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(71) Applicant(s):  
 Lloyd Carrington  
 Carrington Projects Limited, 13 Park Avenue,  
 Northampton, Northamptonshire, NN3 2BX,  
 United Kingdom

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(72) Inventor(s):  
 Lloyd Carrington

(74) Agent and/or Address for Service:  
 Vault IP Limited  
 5th Floor Cavendish House, 39 Waterloo Street,  
 Birmingham, B2 5PP, United Kingdom

(54) Title of the Invention: **Shower floor and shower floor assembly**  
 Abstract Title: **Shower assembly with removable panel**

(57) A shower assembly 100 comprises a base 102 with a drain 112 and a removable panel 104 on supports 106, the panel supports being separate to the tray. The removable floor panel 104 comprises a foam bore and a layer of composite material surrounding the foam core. The panel is supported in the tray on the at least one panel support to space the panel from the base and the sidewall of the tray to allow water to flow around the periphery of the panel to the drain. Also claimed is a removable shower panel characterised by an illuminated display. A further claim relates to a method of removing a removable shower panel, characterised by provision of an inflatable bladder.

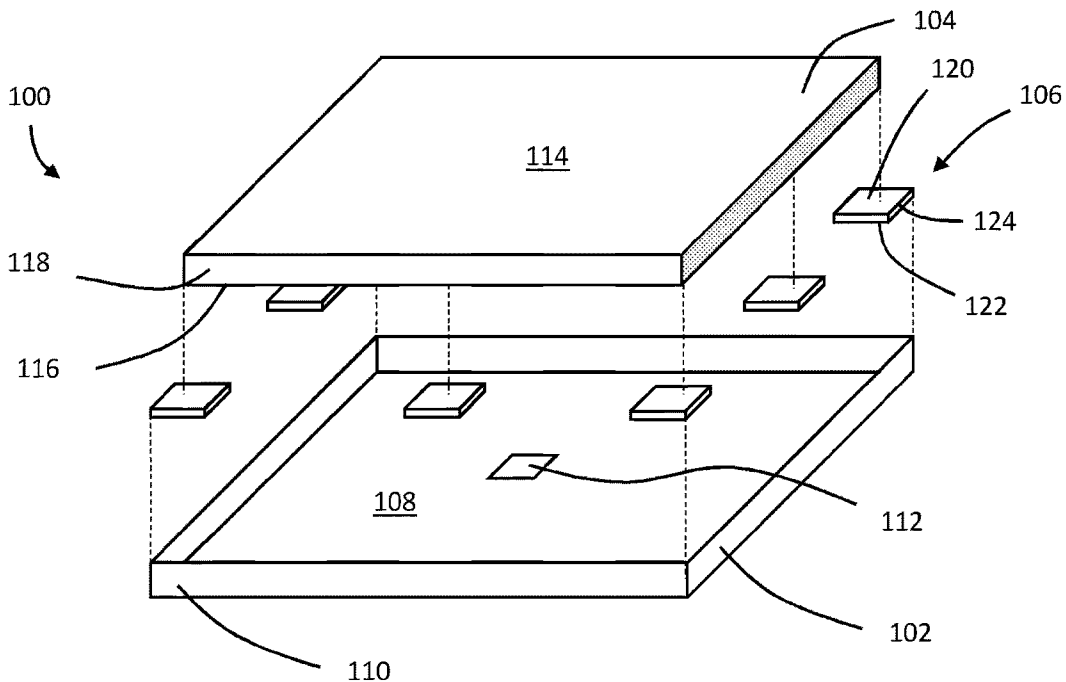


Fig. 1

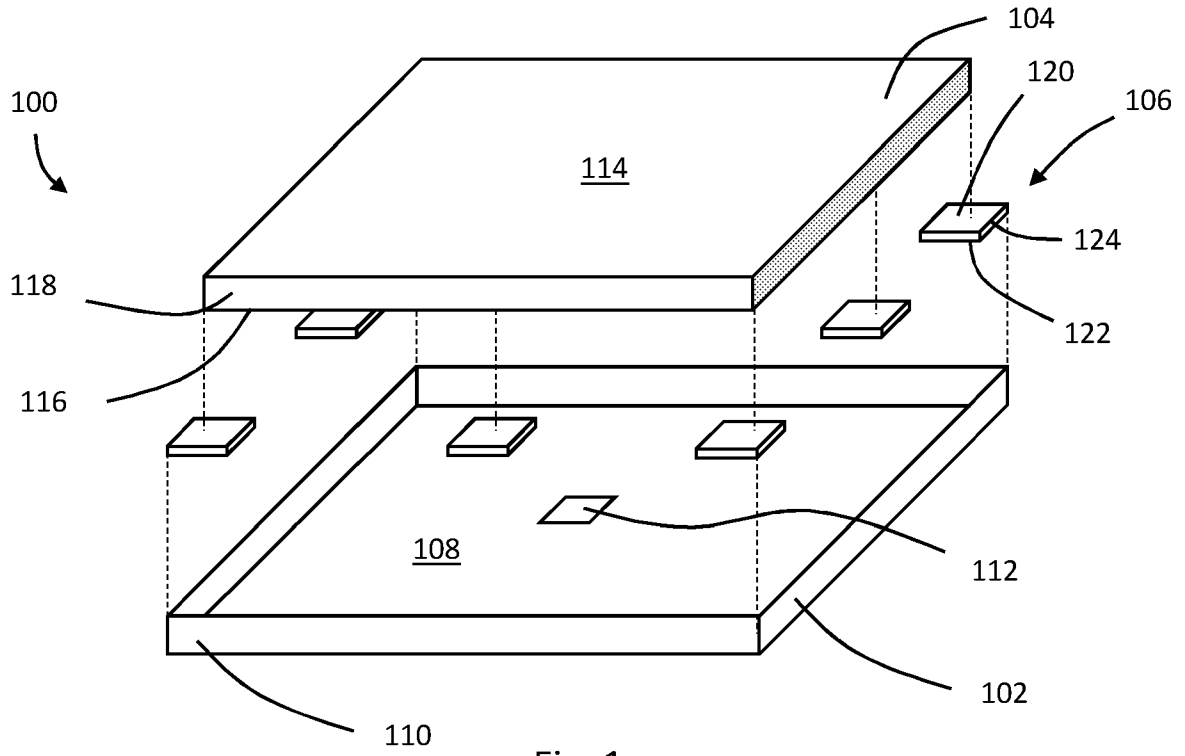


Fig. 1

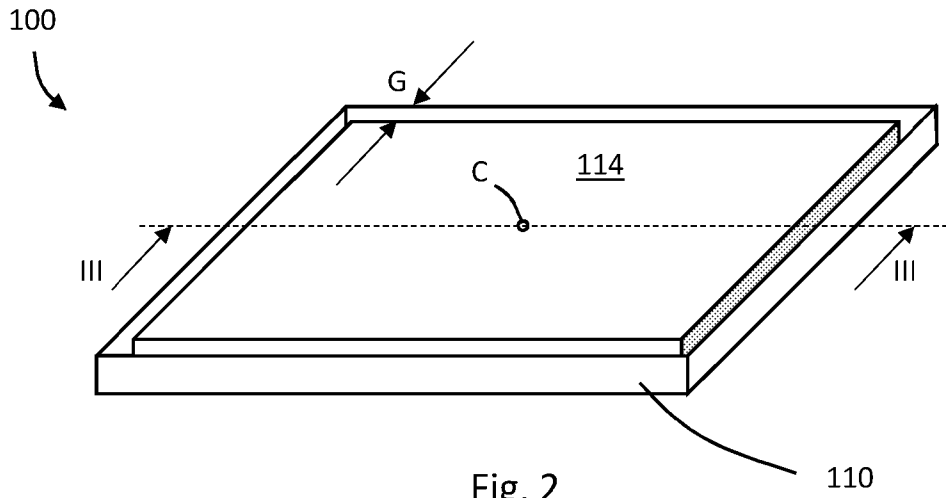


Fig. 2

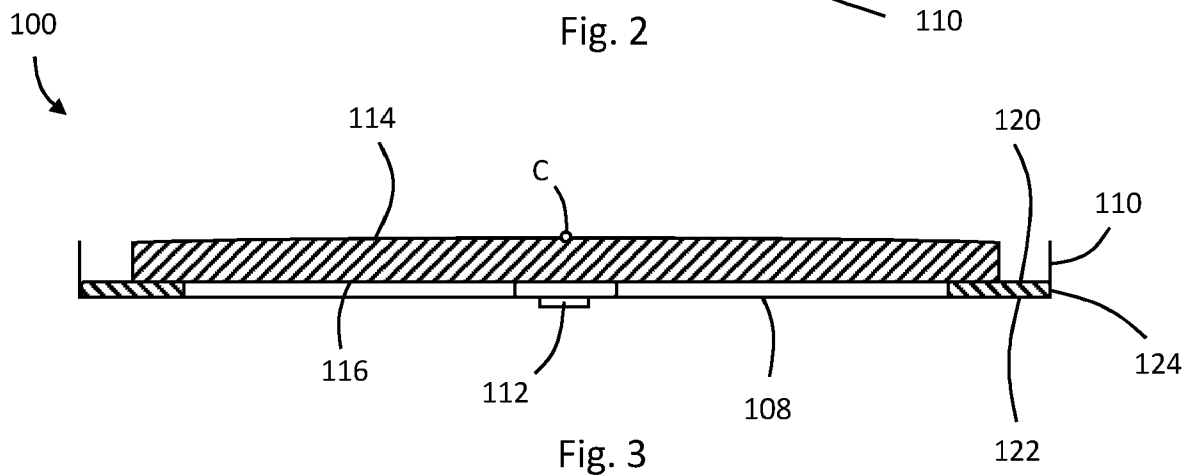


Fig. 3

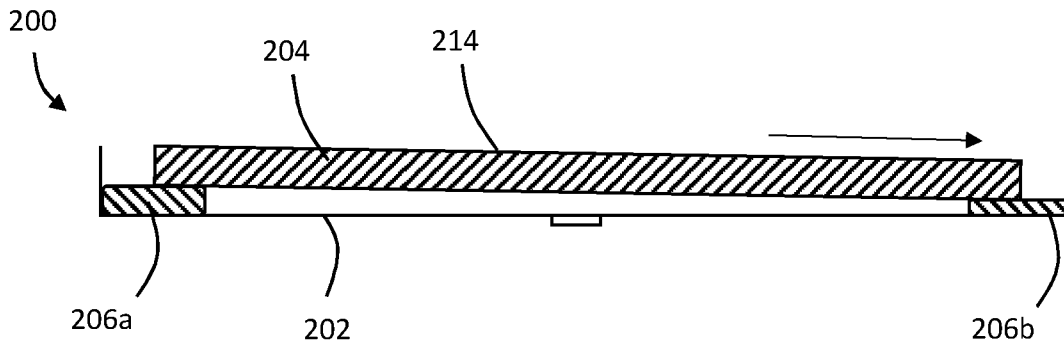


Fig. 4

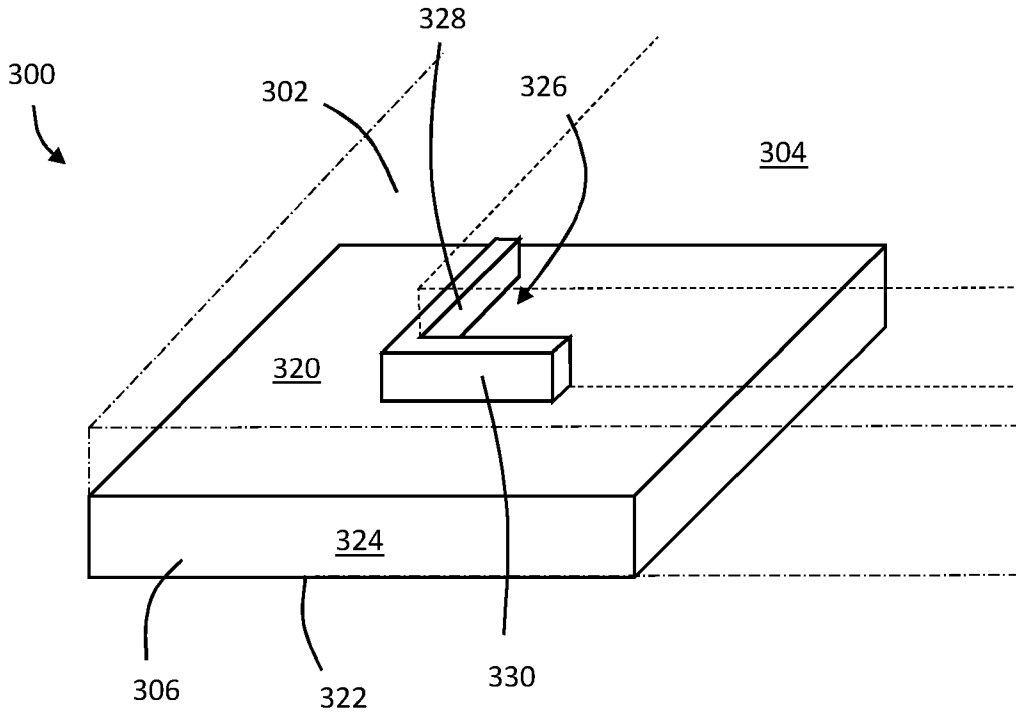


Fig. 5

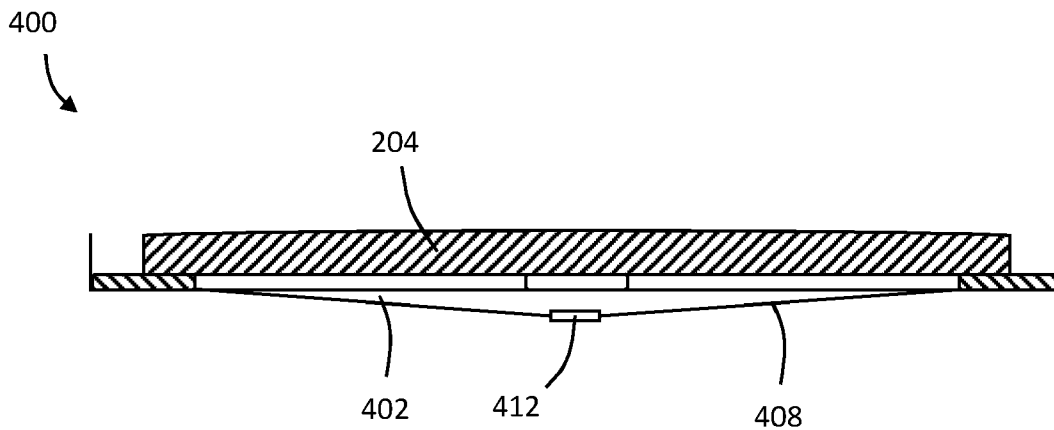


Fig. 6

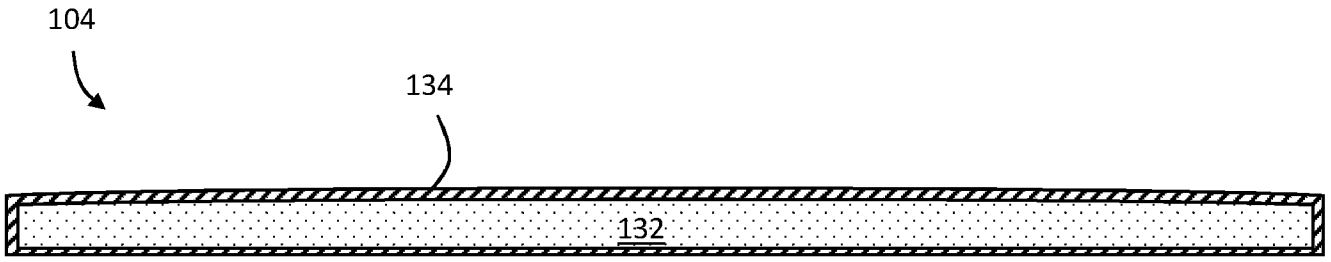
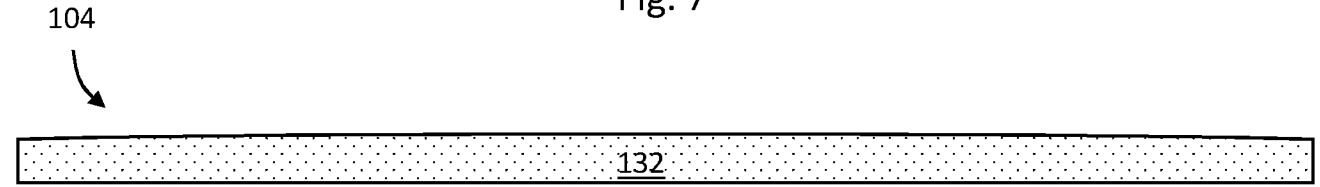
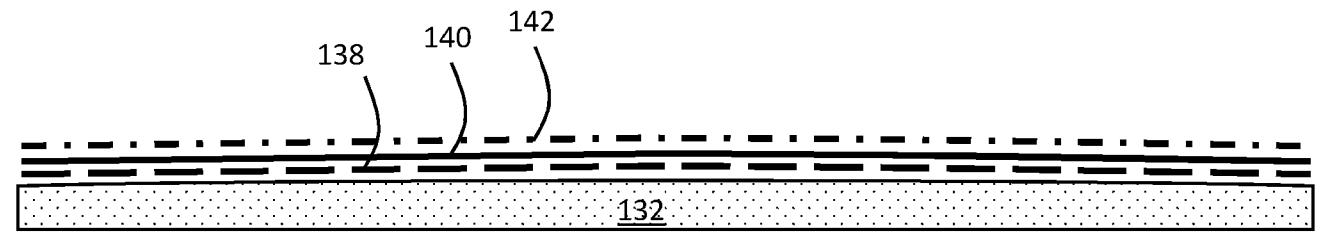


