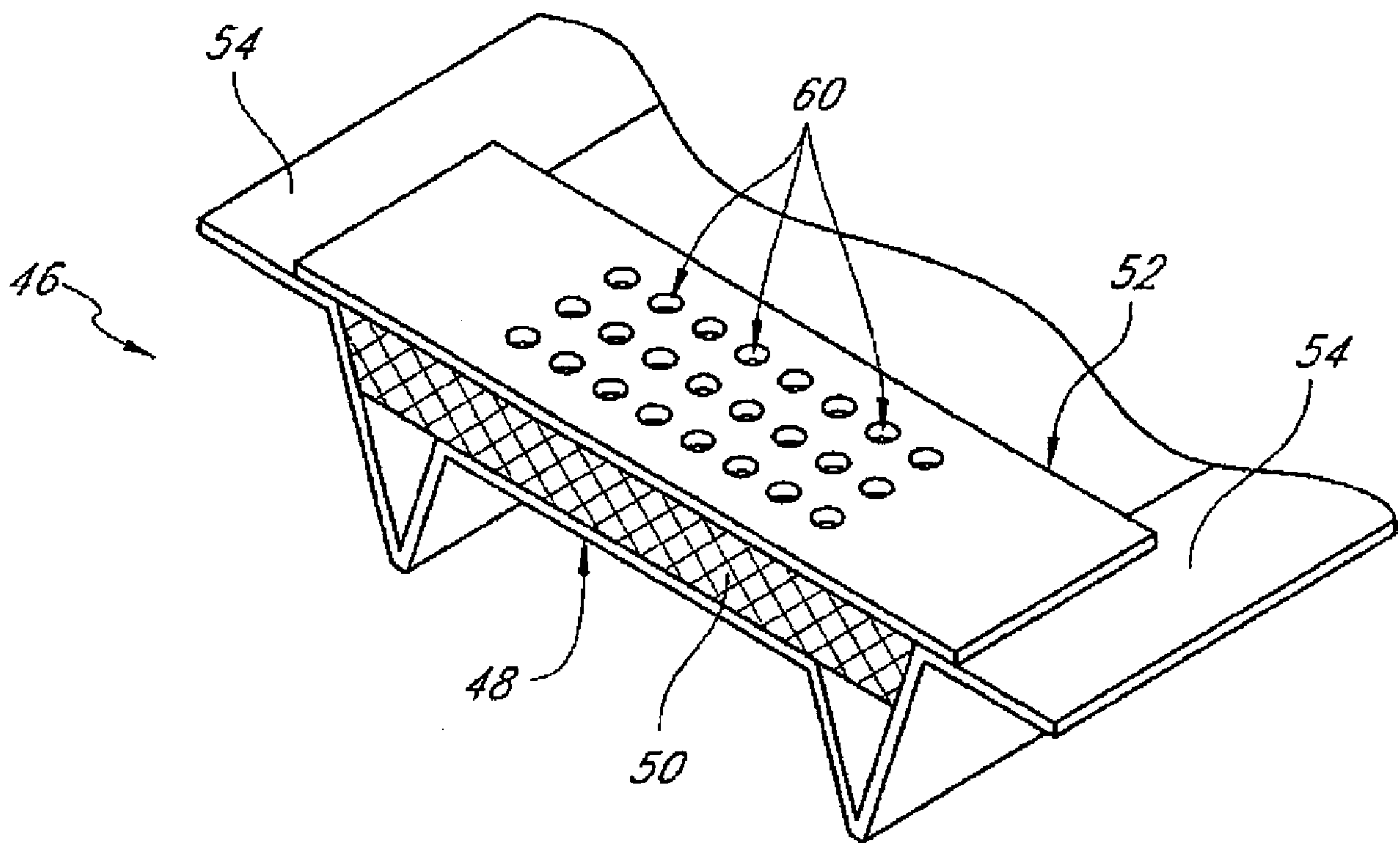




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(57) **Abrégé/Abstract:**
The present application is directed toward fire-rated wall construction components and wall systems for use in building construction. Embodiments can include tracks for holding studs which incorporate various geometries capable of receiving fire-retardant material, flat straps for use between tracks and fluted wall components, fire sponges for use in fluted wall components, and tracks with protruding grooves or other structures which prevent unwanted air movement between a wallboard component and the track.

FIRE-RATED WALL CONSTRUCTION PRODUCT

ABSTRACT

The present application is directed toward fire-rated wall construction components and wall systems for use in building construction. Embodiments can include tracks for holding studs which incorporate various geometries capable of receiving fire-retardant material, flat straps for use between tracks and fluted wall components, fire sponges for use in fluted wall components, and tracks with protruding grooves or other structures which prevent unwanted air movement between a wallboard component and the track.

FIRE-RATED WALL CONSTRUCTION PRODUCT

BACKGROUND OF THE INVENTION

Field of the Invention

This application is directed toward fire-rated wall construction components for use in building construction.

Description of the Related Art

Fire-rated wall construction components and assemblies are commonly used in the construction industry. These components and assemblies are aimed at preventing fire, heat, and smoke from leaving one portion of a building or room and entering another, usually through vents, joints in walls, or other openings. The components often incorporate the use of a fire-retardant material which substantially blocks the path of the fire, heat, and smoke for at least some period of time. Intumescent materials work well for this purpose, since they swell and char when exposed to flames, helping to create a barrier to the fire, heat, and smoke.

One example of a fire-rated wall construction component is the Firestik™ design. The Firestik™ design incorporates a metal profile with a layer of intumescent material on its inner surface. The metal profile of the Firestik™ design is independently and rigidly attached to a wall component, such as the bottom of a floor or ceiling, and placed adjacent to other wall components, such as a stud and track. The intumescent material, which is adhered to the inner surface of the metal profile, faces the stud and track, and the space created in between the intumescent material and the stud and track allows for independent vertical movement of the stud in the track when no fire is present.

When temperatures rise, the intumescent material on the Firestik™ product expands rapidly. This expansion creates a barrier which encompasses, or surrounds the stud and track and

substantially prevents fire, heat, and smoke from moving through the spaces around the stud and track and entering an adjacent room for at least some period of time.

While the Firestik™ design serves to prevent fire, heat, and smoke from moving through wall joint openings, it also requires independent attachment and proper spacing from wall components. It would be ideal to have wall components and systems which themselves already incorporate a fire-retardant material.

An additional problem regarding current fire-rated wall components concerns ventilation. Exterior soffits for balconies or walkways are required to be fire rated. However, these soffits need to be vented to prevent the framing members from rotting. The rot is caused when airflow is taken away and condensation forms inside the framing cavity. The moisture from the condensation attacks the framing members and destroys them from the inside out. In many cases, the deterioration is not noticed until the framing is completely destroyed. Therefore, a fire-rated wall component is needed which accommodates proper ventilation during times when no fire or elevated heat is present, and seals itself when fire or elevated heat is present.

SUMMARY OF THE INVENTION

The present application is directed toward fire-rated wall construction components and systems for use in building construction. The term "wall," as used herein, is a broad term, and is used in accordance with its ordinary meaning. The term may include, but is not limited to, vertical walls, ceilings, and floors. It is an object of the application to provide wall components and systems which have fire-retardant characteristics. It is also an object of the application to provide wall components and systems which allow for needed ventilation during times when no fire or elevated heat is present.

To achieve some or all of these objects, an embodiment of a wall system is provided that takes two separate components, a wall component and intumescent material, and combines the two for use in building construction. The embodiment includes at least one surface on a wall component capable of accepting intumescent material. In some embodiments, the outer surface of the intumescent material sits flush with a second surface of the wall component. This allows the wall component to retain its general shape and geometry without creating unwanted edges, protrusions,

or uneven shapes. It also removes the need for a separate product or wall component to be installed outside or adjacent to a stud or track. In other arrangements, it may be desirable for the outer surface of the intumescent material to extend above the second surface of the wall component to, for example, facilitate contact between the intumescent material and another component or surface. In some arrangements, it may be desirable for the outer surface of the intumescent material to be positioned below the second surface of the wall component.

In an embodiment which resembles a vent or ventilation system, the intumescent material is positioned within an interior space of a vent. The vent may include first and second components, each including vent holes. In some arrangements, the intumescent material may include a set of holes, especially when the intumescent material is covering vent holes of the vent component(s). The term "holes," as used herein, is a broad term, and is used in accordance with its ordinary meaning. The term includes, but is not limited to, holes, mesh, and slots. When the vent is in use, the holes in the vent surface (and, in some arrangements, the holes in the intumescent material) allow for continuous air flow through the vent. If provided, the holes in the intumescent material and the holes in the vent surface need not match up co-axially, as long as air flow is permitted. In some embodiments, the holes in the intumescent material may line up co-axially with the holes in the vent surface. Additionally, in some embodiments a flat strap may define a portion of the vent and may sit above the intumescent material. The flat strap may be a discrete piece attached separately, or may already be an integral part of the vent itself. The flat strap has its own set of holes which, when in use, allow for continuous air flow through the vent. In some embodiments the holes may be aligned co-axially with both the holes in the vent surface and the holes in the intumescent material. By having holes in both the vent and strap, air can flow through the vent, intumescent material (in some embodiments), and strap during times when there is no fire or elevated heat. When the temperature rises, however, the intumescent material will expand quickly and block air pathways. In this manner, the entire vent will be sealed, substantially preventing fire, heat, and smoke from reaching other rooms or parts of the building for at least some period of time. The intumescent material may be a strip of material that can be handled separately from the vent, or may be a layer of material applied to the vent (e.g., sprayed or painted onto the vent), among other possibilities.

In yet another embodiment, a wall system is provided which comprises a first wall component, a second wall component, a flat strap of material attached to the first wall component, and a strip of fire-retardant material located on the flat strap.

In yet another embodiment, a wall system is provided which comprises a deck with a flute, a wall generally aligned along the length of the flute, a flat strap located between the deck and the wall and attached to the deck, and a pair of fire-retardant material strips, one on either side of the flute, located on the flat strap between the flat strap and the deck.

In yet another embodiment, a pre-formed fire-retardant sponge is provided for use in a flute of a fluted deck, the sponge comprising a body having substantially the same shape as the shape of a flute of a fluted deck, the body being formed of compressible material and having at least one layer of fire-retardant material, and the body having an uncompressed size larger than that of the size of the flute.

In yet another embodiment, a fire-retardant wall system is provided comprising a track for receiving wall studs, the track comprising a web and flange, the track further comprising at least one surface for accepting fire-retardant material thereon, the at least one surface configured such that when the track is attached to a deck, the fire-retardant material can expand and seal any gaps present between the track and the deck when the fire retardant material is exposed to elevated heat. The system further comprises at least one wall stud received within the track, at least one piece of drywall attached to the at least one wall stud, and an elongate protrusion or sealing element located along the flange.

In yet another embodiment, a fire-retardant wall system is provided comprising a track for receiving wall studs, the track comprising a web and flange, the track further comprising at least one surface for accepting fire-retardant material thereon, the at least one surface configured such that when the track is attached to a deck, the fire-retardant material can expand and seal any gaps present between the track and the deck when the fire retardant material is exposed to elevated heat. The system further comprises fire-retardant material attached to the at least one surface of the track, the fire-retardant material being located along at least a portion of the flange, at least one wall stud received within the track, at least one piece of drywall attached to the at least one wall stud, and an elongate protrusion located along the flange between a free end of the flange and an edge of the fire-retardant material.

In yet another embodiment, a wall system having fire-retardant characteristics is provided, the system comprising a wall component comprising sturdy material and further comprising a first surface configured to accept fire-retardant material thereon, the first surface positioned such that when the wall component is affixed to an exposed surface of a second wall, the fire-retardant material applied to the wall component would be positioned proximal the second wall so as to permit expansion of said fire-retardant material and resultant sealing of any gap between said wall component and the exposed surface of said second wall when exposed to elevated heat or fire.

In yet another embodiment, a method of substantially preventing fire, heat, and/or smoke from moving through or around wall components for at least some period of time is provided, the method comprising providing a wall component with a first surface capable of receiving fire-retardant material, providing a fire-retardant material in a bonded fashion to the first surface, and installing the wall component and fire-retardant material so as to permit expansion of said fire-retardant material and resultant sealing of the plurality of holes in said wall component when exposed to elevated heat or fire.

Additional embodiments involve individual components of the systems described above, such as the individual flat straps, tracks or vent components, for example. In addition, embodiments of the present invention include methods of manufacturing the wall systems, vents or vent systems described above. Furthermore, other embodiments involve methods of assembling the wall systems, vents or vent systems described above.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects and advantages of the various devices, systems and methods presented herein are described with reference to drawings of certain embodiments, which are intended to illustrate, but not to limit, such devices, systems, and methods. The drawings include thirteen (13) figures. It is to be understood that the attached drawings are for the purpose of illustrating concepts of the embodiments discussed herein and may not be to scale.

Figure 1 illustrates a cross-sectional view of an embodiment of a fire-rated wall component connected to a floor and stud element.

Figure 2 illustrates a perspective view of an embodiment of a fire-rated wall component with arcuate or curved portions.

Figure 3 illustrates a perspective view of an embodiment of a fire-rated wall component with arcuate portions, including intumescent material.

Figure 4 illustrates a perspective view of an embodiment of a fire-rated wall component with channels or slots and intumescent material in the slots.

Figures 5A and 5B illustrate perspective views of embodiments of a fire-rated wall component including holes for ventilation.

Figures 6A and 6B illustrate perspective views of an embodiment of a fire-rated wall component including holes for ventilation.

Figures 7A and 7B illustrate perspective views of an embodiment of a fire-rated wall component including holes for ventilation.

Figure 8 illustrates a cross-sectional view of an embodiment of a fire-rated wall component with intumescent material on its top surface.

Figure 9 illustrates a cross-sectional view of an embodiment of a fire-rated wall component with intumescent material on both its top and side surfaces.

Figure 10A illustrates a cross-sectional view of an embodiment of a wall system with a flat strap.

Figure 10B illustrates a cross-sectional view of the track portion of the embodiment of Figure 10A prior to installation.

Figure 10C illustrates a cross-sectional view of a portion of the embodiment of Figure 10A.

Figure 10D illustrates the embodiment of Figure 10A, except with the fasteners moved in.

Figure 11 illustrates a perspective view of an embodiment of a fire sponge.

Figure 12A illustrates a cross-sectional view of an embodiment of a wall system which incorporates the fire sponge of Figure 11.

Figure 12B illustrates a cross-sectional view of a portion of the embodiment of the wall system of Figure 12A.

Figure 13 illustrates a cross-sectional view of an embodiment of a wall system with a protruding groove to inhibit movement of air.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention are directed toward fire-rated wall construction components and systems for use in building construction. Fire-rated wall construction components and assemblies are commonly used in the construction industry. These components and assemblies are aimed at preventing fire, heat, and smoke from leaving one portion of a building or room and entering another, usually through vents, joints in walls, or other openings. The components and assemblies often incorporate the use of some sort of fire-retardant material, such as intumescent material, which substantially blocks the path of the fire, heat, and smoke for at least some period of time.

