23,25 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) E04F
X	EP 1 262 609 A1 (TARKETT SOMMER SA [FR]) 4 December 2002 (2002-12-04)  * paragraphs [0007], [0035], [0041] - [0046] * * figures 2,3,5 *	1,2,4,5, 9-11,13, 14	
X	WO 2004/016422 A1 (SHAW IND GROUP INC [US]) 26 February 2004 (2004-02-26) * figure 2 *	1,2	
		-/--	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 September 2016	Examiner Arsac England, Sally
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

Application Number  
EP 15 18 2512

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
E	EP 2 963 203 A1 (CARRUBBA VINCENT FRANK [US]) 6 January 2016 (2016-01-06) * paragraphs [0071] - [0078] * * figures 13A-13D *	1,2,4,5,9,11	
A	FR 3 001 481 A1 (NEOLIFE [FR]) 1 August 2014 (2014-08-01) * page 1, line 1 - line 3 * * page 14, line 1 - line 17 * * figures 1,5 *	1-15	
A	US 8 769 904 B1 (BRANDT JEFFREY R [US] ET AL) 8 July 2014 (2014-07-08) * column 1, line 11 - line 25 * * column 4, line 46 - line 48 * * column 5, line 51 - line 53 * * figures 4,5 *	1-15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search Munich		Date of completion of the search 22 September 2016	Examiner Arsac England, Sally
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 18 2512

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-09-2016

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 202013100629 U1	17-05-2013	NONE	
US 6324796 B1	04-12-2001	US RE41140 E1 6324796 B1	23-02-2010 04-12-2001
AT 511712 A4	15-02-2013	AT 511712 A4 EP 2615220 A2	15-02-2013 17-07-2013
US 2013111837 A1	09-05-2013	BE 1019723 A3 BE 1019747 A3 BE 1019954 A3 EP 2591182 A2 EP 2593616 A2 US 2013104478 A1 US 2013111837 A1 US 2015000222 A1 WO 2012004700 A2 WO 2012007851 A2	02-10-2012 04-12-2012 05-03-2013 15-05-2013 22-05-2013 02-05-2013 09-05-2013 01-01-2015 12-01-2012 19-01-2012
EP 1262609 A1	04-12-2002	AT 333545 T DE 60213161 T2 EP 1262609 A1 ES 2266423 T3 FR 2825397 A1	15-08-2006 14-06-2007 04-12-2002 01-03-2007 06-12-2002
WO 2004016422 A1	26-02-2004	CN 1684824 A WO 2004016422 A1	19-10-2005 26-02-2004
EP 2963203 A1	06-01-2016	NONE	
FR 3001481 A1	01-08-2014	NONE	
US 8769904 B1	08-07-2014	US 8769904 B1 US 2015033659 A1	08-07-2014 05-02-2015

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82