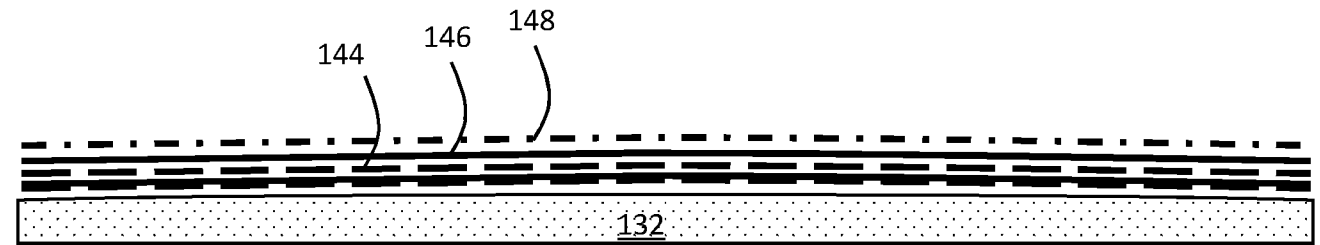
Fig. 7



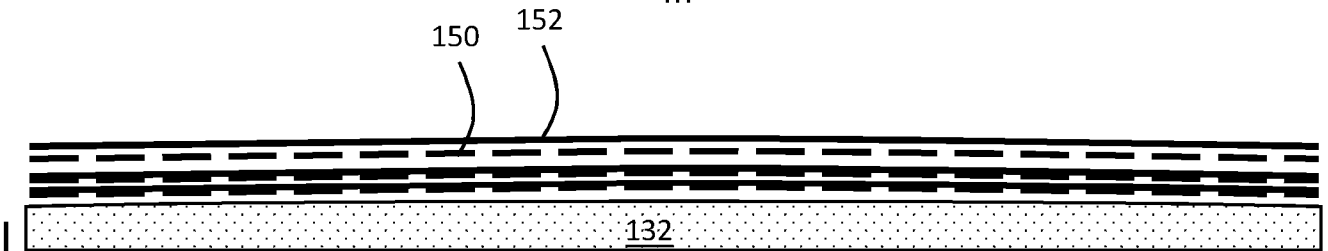
I



II



III



IV



Fig. 8