Figure 1 illustrates a cross-sectional view of an embodiment of a fire-rated wall component 10 connected to a floor or ceiling element 18 and stud element 20. The wall component 10 is used as a track for holding a stud within a vertical wall, and may include slots along its sides. The slots provide areas to accommodate fasteners for connection with the studs and allow for vertical movement of the attached studs during an earthquake or some other event where vertical movement of the studs is desired.

As can be seen in Figure 2, wall component or header track 10 has both a flat top surface 28 and two arcuate surfaces 24 and 26. Top surface 28 is flat for ease of attachment to the bottom surface of a floor or ceiling 18. The two arcuate surfaces 24 and 26 are designed to receive intumescent material. The arcuate nature of the surfaces 24 and 26 can encourage the intumescent material, in at least some embodiments, to expand in a more radial direction from the top of the wall component 10 when subjected to elevated levels of heat, thereby filling in a larger area between and alongside the header track and floor 18. In other embodiments, the surfaces 24, 26 can have other shapes or configurations.

The intumescent material, identified as 12 and 14 in Figures 1 and 3, is bonded to arcuate surfaces 24 and 26. The term "bonded," as used herein, is a broad term, and is used in accordance with its ordinary meaning. The term includes, but is not limited to, mechanically bonded or bonded using adhesive. In some embodiments, when the intumescent material is bonded, an outer surface of the intumescent material will be flush with top surface 28. This allows top surface 28 to remain flush, or at least partially flush, with the bottom of floor element 18, and may aid in the installation

of wall component 10 to a floor or ceiling. This flush attachment additionally allows the wall component 10 to retain a fluid or smooth-shaped geometry free of added edges, overlaps, or protrusions. In doing so, the area of contact between the intumescent material and the floor element 18 can inhibit air and sound from moving past the header track 10. In other arrangements, it may be desirable for the outer surface of the intumescent material to extend above the top surface 28 to, for example, ensure contact between the intumescent material and the floor element 18. In some arrangements, it may be desirable for the outer surface of the intumescent material to be positioned below the second surface of the wall component.

By incorporating intumescent material onto a wall component such as a track for studs in the manner shown, it becomes unnecessary to use or attach additional features or devices to the wall component. Instead, when the temperature rises near the wall component 10, the intumescent material 12 and/or 14 will heat up. At some point when the intumescent material becomes hot enough, it will quickly expand to multiple times its original volume. This intumescent material will expand towards the floor or ceiling element 18 and outwards toward any open space. This helps to substantially prevent fire, heat, and smoke from moving past, through, or around wall component 10 and stud 20 for at least some period of time.

Figure 4 illustrates another embodiment of a fire-rated wall component 32. In this embodiment, the wall component 32 again takes the form of a track member for use in holding studs in place within a vertical wall. However, here the wall component 32 has two slots or channels, shown as 34 and 36, wherein the intumescent material 40 and 42 is attached. As can be seen in the drawing, the top surface layers of intumescent material 40 and 42 are flush with the top surface 38 of wall component 32. This allows the top surface 38 of wall component 32 to maintain a smooth geometry, which may aid in the installation of wall component 32 to a floor, ceiling or intersecting wall. This flush attachment additionally allows the wall component 10 to retain a fluid or smooth-shaped geometry free of added edges, overlaps, or protrusions. However, a flush attachment as described above is not essential to the success of the present invention.

It is possible that more than two slots could be used in the type of embodiment shown in Figure 4, or even as few as one. The purpose of having the intumescent material located in the slots 34 and 36 is to create fire protection areas. When the intumescent material 40 and 42 becomes hot, it will expand rapidly into the open areas around it. Much as in the embodiment shown in Figures 1-3,

this expansion will help to create a barrier, or seal, substantially preventing fire, heat, and smoke from moving from one area of a building to another for at least some period of time.

Figures 5A and 5B illustrate other embodiments of a fire-rated wall component 46. Here, the wall component takes the form of a soffit vent. The wall component 46 has a lower ventilation area 48 which includes a set or series of ventilation holes. These holes, which are hidden from view in Figures 5A and 5B, but are shown in Figure 6B, allow air and other matter to travel between floors and rooms in a building, or between the outside of a building and the interior of a building.

As can be seen in Figure 5A, a strip of intumescent material 50 is provided within the vent 46 and above ventilation area 48. The intumescent material 50 may be loosely positioned within the vent 46 or, as illustrated, may be attached adjacent to one or more components of the vent 46. The top surface of the intumescent material is flush with the top surface 54 of wall component 46. This allows for easy installation and use of a flat strap 52, which may be a separate member from the vent 46 or may be integrated with the vent 46. A flush fit, however, is not essential to the success of the present invention.

In some arrangements, especially if covering the holes of the ventilation area 48, the intumescent material 50 may be provided with a series of surfaces defining holes. These holes are hidden from view in Figures 5A and 5B but are shown in Figure 6A. The holes allow air and other matter to continue to travel between floors and rooms in a building, or between the outside of a building and the interior of a building. Flat strap 52 also has a series of holes 60 located in its center area. This series of holes, much like the ventilation and intumescent material holes, allows air and other matter to travel between floors and rooms in a building, or between the outside of a building and the interior of a building.

The intumescent material 50 may occupy a portion or all of the interior space defined by the vent 46. In one or more arrangements, the intumescent material 50 occupies only a portion of the interior space to facilitate air flow through the vent 46. When the intumescent material 50 becomes hot, it will expand to many times its original size into the open areas around it. Much as in the embodiments shown in Figures 1-4, this expansion will help to create a barrier, or seal, inhibiting or at least substantially preventing fire, heat, and smoke from moving from one area of a building to another for at least some period of time.

Figures 6A and 6B illustrate another embodiment of a fire-rated wall component 56. In Figure 6A, intumescent material holes 58 are visible, and the intumescent material 50 extends along the sides of vent area 48. When the intumescent material 50 becomes hot, it expands rapidly, filling much if not all of the space underneath the flat strap 52. This expansion substantially cuts off at least a substantial amount of air movement through the vent surface 48, and inhibits or at least substantially prevents fire, heat, and smoke from moving through the vent for at least some period of time. As can be seen in the embodiment in Figure 6A, the flat strap 52 is formed as an integral part of the wall component 56. In other embodiments, the flat strap 52 may be a discrete piece attached separately.

Figure 6B illustrates the bottom view of fire-rated wall component 56. Here, ventilation holes 68 can be seen in the vent area 48. The intumescent material 50 is attached to both the vent area 48 and along its extended sides. The intumescent material 50 can be a single piece of material, or can be made up of several pieces. The intumescent material 50 can be secured to the strap 52 or wall component 56 by any suitable means. For example, in one arrangement, the intumescent material 50 includes an adhesive backing, which permits the intumescent material 50 to be secured to the strap 52 or wall component 56. In an alternative arrangement, the intumescent material 50 may be secured to the strap 52 or wall component 56 by a mechanical fastener, such as a screw or rivet, for example. Other suitable mechanisms or methods may also be used. The intumescent material 50 may be secured to the strap 52 or wall component 56 during the manufacturing process or in the field.

Figures 7A and 7B illustrate another embodiment of a fire-rated wall component 66. With reference to Figure 7A, the wall component 66 can include a flat strap 52 with intumescent material 50 attached underneath, such that the intumescent material faces the inside area of the vent. In at least some embodiments the flat strap can comprise 20 gauge sheet metal, and the intumescent material can be about 2mm thick and about 1 1/4" wide. Other gauges, sizes, and shapes are also possible. The intumescent material can be attached to the flat strap 52 by various means, including but not limited to adhesive tape and/or mechanical fasteners. The flat strap 52 can be a discrete piece attached separately to the top surface 54, or can be formed as an integral part of the wall component, as shown in Figure 6A. In some embodiments, the flat strap 52 can include expanded metal lathes along either side with slots or holes 60, and an area in between for attachment of the

intumescent material 50. In some embodiments, the holes 60 can be about ¼" wide and about 1 ½" wide. Other sizes are also possible.

With continued reference to Figure 7A, the wall component 66 can allow air movement through the vent when the intumescent material 50 has not expanded. The air can move through holes 68 into the open space inside the vent and then out through slots or holes 60. In at least some embodiments the holes 68 can be about 1/8" in diameter. Other sizes and shapes are also possible. When the intumescent material expands, it can cover up either or both sets of holes 68, 60, in order to inhibit fire, heat, and smoke from moving through the vent.

With reference to Figure 7B, in some embodiments the intumescent material can instead be placed on the lower portion of the vent itself as opposed to the bottom of the flat strap 52. Holes 68 can be located on one or both sides of the intumescent material along the bottom of the vent, and slots or holes 60 can be located along the flat strap 52. Just as with the embodiment shown in Figure 7A, the intumescent material 50 can expand to cover up holes 60 and/or 68 when exposed to elevated levels of heat, inhibiting fire, heat, and smoke from moving through the vent. In at least some embodiments the top of the vent can have at least one end that wraps about the flat strap 52 to help hold it in place, as shown in Figure 7B.

In yet other embodiments, the intumescent material, or other fire-retardant material, can be sprayed or painted onto one or both sides of the bottom of the vent or onto the flat strap. The spray or paint can cover areas which surround the holes 68. When exposed to heat, the fire-retardant material can expand to cover the holes 68, thereby inhibiting fire, heat, and smoke from moving through the vent.

Figure 8 illustrates another embodiment of a fire-rated wall component 72. In this embodiment, the wall component 72 is a track for holding a wall stud 20 beneath a ceiling 18. Here, the intumescent material 74 is attached to the top surface of the wall component 72. During installation, it is possible to install the wall component 72 and intumescent material 74 to the ceiling 18. In some embodiments, this may be accomplished by threading a screw through both the wall component and intumescent material. Additionally, in some embodiments the intumescent material may extend down one or both sides of the wall component 72.

Figure 9 illustrates another embodiment of a fire-rated wall component 80. In this embodiment, the wall component 80 is a track for holding a wall stud. However, here the intumescent material 84 extends both along a portion of the top and side surfaces of the wall component 80. In particular, intumescent material is provided on the side and top surfaces of each corner portion of the wall component 80. In some embodiments, an outer surface of the intumescent material 84 may be flush with the top surface 82. In other embodiments, the intumescent material 84 may extend above the adjacent surfaces of the wall component 80, or may be positioned below the adjacent surfaces of the wall component 80.

With reference to Figure 10A, a fire-retardant wall system 110 can comprise a first wall component 112, a second wall component 114, a flat strap 116, and at least one strip of fire-retardant material 118. In at least some embodiments the first wall component 112 can comprise a fluted deck such as the one illustrated in Figure 10A. In yet other embodiments the first wall component 112 can comprise a floor, ceiling, overhang, or any other type of wall component.

In at least some embodiments the second wall component 114 can comprise a track, or header track, such as the one illustrated in Figure 10A, for retaining wall studs. The header track can comprise a slotted header track. In yet other embodiments the second wall component can comprise a different type of track or wall component.

With reference to Figures 10A and 10B, the second wall component 114 can include at least one gasket 120. The gasket 120 can itself comprise a strip of fire-retardant material, including but not limited to intumescent material. In at least some embodiments, the gasket 120 can be adhered to a surface of the second wall component 114 such that when the second wall component is attached to, pressed, and/or placed against the fire strap 116, the gasket or gaskets 120 can form a sound and/or air seal, inhibiting sound and/or air from moving from one side of the second wall component 114 to the other. For example, and with reference to Figure 10B, in at least some embodiments the gasket can be adhered to the second wall component 114 such that a portion of it protrudes and/or extends past an adjacent edge of the second wall component 114. When the second wall component 114 is pressed against and/or attached to the flat strap 116 or other wall component, the portion of the gasket protruding past the edge can be compressed down towards the adjacent edge of the wall component 114 in order to form a seal between the flat strap 116 and second wall component 114.

As described above, this seal and contact can inhibit air and sound from moving past the second wall component 114.

The flat strap 116 can be attached to the first wall component, the second wall component, or both the first and second wall components. For example, and as illustrated in Figure 10A, the flat strap 116 can be attached via fasteners 122 to the first wall component 112. In at least some embodiments, the flat strap 116 can comprise an about 6"- 8" wide 20 gauge flat strap. The flat strap 116 can be used to cover a portion or all of one or more flutes 124 of the fluted deck 112, Figure 10A showing a cross-section of the flute 124. Thus, the flat strap 116 provides a surface for the second wall component 114 to contact when the wall component 114 is generally aligned with the length of the flute 124, or when the wall component 114 extends generally alongside and underneath the length of the flute 124 as shown in Figure 10A. In other embodiments a portion or portions of the wall component 114 can be aligned with a portion of the fluted deck that does not include the flute 124.

With reference to Figures 10A-10D, the strip of fire-retardant material 118 can comprise intumescent material, which expands when subjected to elevated levels of heat, or can comprise other types of fire retardant material. In some embodiments an about ½" thick strip of material can be used. Other thicknesses are also possible.

In at least some embodiments, and with reference to Figure 10C, the strip of fire-retardant material 118 can be adhered to the flat strap so that it rests between the flat strap 116 and first wall component 112. In at least some embodiments, the fire-retardant system 110 can include two or more strips of fire-retardant material 118. In some embodiments, the strips of fire-retardant material 118 can be located approximately ¼" in from the ends of the flat strap 116. For example, and with reference to Figure 10A, the system 110 can include one strip of fire-retardant material 118 located on each side of the second wall component 114 and on each side of the flute 124.

In at least some embodiments, and with reference to Figures 10A and 10C, the strip of fire-retardant material 118 can include a preformed fastener hole for insertion of the fastener 122. The fastener 122 can be fastened through the fire-retardant material 118. A washer 117 can be used between a head of the fastener 122 and the flat strap 116 to help secure the flat strap 116. The fastener 122 can help to secure the fire-retardant material in place. In other embodiments, and with

reference to Figure 10D, the fastener 122 can be located adjacent or inside of the fire-retardant material 118 along the flat strap 116.

In some embodiments, the fasteners 122 can be located every 12" on center along the length of the flat strap. In order to locate the areas for attachment, in at least some embodiments, the flat strap 116 can include the preformed fastener hole, as described above, or other suitable markings. For example, in some embodiments the flat strap can be indented, scored, or a laser or inkjet (or other suitable) line can be placed along the length of the flat strap 116, to help locate where the fasteners 122 should be installed through the fire-retardant material and into the wall component 112.

With continued reference to Figures 10A-10D, the fire-retardant system 110 can inhibit fire, smoke, air, sound, and/or debris from moving from one side of the second wall component 114 to the other (e.g. from one room to another inside a building). The strip or strips of fire-retardant material 118 and/or 120 can act as gaskets, preventing air and/or sound from moving past the system 110. At the same time, when the strips 118 and/or 120 are exposed to elevated levels of heat, they can expand and fill any gaps left between the flat strap 116 and first and second wall components 112, 114.

The flat strap 116 with fire-retardant material 118 can be used with other systems, decks, tracks, or wall components as well. Thus, it is not limited to use with a fluted wall component and/or header track, as illustrated in Figures 10A-10D.

With reference to Figures 11 and 12, a fire sponge 130 can be used to prevent the spread of fire, heat, and/or debris. The fire sponge 130 can be sized and shaped so that it is custom-made for particular sized and shaped spaces. For example, the fire sponge 130 can be shaped so that it fits snugly into the hollow area or areas of a fluted deck.

With continued reference to Figure 11, the fire sponge 130 can comprise an inner layer of material 132, such as for example mineral wool. The inner layer 132 can be compressible, so that the entire sponge 130 can be compressed into an area smaller than the volume of the fire sponge 130 itself. The fire sponge 130 can further comprise another layer of material 134 outside of the inner layer 132. In some arrangements, the layer of material 134 can be the outermost layer, and in other

arrangements can be an intermediate layer. In at least some embodiments the layer of material 132 can comprise fire-retardant material, including but not limited to intumescent material. In at least some embodiments, the fire sponge 130 can further comprise an additional outer layer of material 136, including but not limited to latex smoke seal. In one preferred embodiment, the outer layer of latex smoke seal can range between 1/16"- 1/8" in thickness. This outer layer of latex smoke seal can give the fire sponge 130 a flexible, yet durable shape. For example, the latex can prevent wear and tear during shipping and/or installation, and can also prevent smoke from moving through the fire sponge 130.

With reference to Figures 11 and 12A, the custom-made and pre-shaped fire sponges 130 can be made to have a trapezoidal cross-section so as to fit into the generally trapezoidal-shaped flutes commonly found in decks. In at least some embodiments, the trapezoidal-shaped fire sponge 130 can have widths which are larger than the widths of the flute. Other shapes and geometries are also possible. In some embodiments, the fire sponge 130 can be made at least in part of a compressible material, and its initial manufactured size can be larger than that of the flute 124. This allows the sponge 130 to be compressed to fit inside the flute 124, and once inside to expand and hold itself in place. For example, in at least one embodiment, the fire sponge 130 can be made to compress by approximately 30% of its initial volume to fit inside the flute 124. Other percentages and/or ranges of percentages are also possible.

Custom-made and pre-shaped fire sponges can reduce the amount of time required for fire-proofing the interior of a building, particularly if the size of the fluted wall components is known. For example, instead of placing or stuffing numerous, similar-shaped fire blocks or material into a hollow area and then using an airless sprayer to spray latex smoke sealer, a single custom-shaped fire sponge as described above can be used.

With continued reference to Figure 12A, a fire-retardant wall system 210 can include a first fluted wall component 212 and a second, attached wall component 214. In at least some embodiments the first fluted wall component 212 can comprise a fluted deck, and can include hollow areas for insertion of a fire sponge or sponges 130. In at least some embodiments, the sponges 130 can be inserted after the second wall component 214 has been attached to the fluted wall component 212.

With reference to Figures 12A and 12B, in at least some embodiments the second wall component 214 can comprise a header track, which may be slotted or unslotted. In some embodiments the track can have a U-shape. In other embodiments it can have a J-shape. Other shapes are also possible. In at least some embodiments the track can be used for shaft areas in buildings, including but not limited to elevator shafts. In such arrangements, the structures for sealing with wallboard members described below may be provided on only one side of the track because the shaft side typically does not include wallboard.

With continued reference to Figures 12A and 12B, the illustrated header track is slotted and can comprise a strip or strips of fire-retardant material 216, including but not limited to intumescent material, along at least one flange. The strip of fire-retardant material 216 can be located along an area of the flange adjacent and/or proximal to the series of slots 218 in the flange. As illustrated in Figure 12A, the second wall component 214 can extend along the bottom of the fluted wall component 212, generally perpendicular to the lengths of the flutes 224.

The second wall component 214 can further comprise a strip or strips of a sealing element 220 located between the strip 216 and series of slots 218, and also between the strip 216 and a piece or pieces of an outer wallboard member, such as a sheet of drywall 222, or other exterior material. The sealing element 220 can be a separate component from the track 214 such as, for example, caulk, foam or tape, and can be used to prevent or inhibit air from moving between the drywall and the second wall component 214. Alternatively, as described below, the sealing element can be formed by the track itself. For example, and with reference to Figure 12B, the sealing element 220 can extend away from the flange and towards the drywall 222 such that the drywall 222 is able to rest against a portion of the sealing element 220. This configuration can help prevent air from moving between the drywall 222 and the track, while at the same time preventing the drywall from covering up or moving over and interfering with the fire-retardant material 216.

With reference to Figure 13, other structures or embodiments for preventing unwanted airflow are also possible. For example, a fire-retardant wall system 310 can comprise a slotted or unslotted track 312. In the illustrated arrangement, the track 312 is slotted. The slotted track 312 can comprise at least one surface for accepting fire-retardant material 314 thereon. The at least one surface can be configured such that when the track is attached to a first wall component, the fire-retardant material 314 can expand and seal a gap between the slotted track 312 and first wall

component when the fire-retardant material is exposed to elevated heat. The track 312 can also comprise an elongate protrusion or rib 316 located along at least a portion of one or more of the flanges of the track and proximal the at least one surface, as illustrated in Figure 13.

In at least some embodiments, the elongate protrusion 316 can have a generally v-shaped cross section. Other cross-section shapes are also possible, for example, the protrusion 316 can be generally u-shaped or trapezoidal in shape. The elongate protrusion 316 can act as both a boundary area for the fire-retardant material, as well as a resting and/or attachment location for a piece of drywall 318, or other exterior material. The drywall can rest and/or remain in contact with the elongate protrusion 316, thereby blocking air from moving between the drywall 318 and slotted track 312. At the same time, the elongate protrusion 316 can help prevent the drywall 318 from contacting and/or interfering with the fire-retardant material 314.

In some embodiments, the drywall is fastened to a stud within the slotted track 312. The head portion 320 of the fastener can tend to bow out the drywall, leaving a gap at the top of the drywall to allow air, sound, or debris in general to move between the drywall and the slotted track 312. The sealing element 220 and/or elongate protrusion 316 can have depths large enough such that even if the drywall is bowed out, the drywall remains in contact with the sealing element 220 and/or elongate protrusion 316. For example, in some embodiments, the sealing element 220 and/or protrusion 316 can have depths at least equivalent to the depth of the fastener head 320. As described above, the track can be configured for use in a shaft wall application. In such an arrangement, the track may include fire-retardant material 216 or 314 and the sealing element 220 or protrusion 316 on only one side (i.e., the side opposite the shaft). The flange of the track facing the shaft may be the same or a different length (shorter or longer) than the opposite flange. In some applications, it may be desirable for the shaft flange to be longer than the opposite flange.

The present application does not seek to limit itself to only those embodiments discussed above. Other embodiments resembling tracks, vents, or other wall components are possible as well. Various geometries and designs may be used in the wall components to accommodate the use of fire-retardant material. Additionally, various materials may be used. In at least some embodiments the wall component and wall system materials can comprise steel, iron, or other material having at least some structural capacity. The fire-retardant materials can comprise intumescent material, such

as for example BlazeSeal™, or some other material which accomplishes the same purposes as those described above.

Although these inventions have been disclosed in the context of certain preferred embodiments and examples, it will be understood by those skilled in the art that the present inventions extend beyond the specifically disclosed embodiments to other alternative embodiments and/or uses of the inventions and obvious modifications and equivalents thereof. In addition, while several variations of the inventions have been shown and described in detail, other modifications will be readily apparent to those of skill in the art based upon this disclosure. It is also contemplated that various combinations or sub-combinations of the specific features and aspects of the embodiments can be made, and should be understood that various features and aspects of the disclosed embodiments can be combined with or substituted for one another in order to form varying modes of the disclosed inventions.

WHAT IS CLAIMED IS:

1. A fire rated metal stud framing wall and ceiling system, comprising:

a metal bottom track comprising a web, a first flange and a second flange, the first and second flanges extending in an upward direction from opposing side edges of the web, the bottom track defining an interior space between the web and the inwardly-facing surfaces of the first and second flanges;

a plurality of metal studs that are spaced from one another along the bottom track, each of the plurality of studs having a bottom end received within the interior space of the bottom track, each of the plurality of studs extending in a generally vertical direction from the bottom track;

a metal top track comprising a web, a first flange and a second flange, the first and second flanges extending in a downward direction from opposing side edges of the web, the top track defining an interior space between the web and the inwardly-facing surfaces of the first and second flanges, wherein upper ends of each of the plurality of studs are received within the interior space of the top track, further comprising at least one heat-expandable, intumescent material strip extending along a length of the top track, the intumescent material strip attached to the top track and having at least a first surface facing the top track and a second surface; and

a ceiling;

wherein the top track is secured to the ceiling and the at least one intumescent material strip is located on the top track such that the second surface of the at least one intumescent material strip contacts the ceiling and wherein the second surface of the at least one intumescent material strip defines a width that is less than the width of the web of the metal top track.

2. The system of Claim 1, wherein each of the first flange and the second flange comprise planar portions that extend a substantial depth of the top track.

3. The system of Claim 2, further comprising a recess defined by at least one side edge of the web, wherein the intumescent material strip is positioned within the recess.

4. The system of Claim 1, wherein the second surface of the intumescent material strip is opposite the first surface.

5. The system of Claim 1, wherein the intumescent material strip further comprises an exposed third surface that faces the same direction as an outer surface of one of the first and second flanges.

6. The system of Claim 1, wherein each of the first and second flanges include a plurality of vertically-oriented slots.

7. The system of Claim 1, wherein the at least one intumescent material strip comprises a first strip and a second strip, wherein the first strip and second strip are adhesively attached to the top track along respective outermost surfaces which come in contact with the ceiling.

8. The system of Claim 1, further comprising at least one wall board coupled to the plurality of studs.

9. The system of Claim 1, wherein the studs, the bottom track and the top track are constructed from a cold formed steel.

10. The system of Claim 1, wherein the at least one intumescent material strip is adhesively attached to the top track.

11. A fire rated metal stud framing wall and ceiling system, comprising:

a metal bottom track comprising a web, a first flange and a second flange, the first and second flanges extending in an upward direction from opposing side edges of the web, the bottom track defining an interior space between the web and the inwardly-facing surfaces of the first and second flanges;

a plurality of metal studs that are spaced from one another along the bottom track, each of the plurality of studs having a bottom end received within the interior space of the bottom track, each of the plurality of studs extending in a generally vertical direction from the bottom track;

a metal top track comprising a web, a first flange and a second flange, the first and second flanges extending in a downward direction from opposing side edges of the web, the top track defining an interior space between the web and the inwardly-facing surfaces of the first and second flanges, wherein upper ends of each of the plurality of studs are received within the interior space of the top track, further comprising a first

heat-expandable, intumescent material strip extending along a length of the top track on a first side thereof and a second heat-expandable, intumescent material strip extending along a length of the top track on a second side thereof, the first and second intumescent material strips attached to the top track and each having at least a first surface facing the top track and a second surface, wherein the second surface of each of the first and second intumescent material strips defines a width and the combined widths of the second surfaces of the first and second intumescent material strips is less than the width of the web of the metal top track; and

a ceiling;

wherein the top track is secured to the ceiling and the first and second intumescent material strips are located on the top track such that the second surface of each of the first and second intumescent material strips contact the ceiling.

12. The system of Claim 11, wherein each of the first flange and the second flange comprise planar portions that extend a substantial depth of the top track.

13. The system of Claim 12, further comprising a first recess defined by a first side edge of the web and a second recess defined by a second side edge of the web, wherein the first intumescent material strip is positioned within the first recess and the second intumescent material strip is positioned within the second recess.

14. The system of Claim 11, wherein the second surface is opposite the first surface on each of the first and second intumescent material strips.

15. The system of Claim 11, wherein each of the intumescent material strips further comprise an exposed third surface that faces the same direction as an outer surface of the respective one of the first and second flanges closest to the intumescent material strip.

16. The system of Claim 11, wherein each of the first and second flanges include a plurality of vertically-oriented slots.

17. The system of Claim 11, further comprising at least one wall board coupled to the plurality of studs.

18. The system of Claim 11, wherein the studs, the bottom track and the top track are constructed from a cold formed steel.

19. The system of Claim 11, wherein each of the first and second intumescent material strips is adhesively attached to the top track.