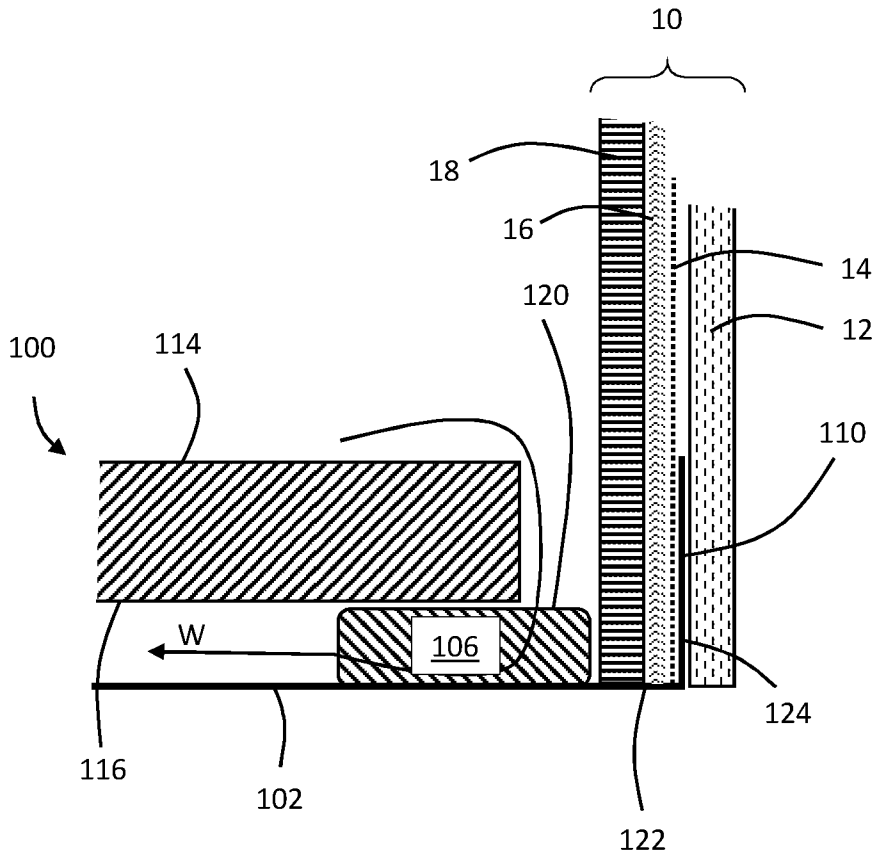


Fig. 9

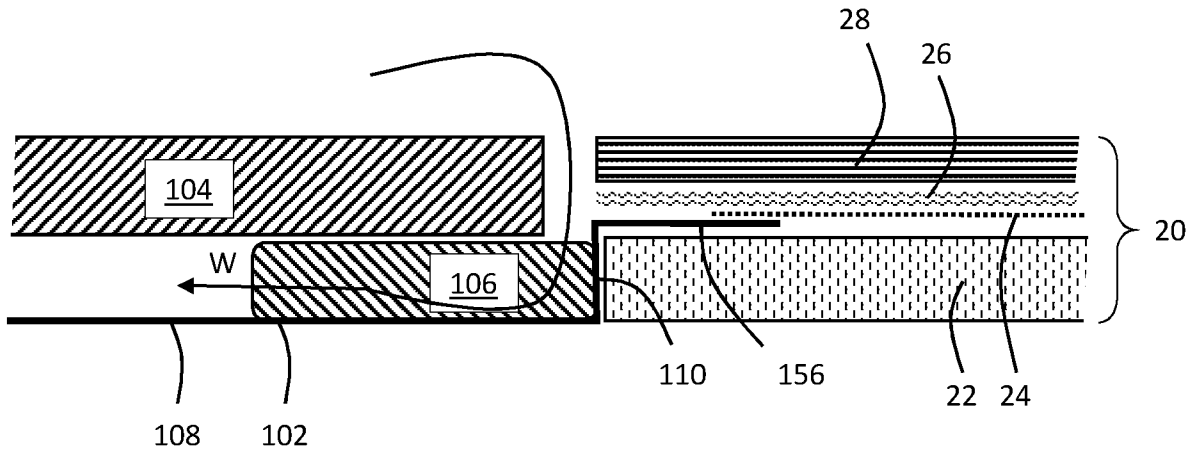


Fig. 10

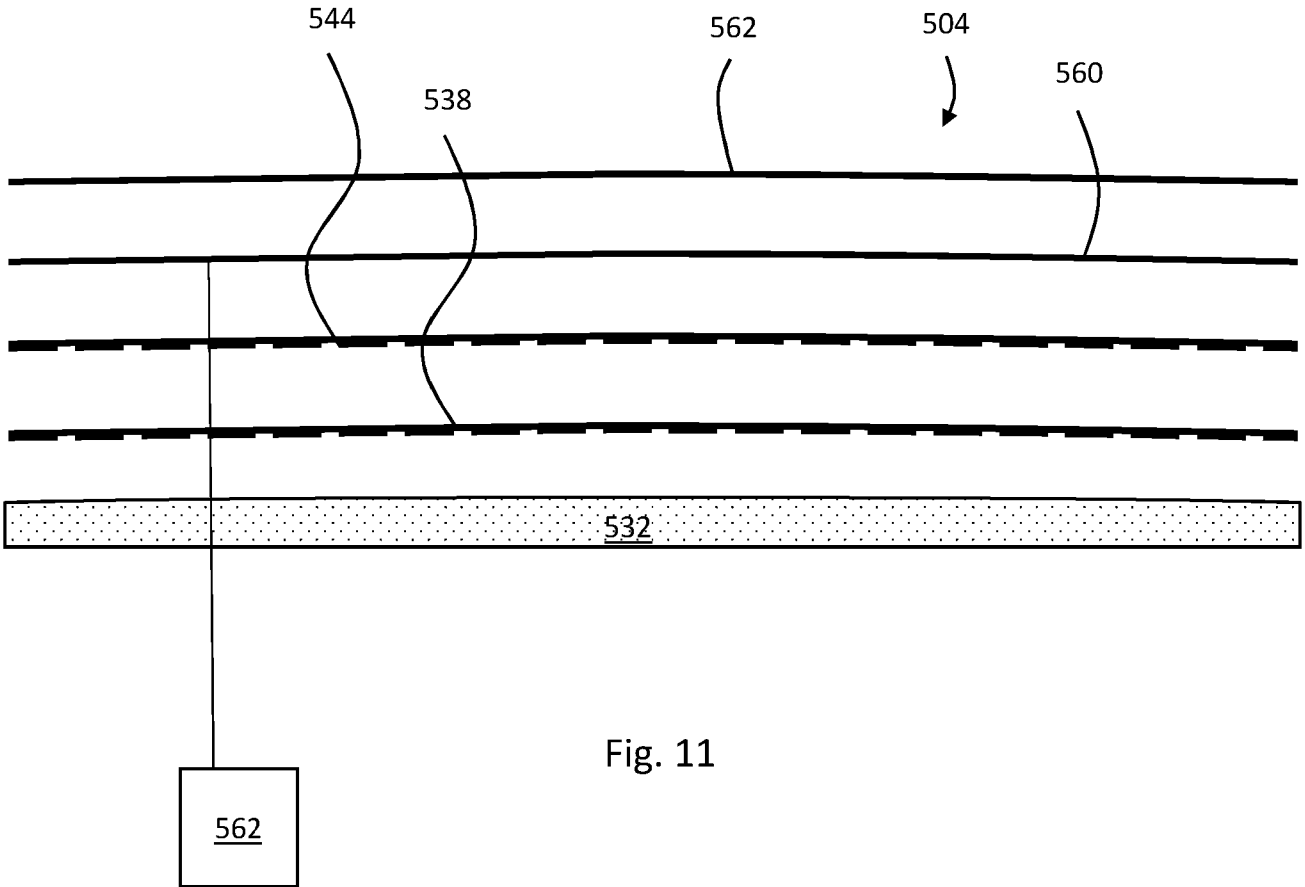