1/13

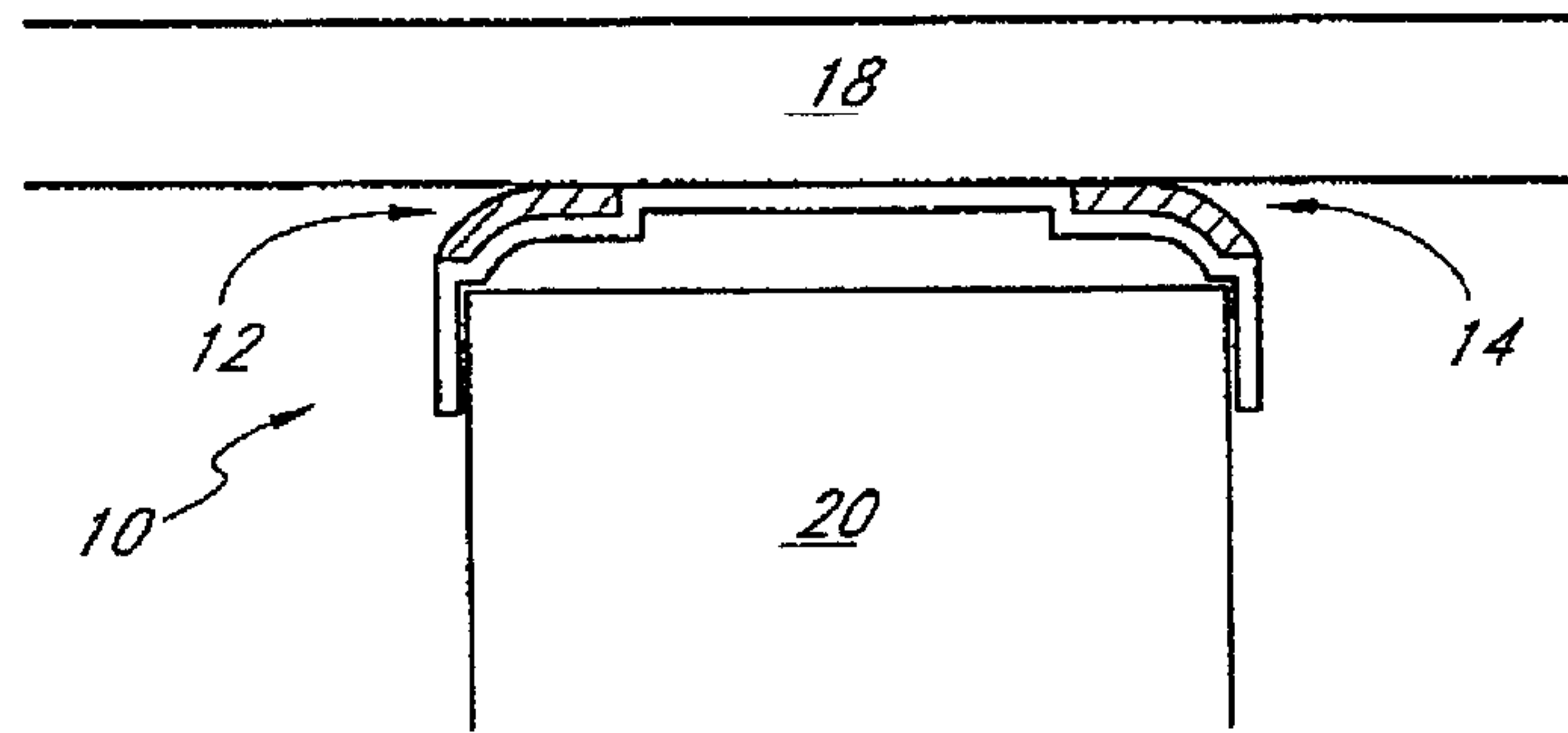


FIG. 1

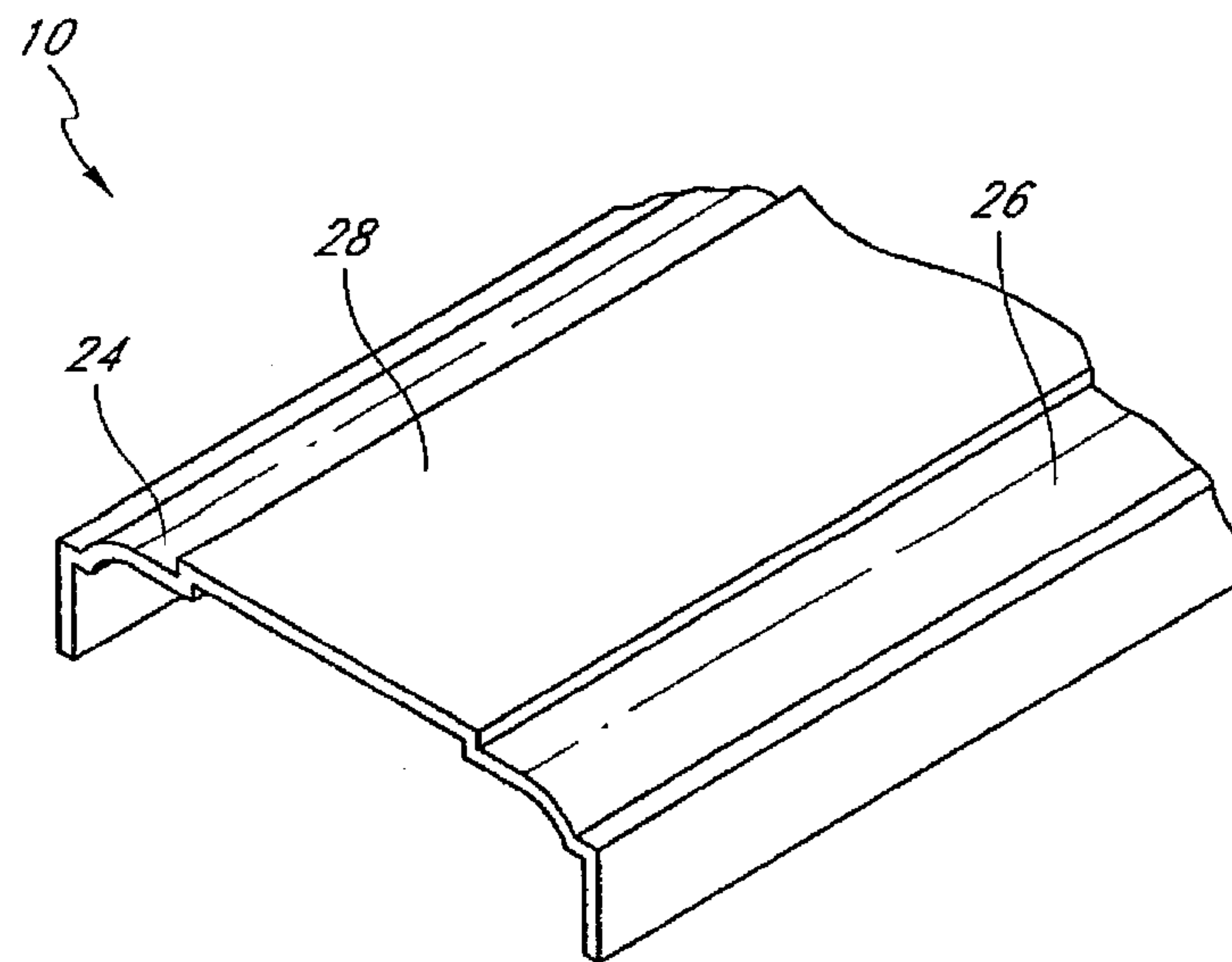


FIG. 2

2/13

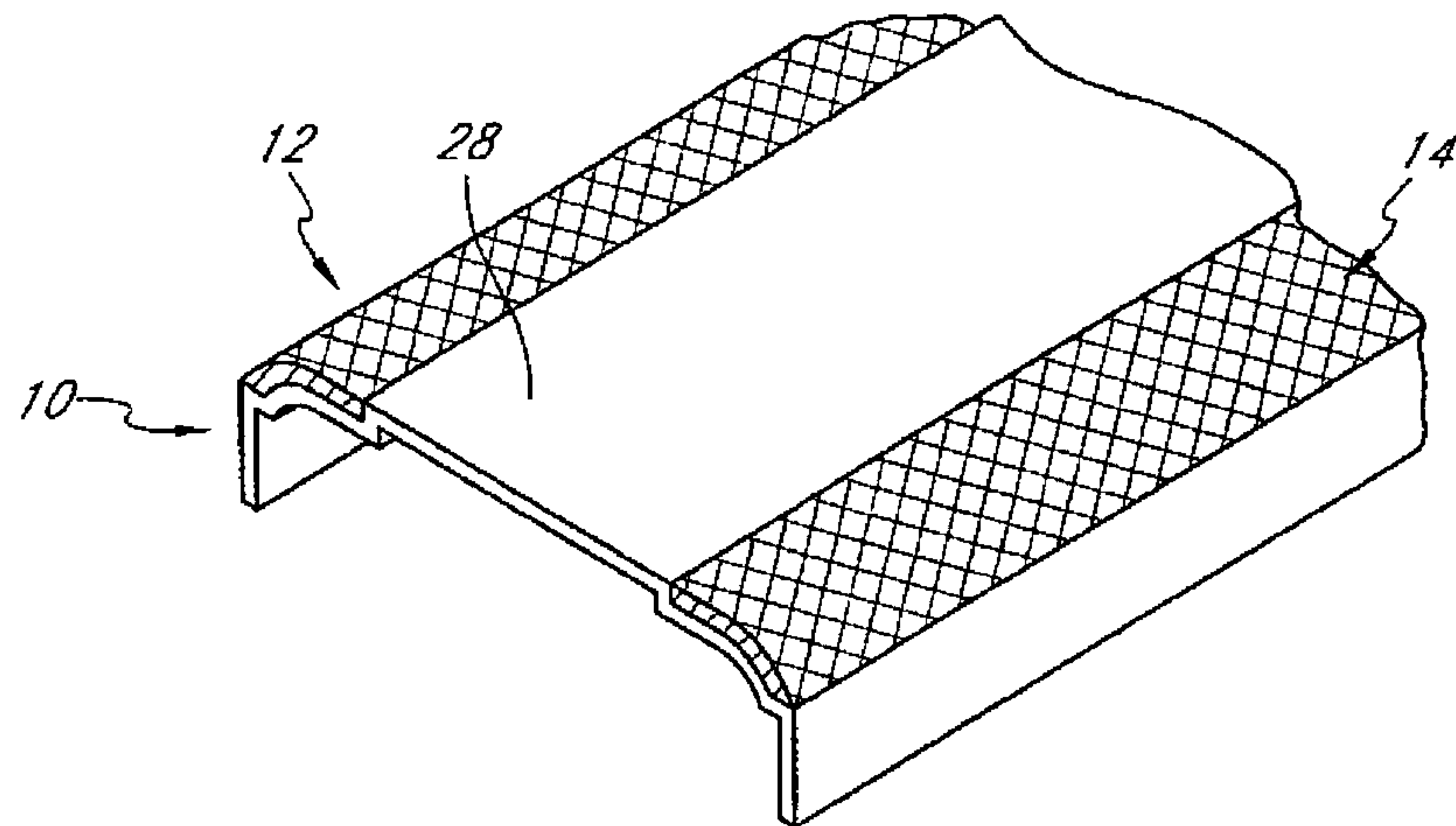


FIG. 3

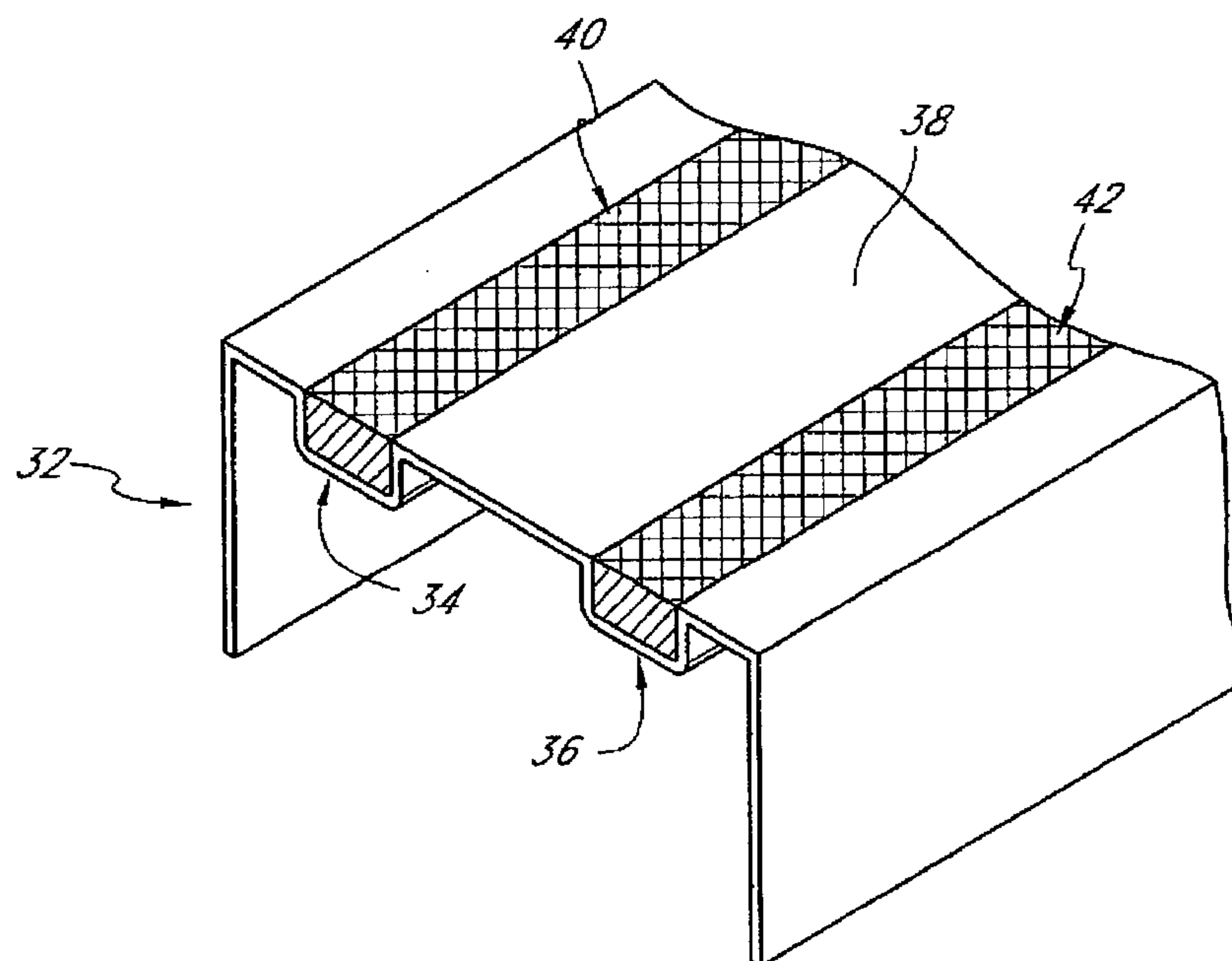


FIG. 4

3/13

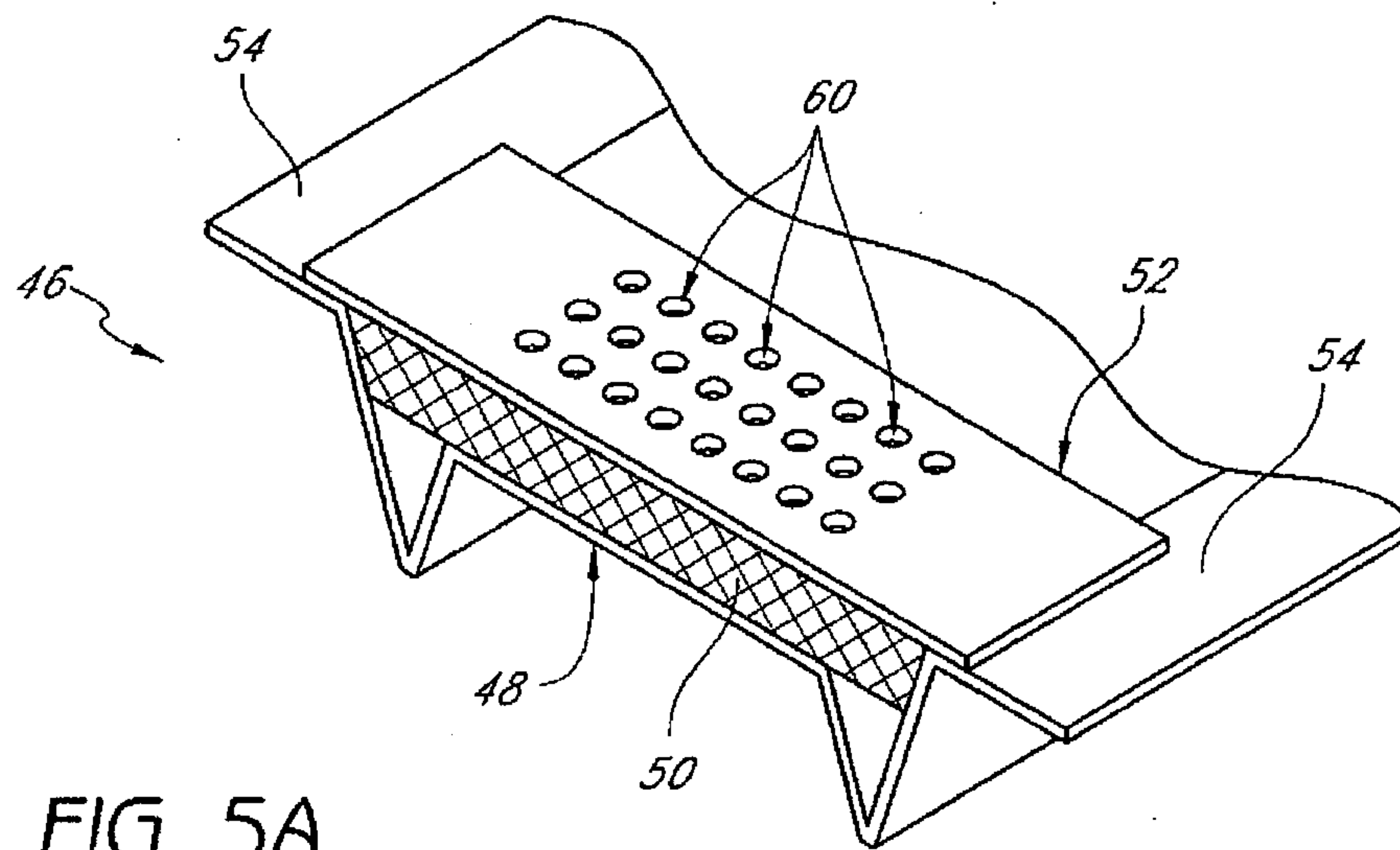


FIG. 5A

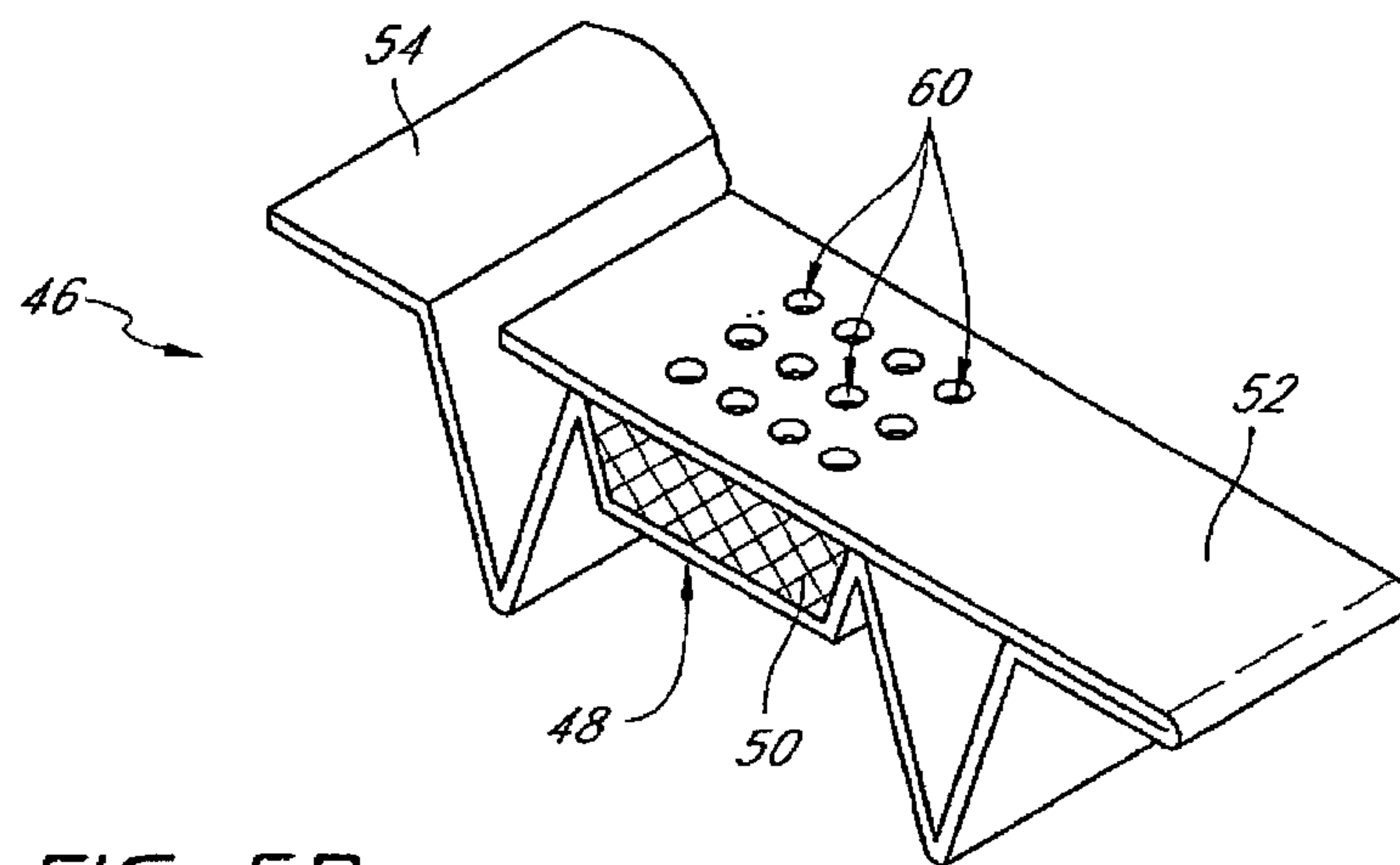


FIG. 5B

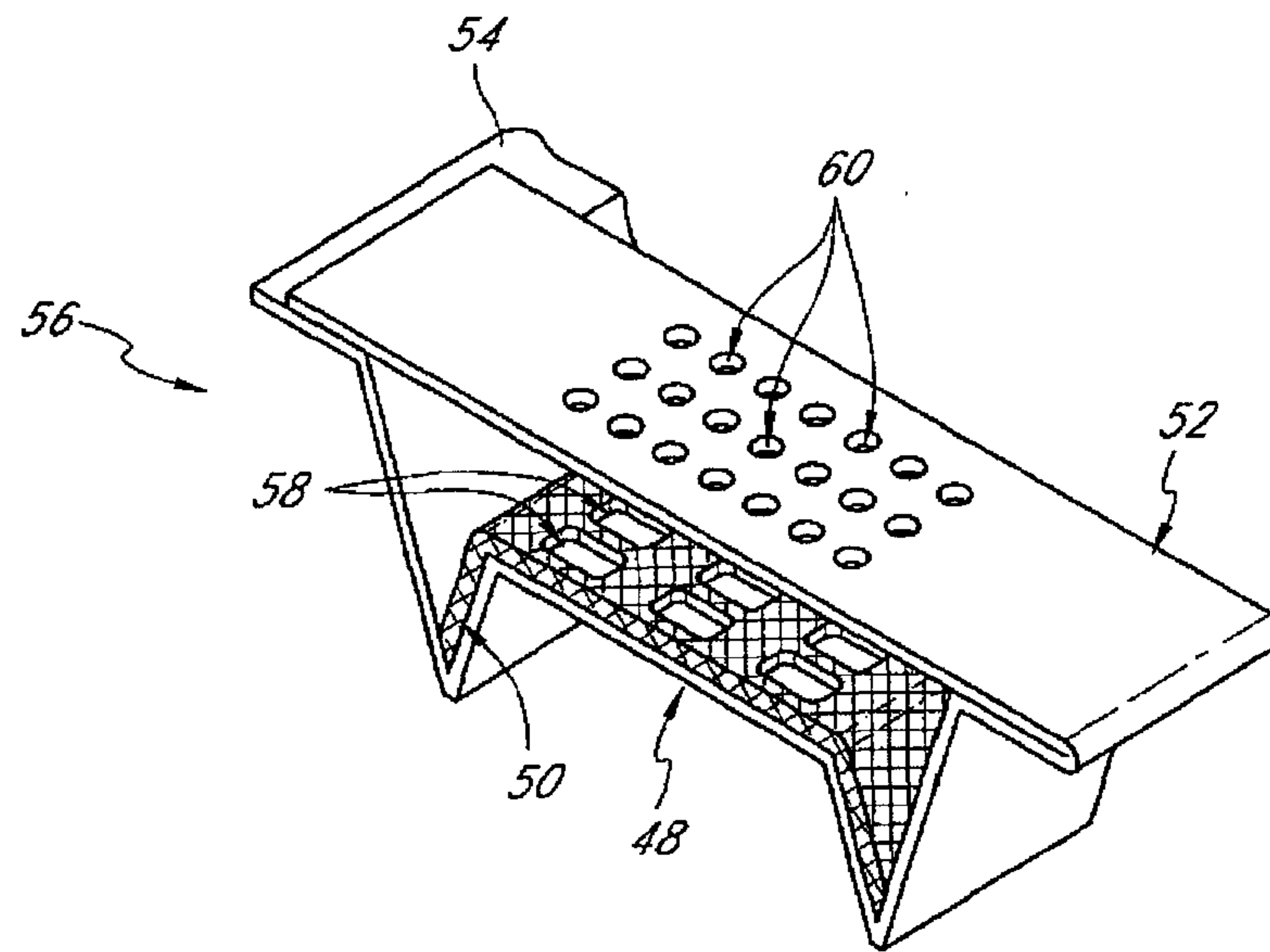


FIG. 6A

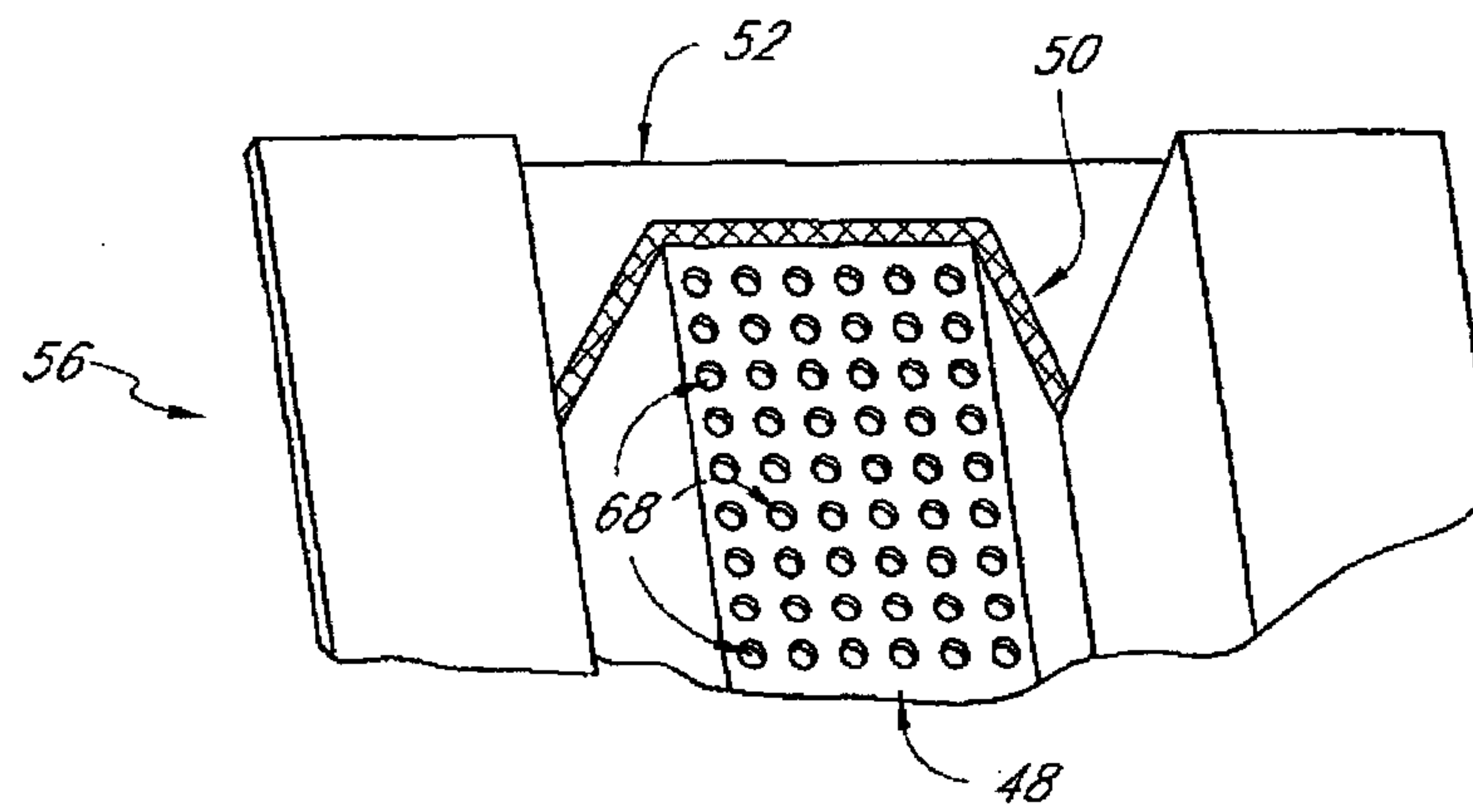


FIG. 6B