Fig. 11

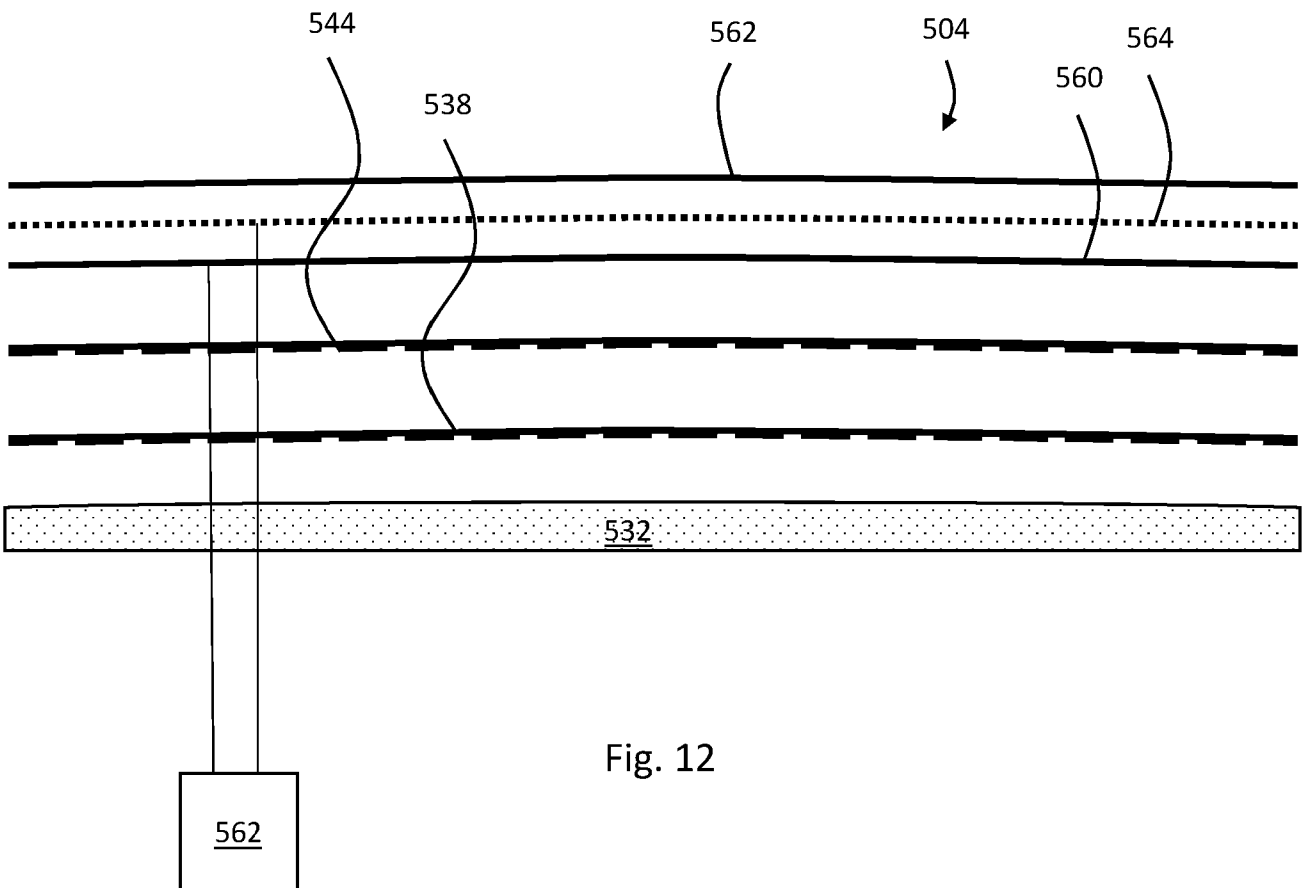


Fig. 12

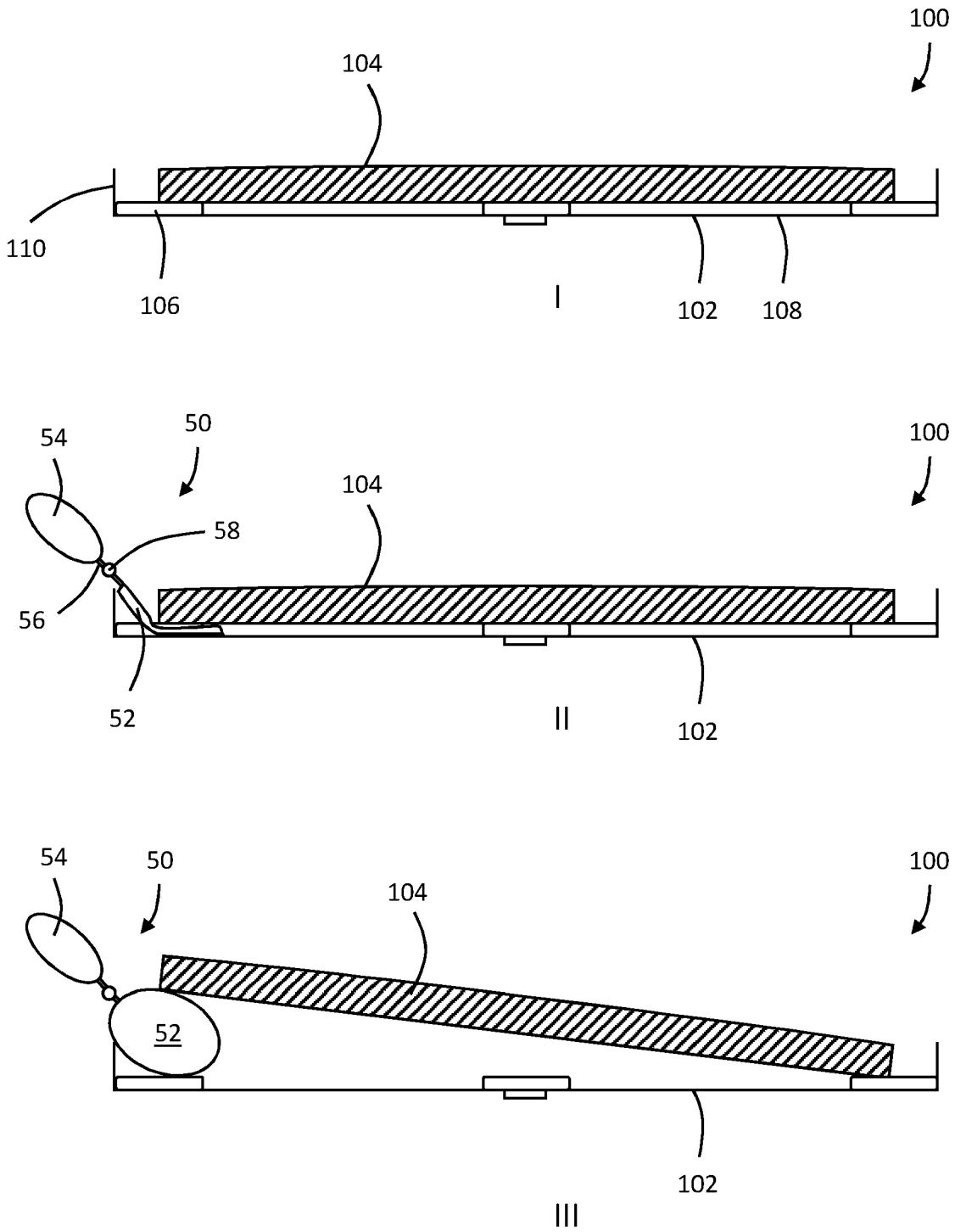


Fig. 13