5/13

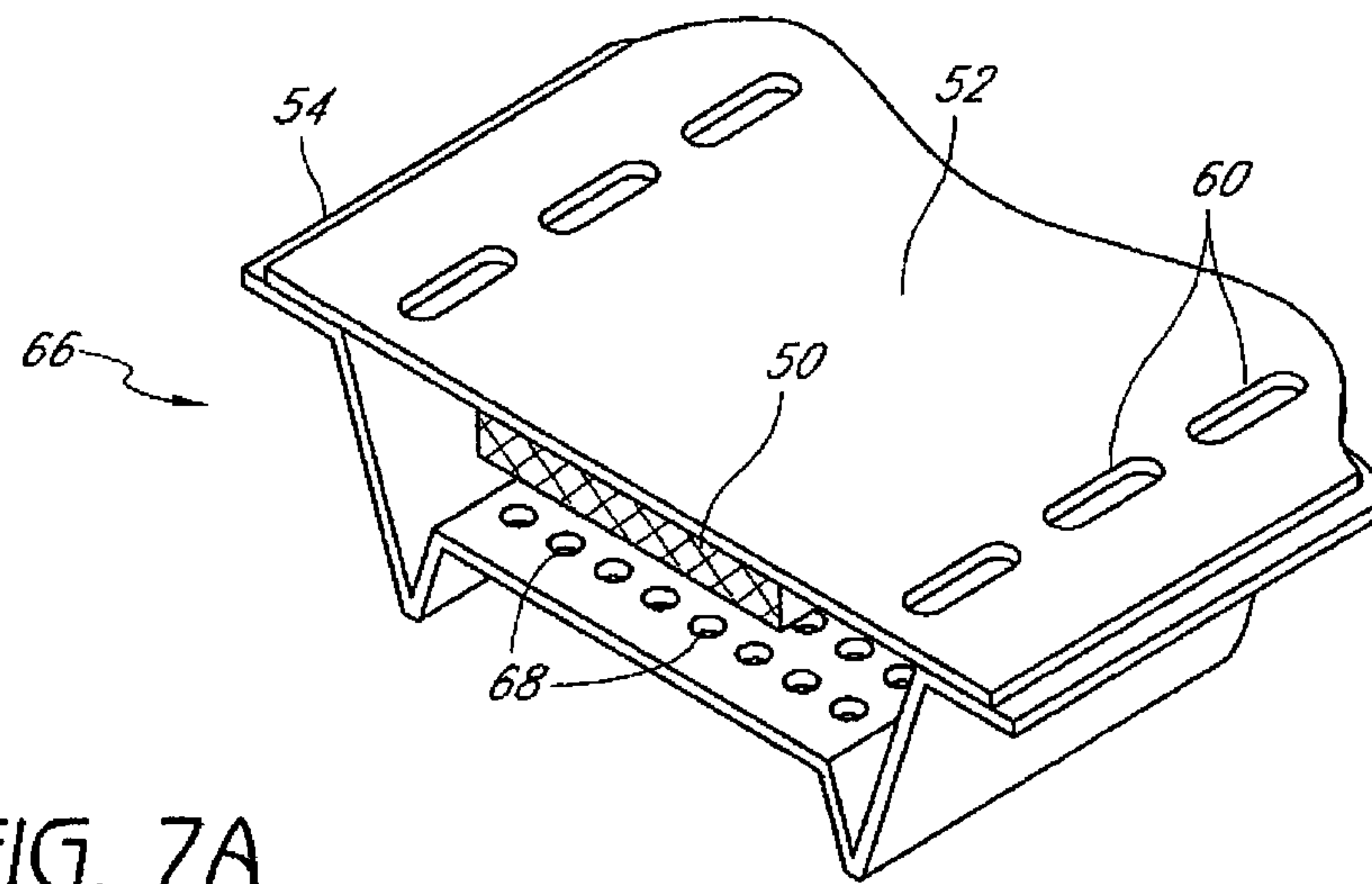


FIG. 7A

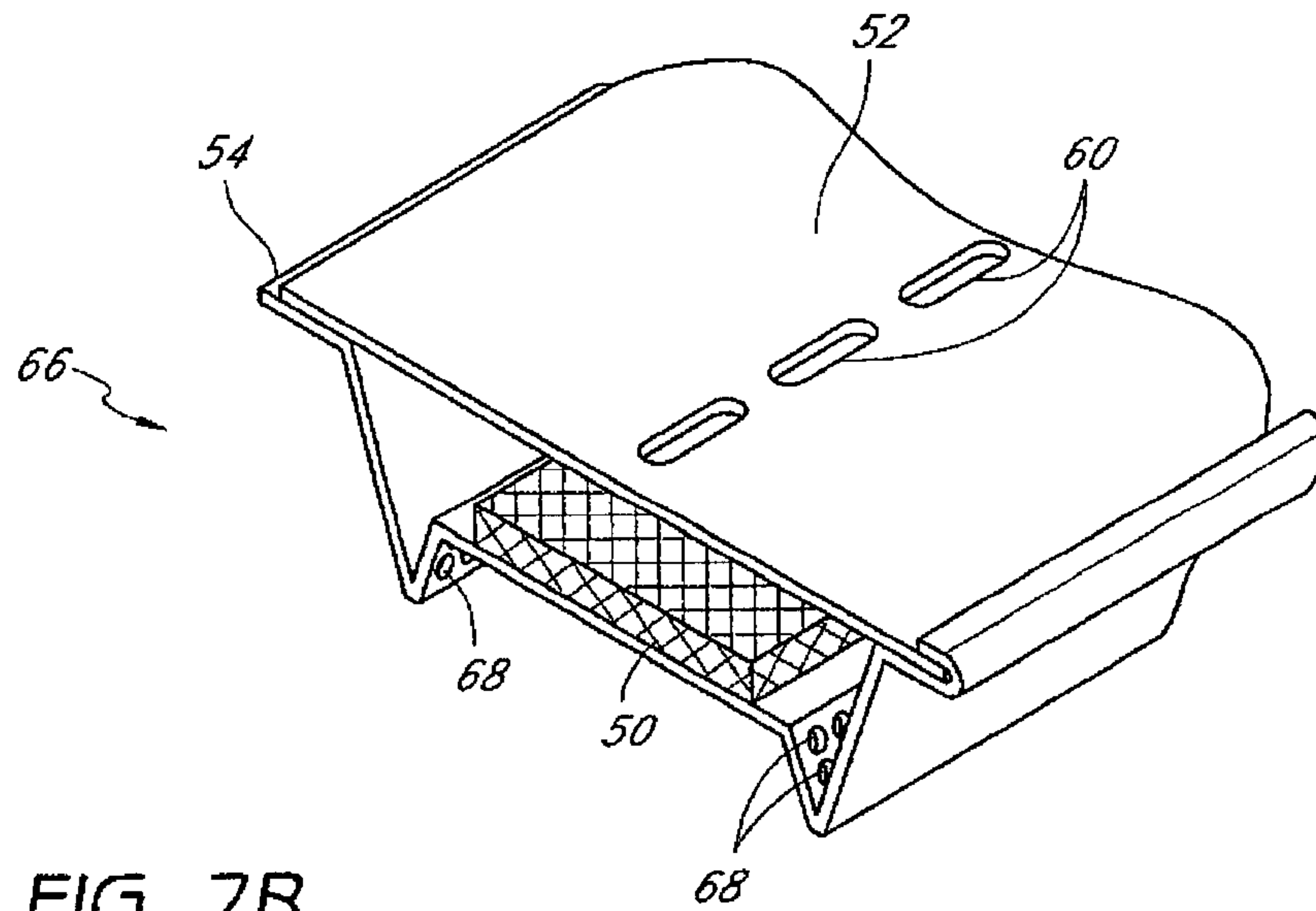


FIG. 7B

6/13

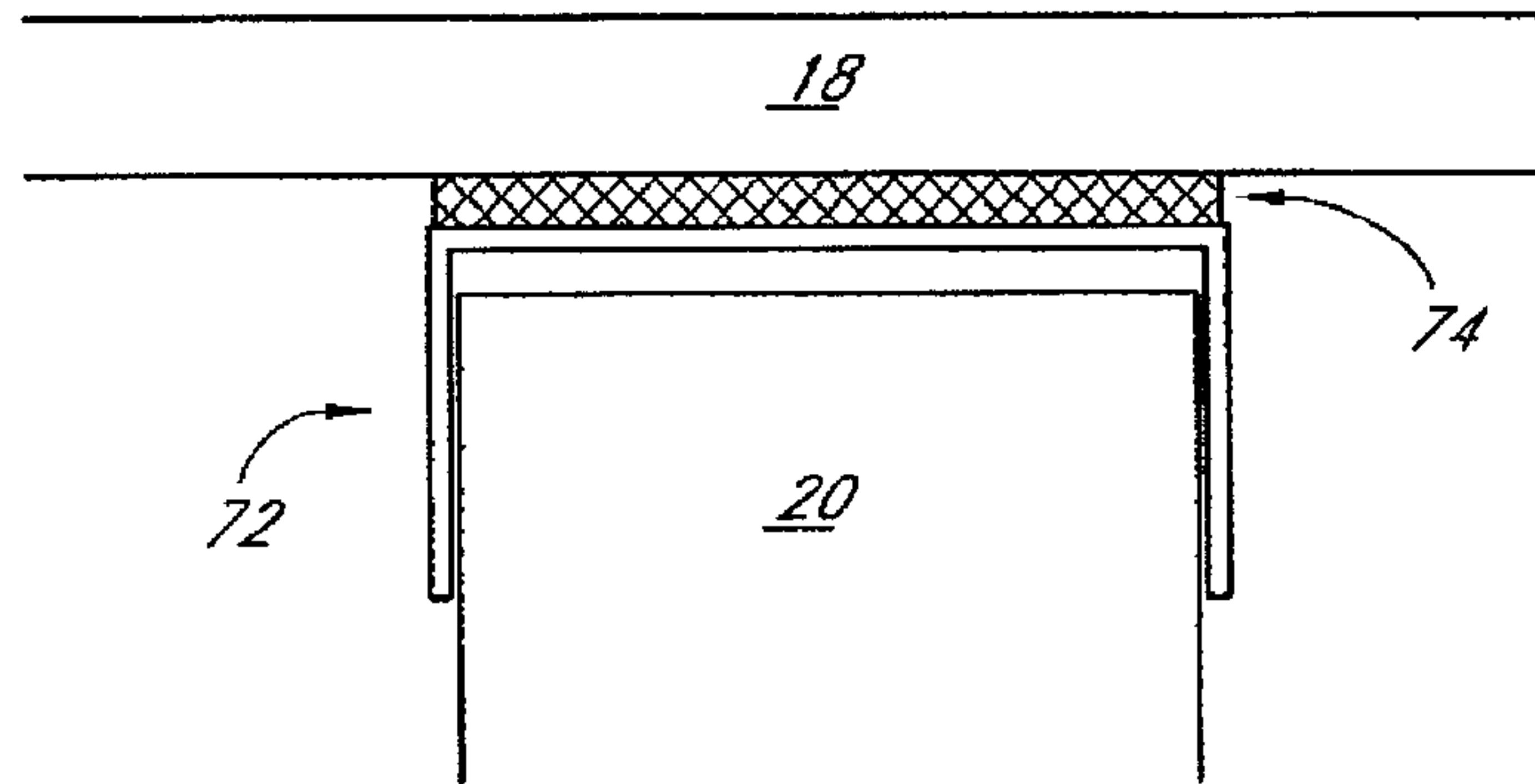


FIG. 8

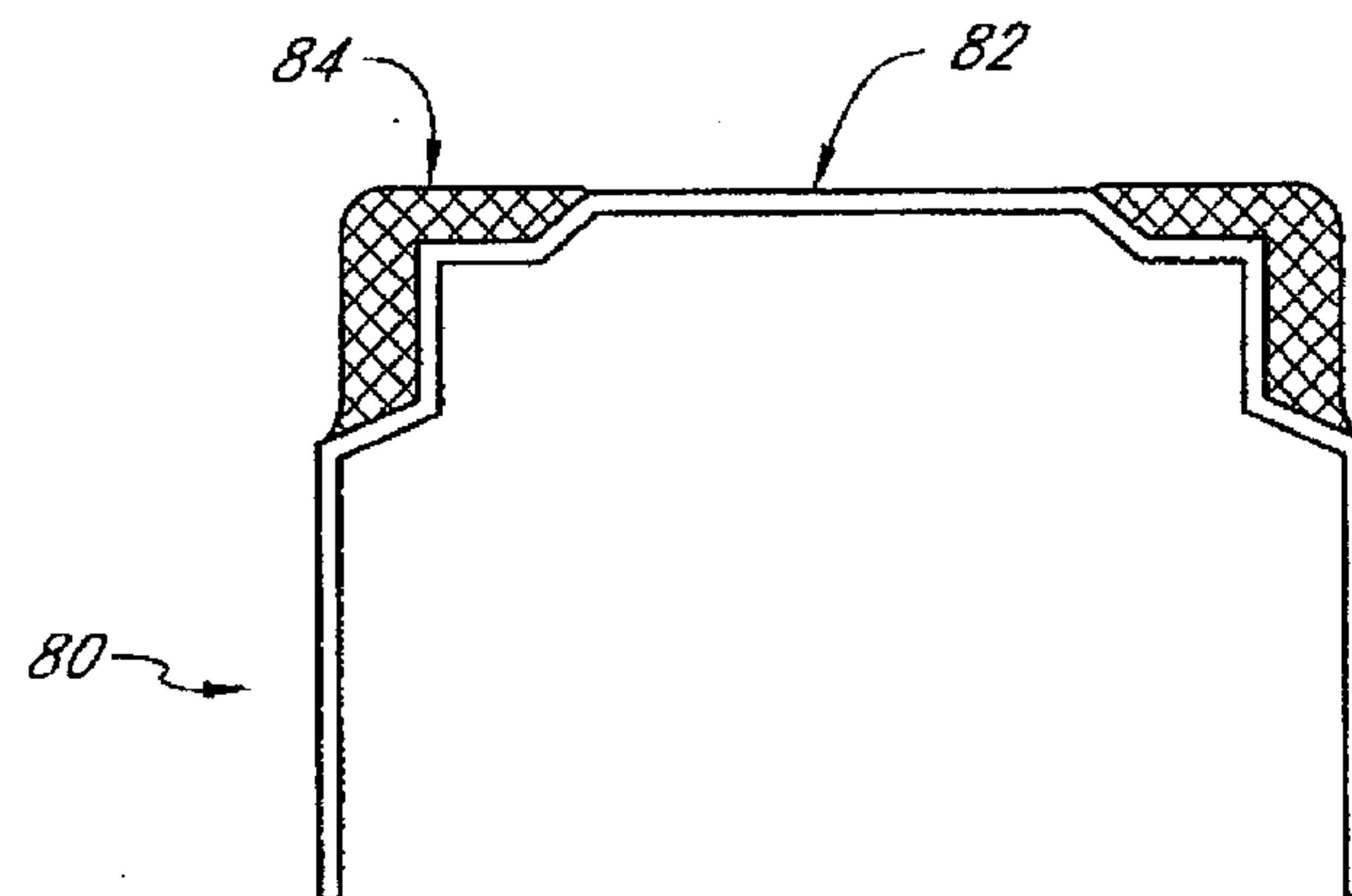


FIG. 9

7/13

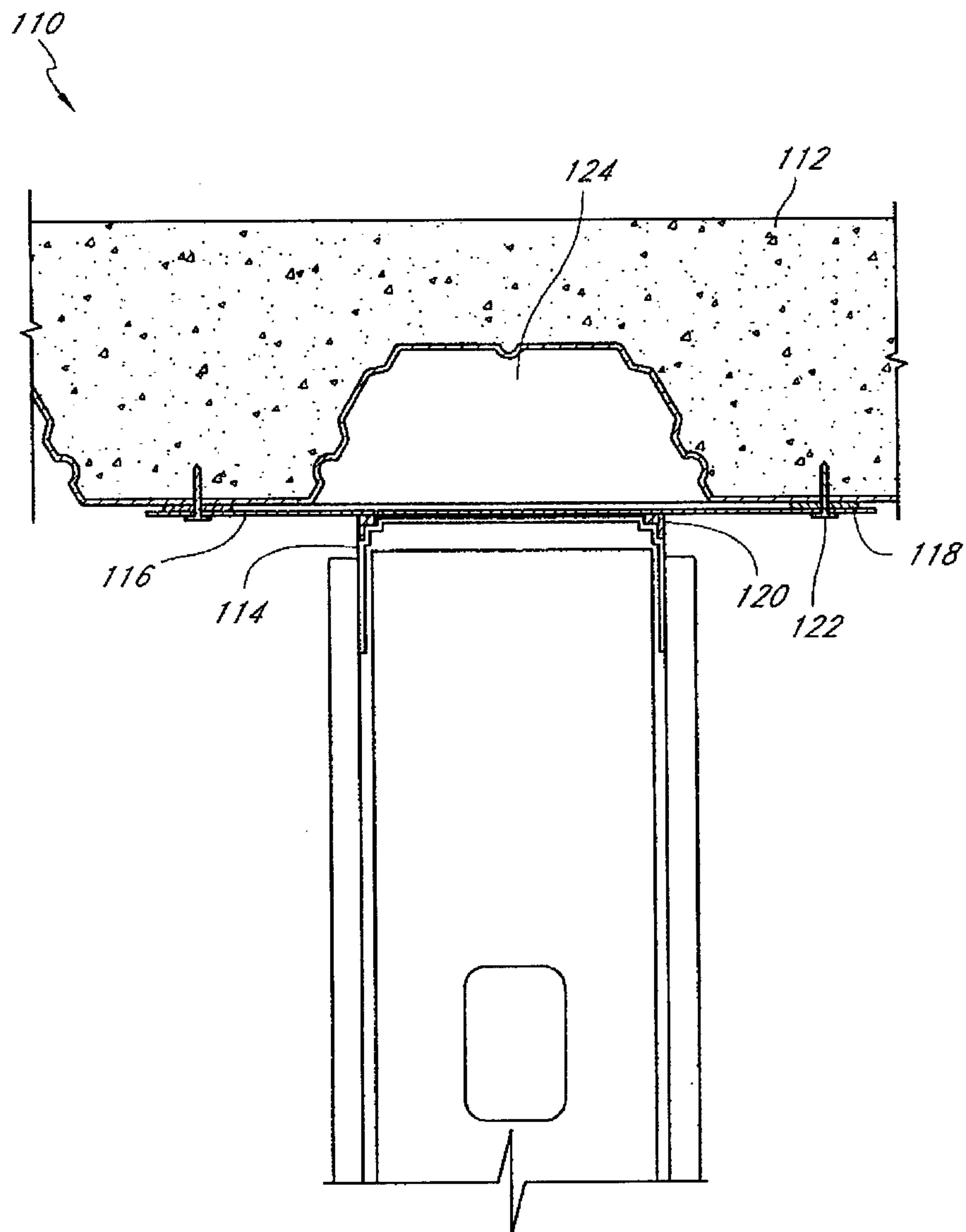


FIG. 10A

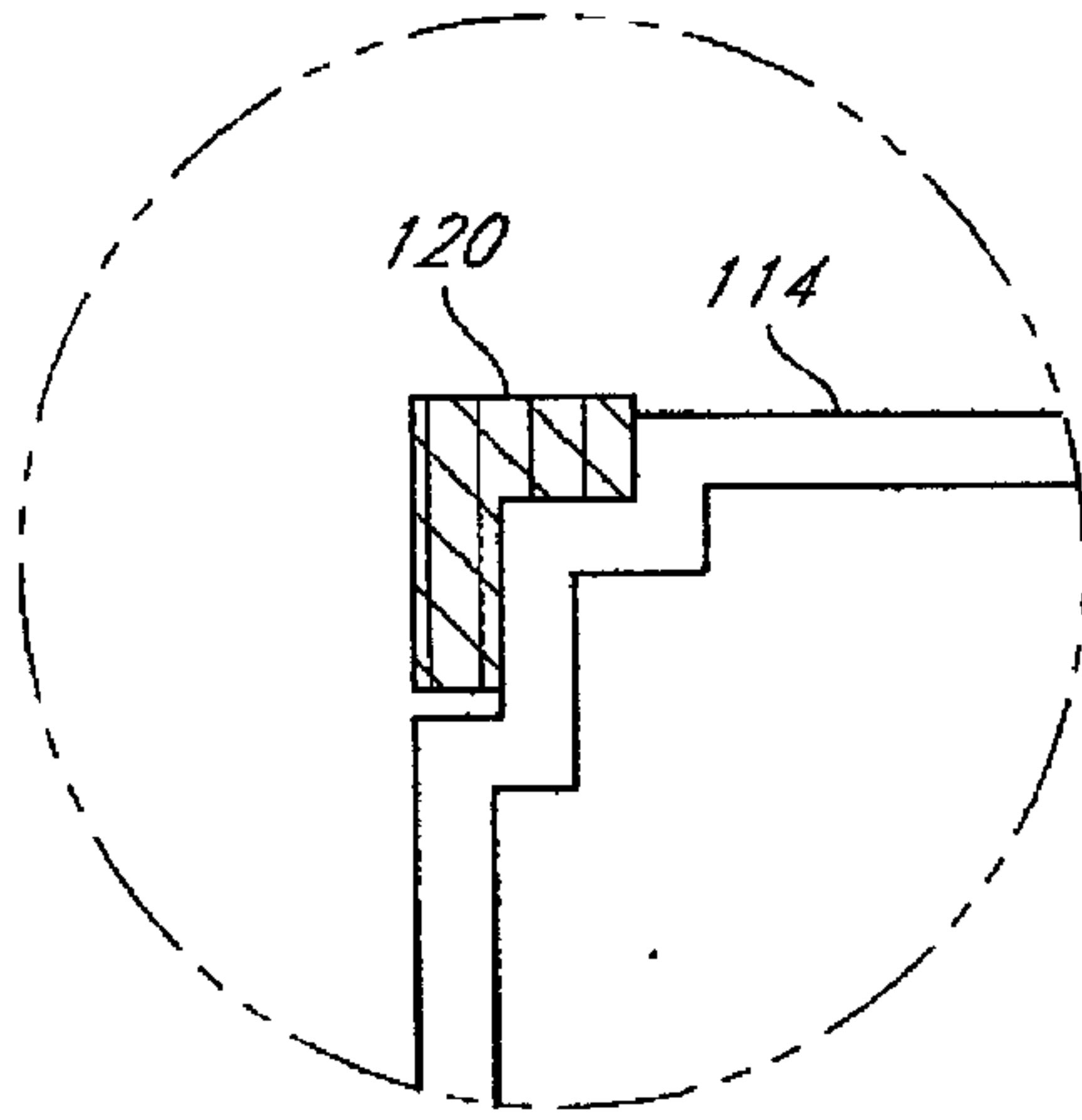


FIG. 10B

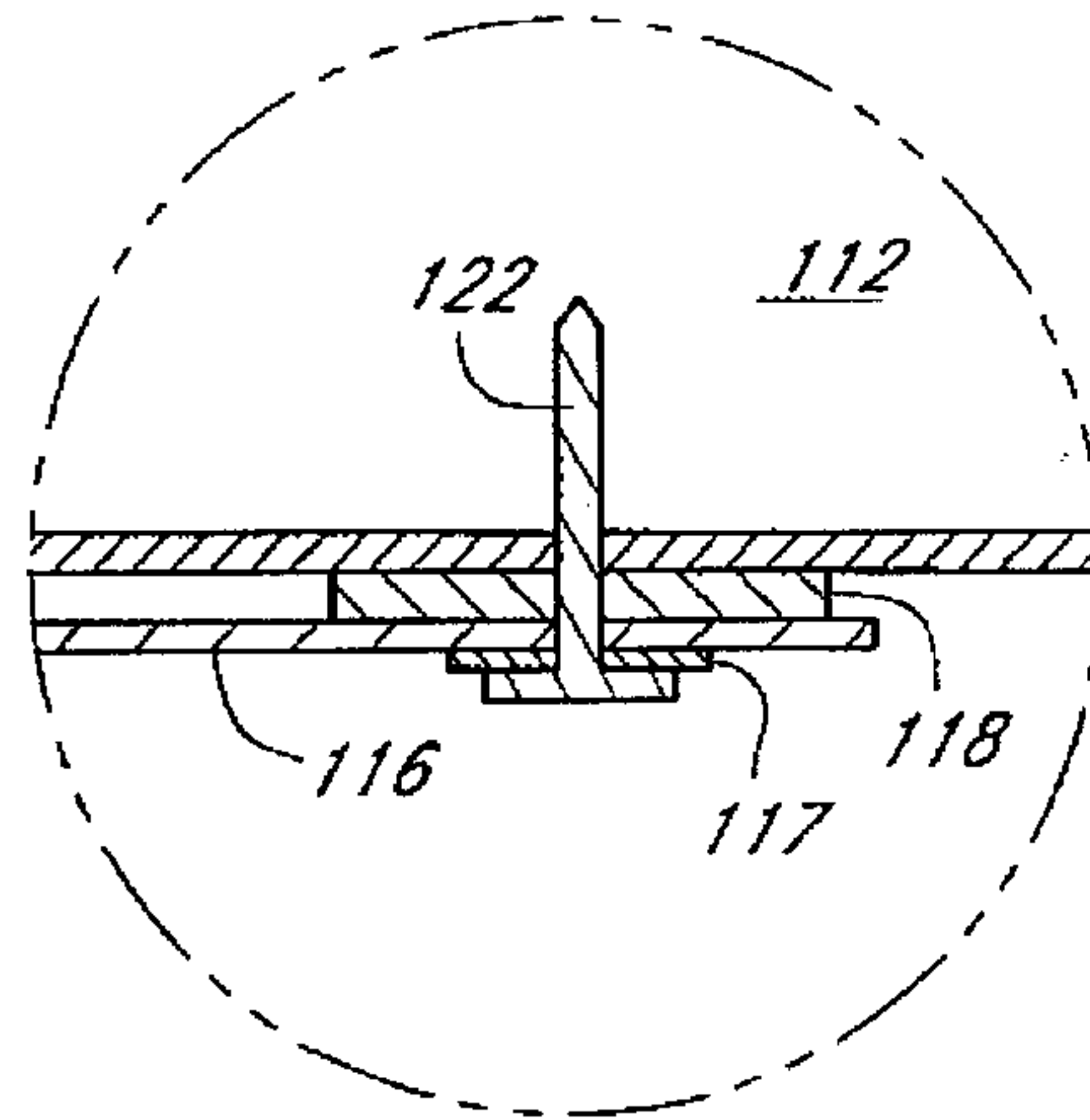


FIG. 10C

9/13

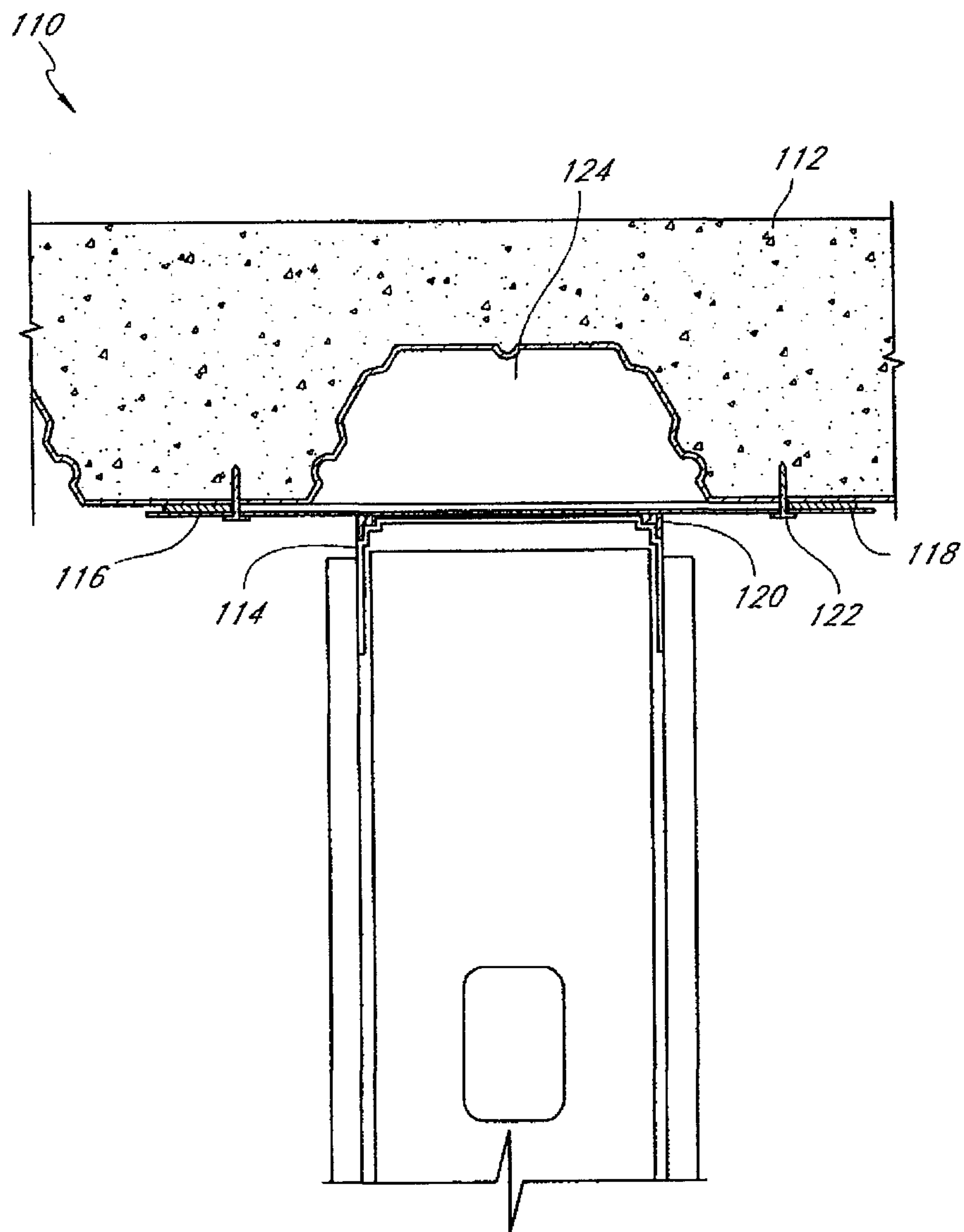