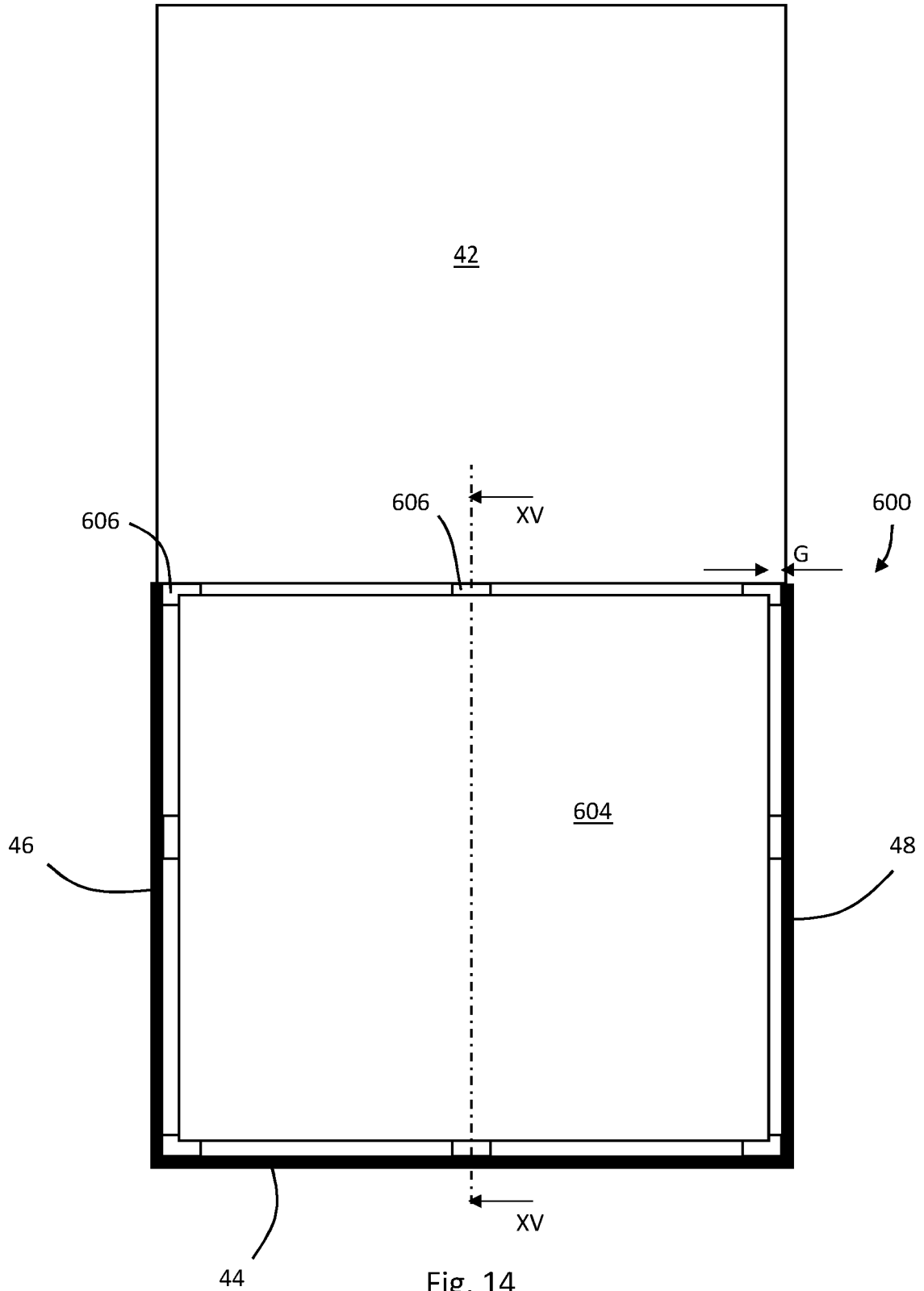


Fig. 14



Fig. 15

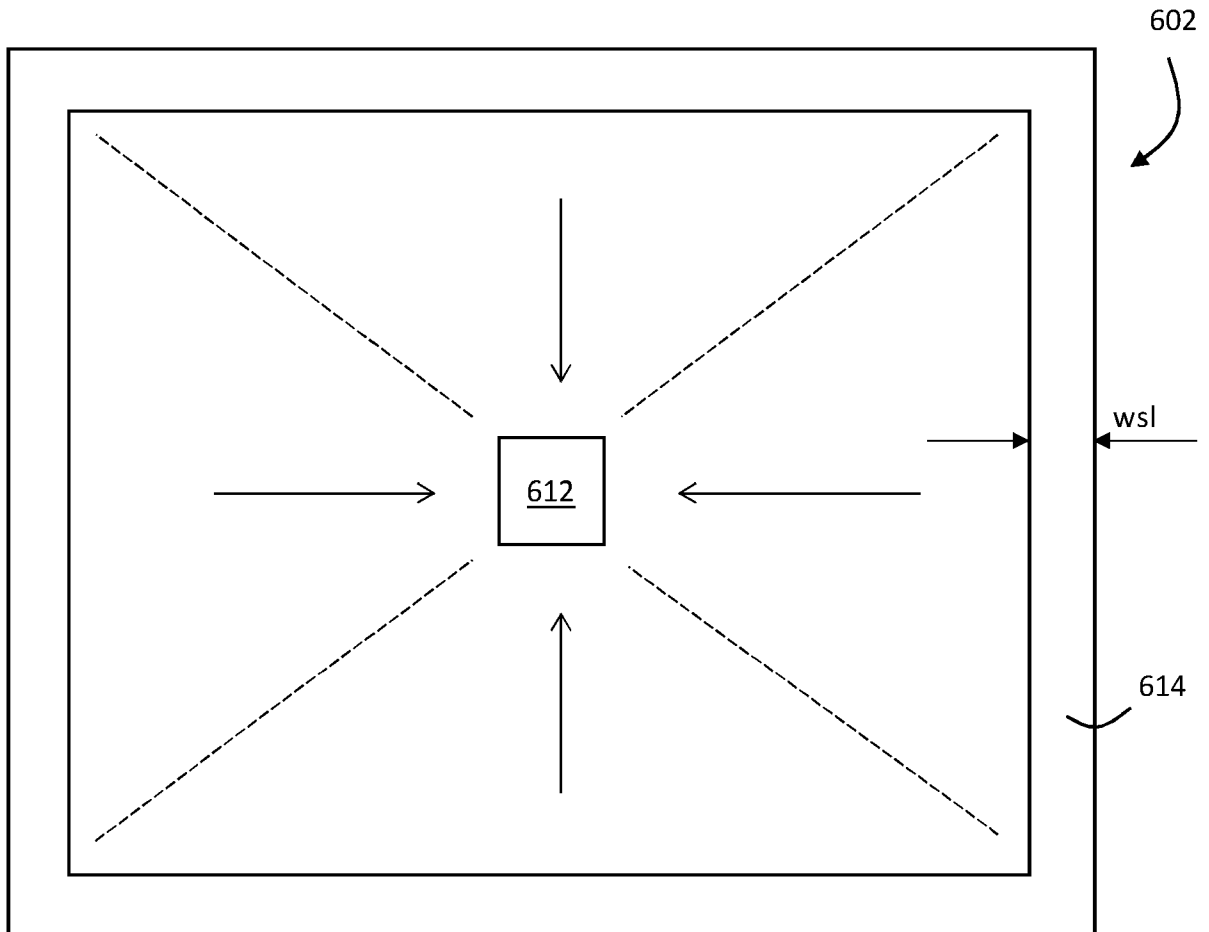
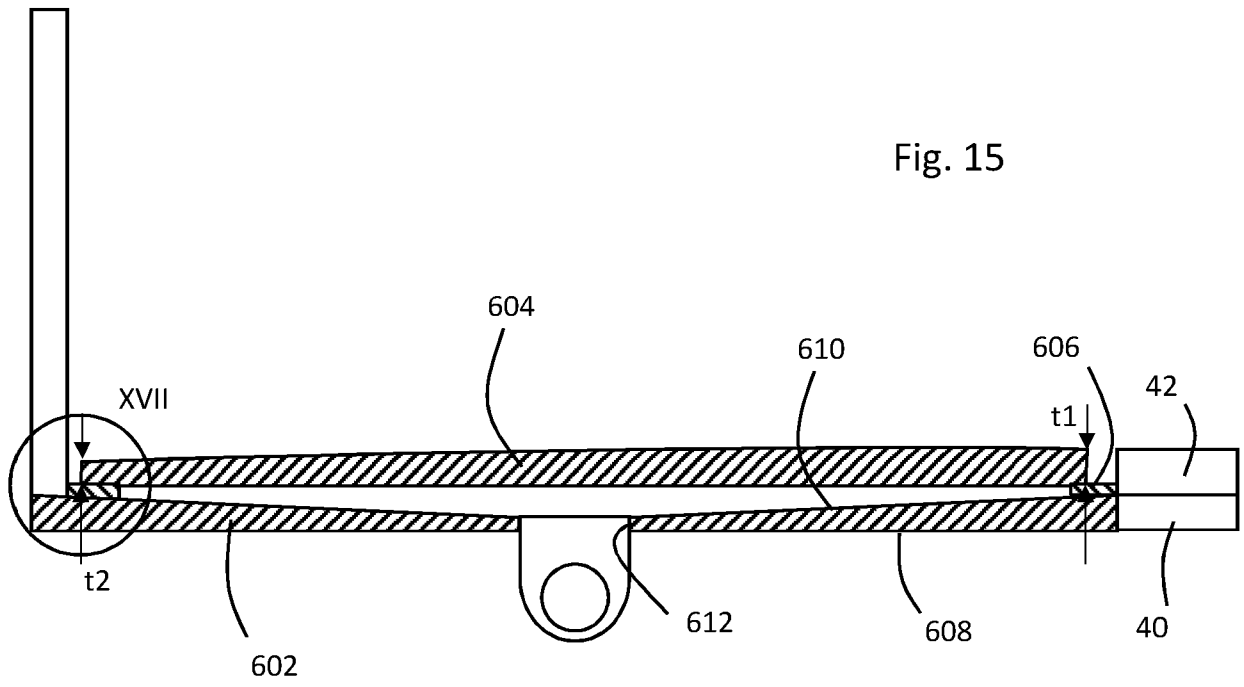