FIG. 10D

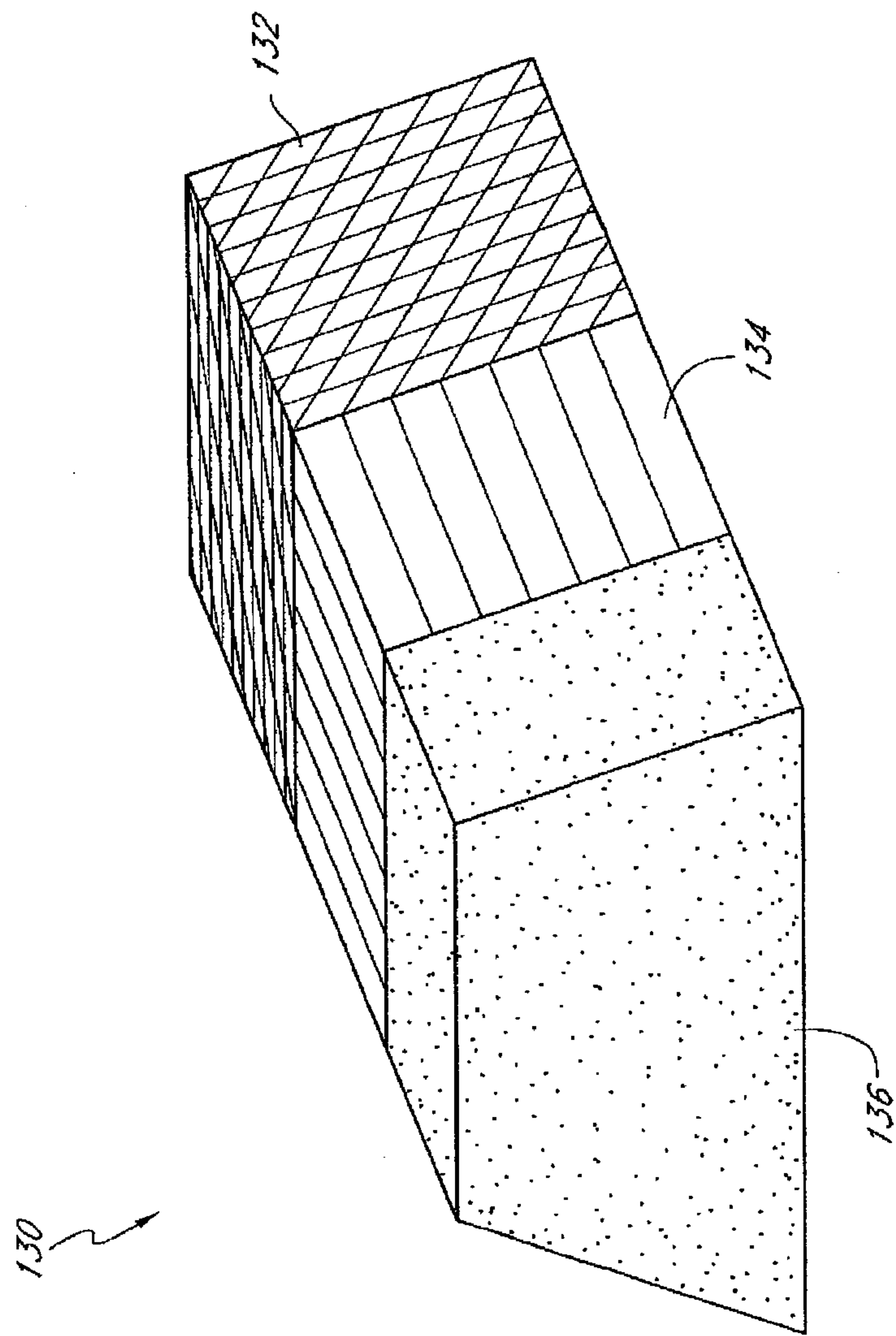


FIG. 11

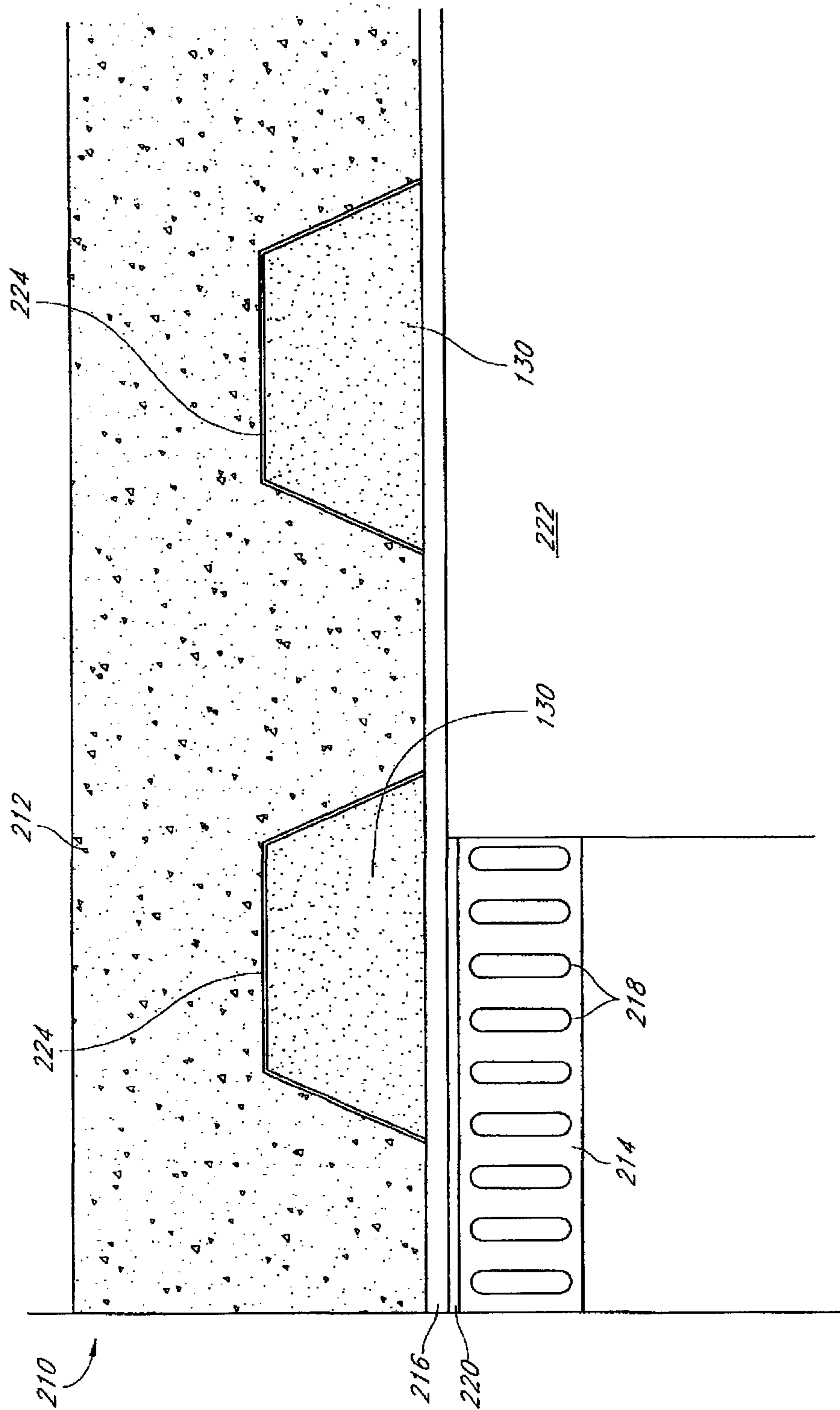


FIG. 12A

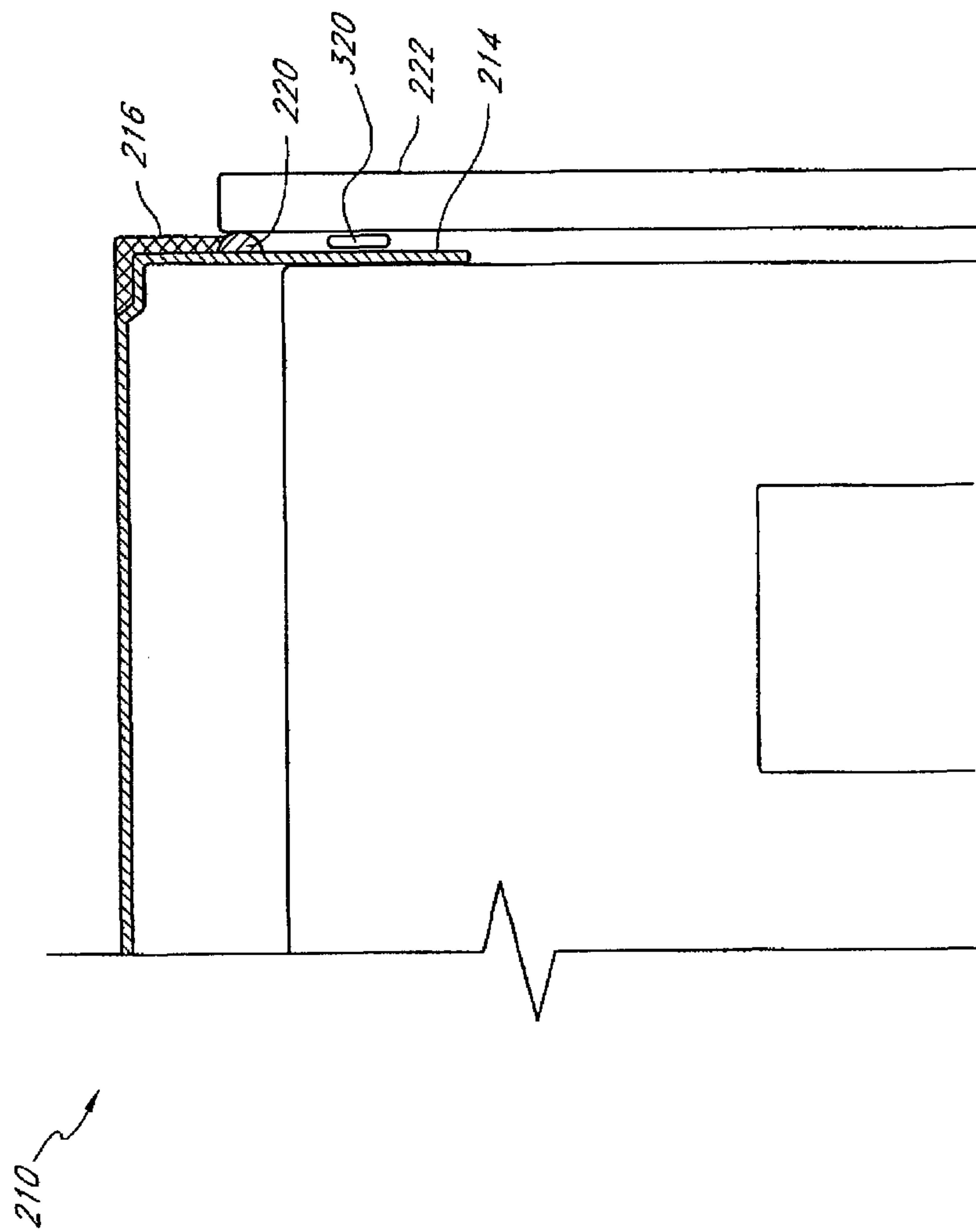


FIG. 12B

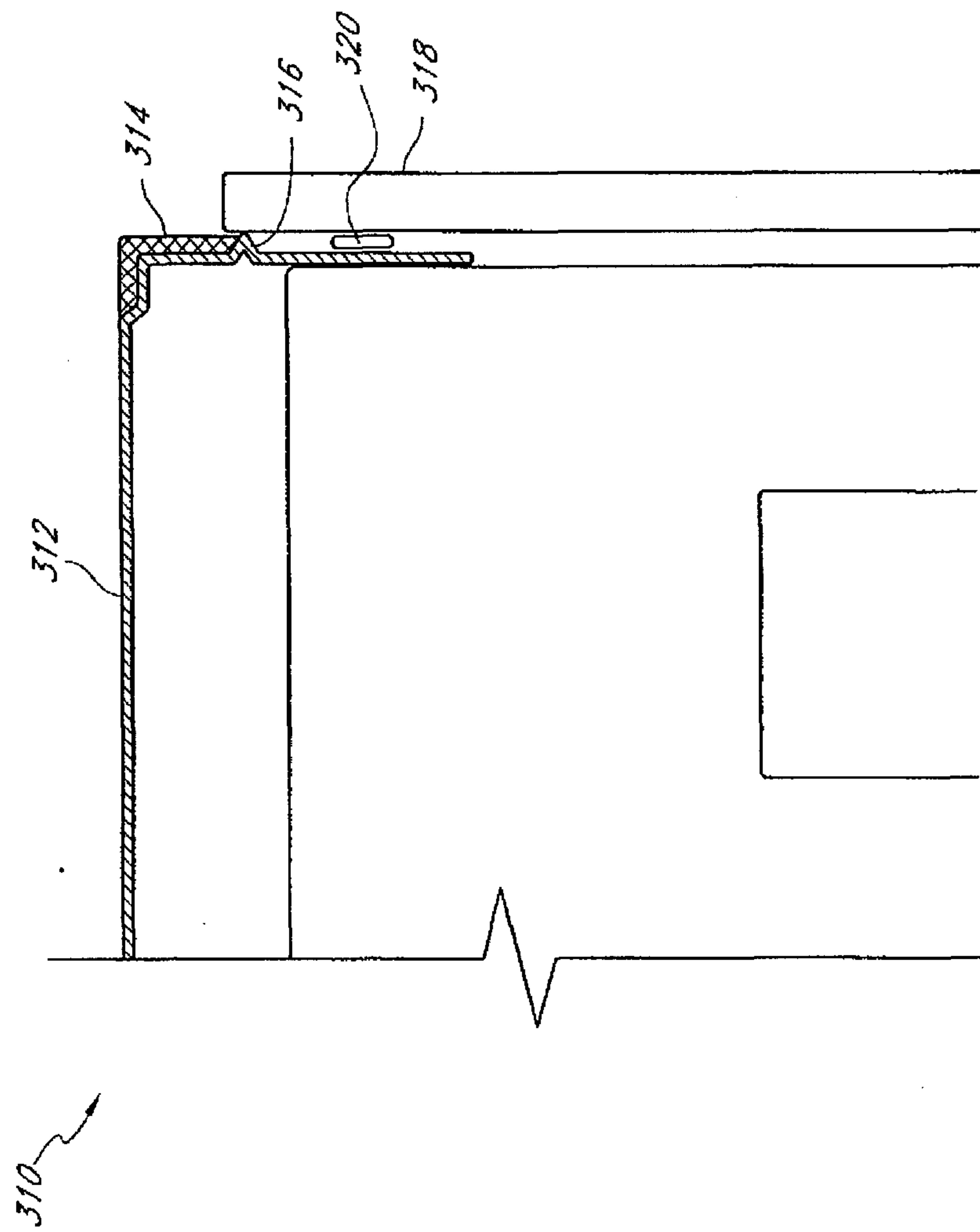


FIG. 13