Fig. 16

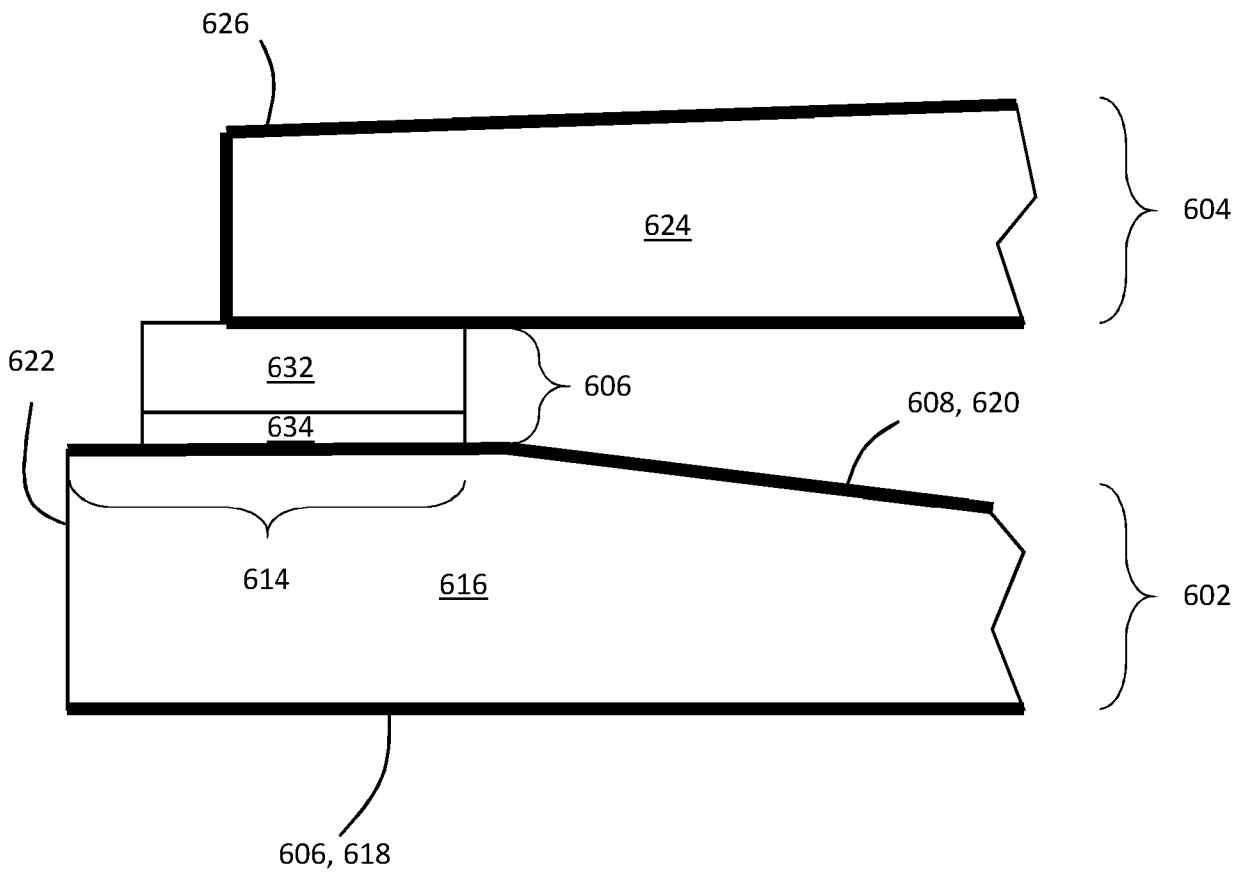


Fig. 17

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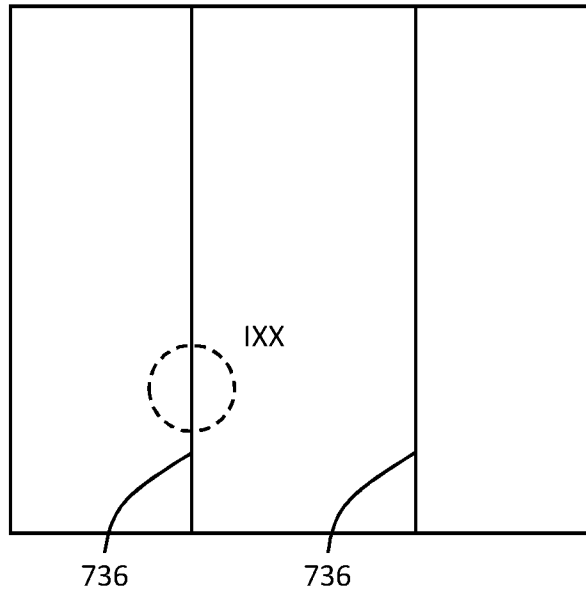


Fig. 18

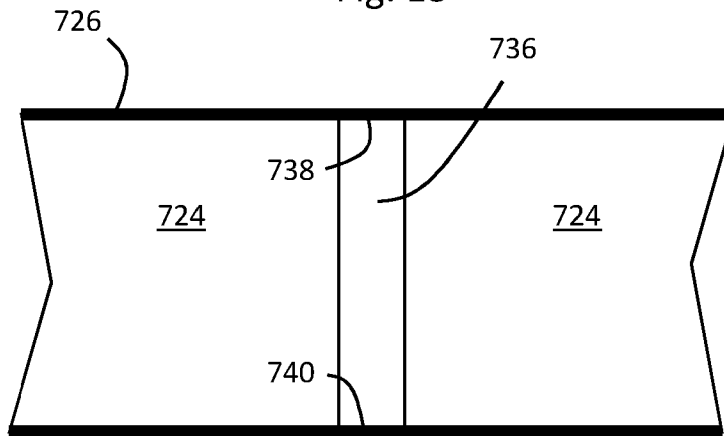


Fig. 19

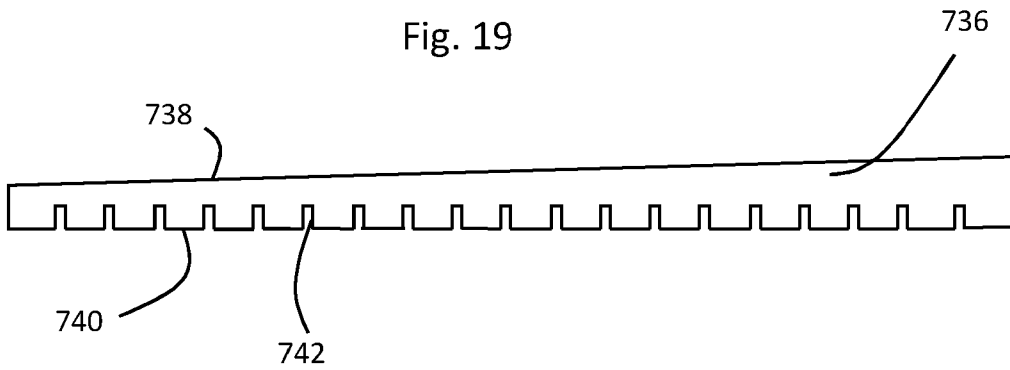


Fig. 20

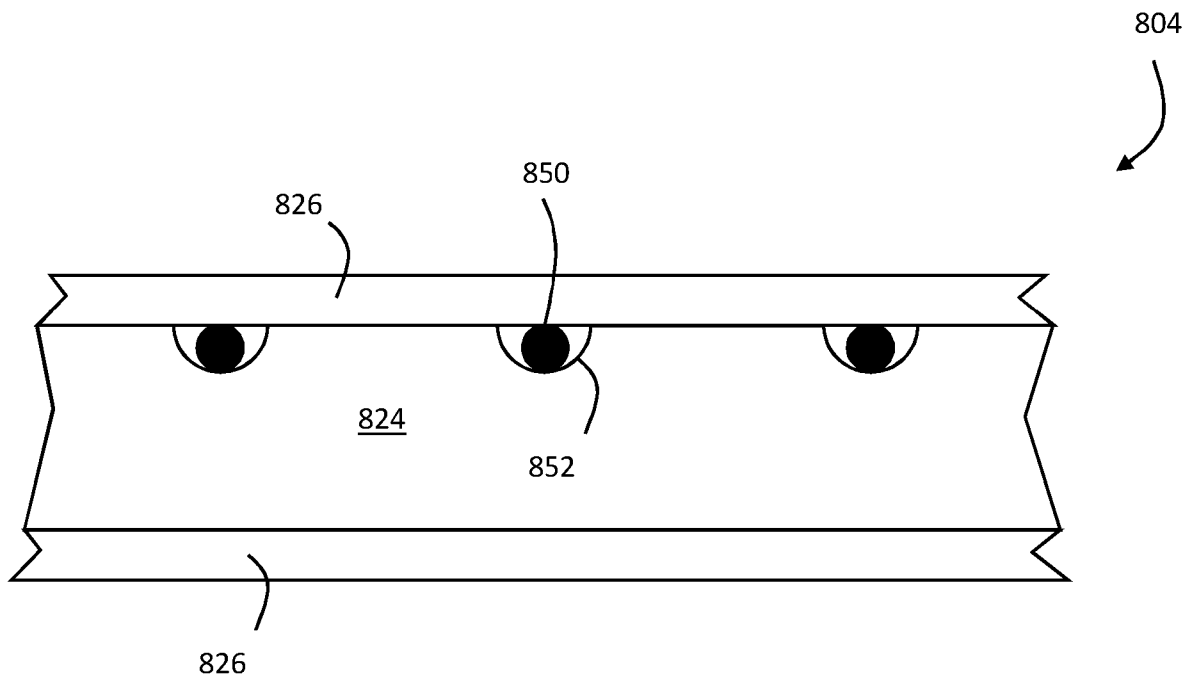


Fig. 21

## Shower floor and shower floor assembly

The present invention is concerned with a shower floor and shower floor assembly. More specifically, the present invention is concerned with a shower floor assembly having a shower tray or base and a removable floor panel recessed into the shower tray to support the user during use.

5 Shower floors are well known, and come in many varieties of shape, size and colour.

Most typically, shower floors are in the form of a tray constructed from a moulded granular composite material having a resin gel coat. The composites are usually granular ceramic filled resins. Sometimes trays are constructed from moulded sheet plastics materials (such as acrylics), but are often filled with granular composite material for strength and stiffness. Trays are provided with a drain to channel  
10 waste water. In use, shower trays are installed into the base of a shower cubicle and are often raised above the general floor level. The user must step over a lip to enter the shower.

Some showers are installed in “wet rooms” in which the shower floor is continuous with the surrounding floor of the room. This gives a cleaner, more aesthetically pleasing appearance. Wet room floors will typically be tiled, and have a drain with a sub-floor drainage channel integrated therein.  
15 Advantages of wet room floors are that they have a more aesthetically pleasing appearance, which is consistent with the rest of the room, and there is no “lip” to step over upon entry and exit from the shower.

A problem with all types of showers is the appearance of the drain in the floor. These are unsightly, and can be uncomfortable to stand on. A further problem with showers in general is that the  
20 appearance of the floor area is difficult to change, for example upon redecoration. In the case of shower trays, the entire cubicle usually needs to be dismantled to remove the tray, and due to the usual techniques of tray manufacture there are few available finishes. In the case of wet room shower floors, finishes are limited to the floor tiles available, and removal and replacement of floor tiles is a complex task.

25 Various solutions have been proposed to one or both problems.

US2011231991A discloses a shower arrangement in which there is a tub for the collection of waste water from the shower, the tub having an upper edge level with the floor. A detachable panel which forms the floor of the shower is provided flush with the floor level. The aim is to provide both drainage and a shower floor having continuity with the bathroom floor. To provide drainage, the panel is a  
30 “grating”, and therefore water drainage is provided through the thickness of the panel. A problem with this approach is that it is not aesthetically pleasing, and does not allow the panel to be decorated to the user’s preference.

GB2306316A discloses a shower floor for physically disabled users in which a removable cover plate can be positioned on raised lands projecting from a shower tray base. The plate allows a wheelchair user to access the shower without having to traverse the lip leading to a recessed shower tray. A problem with this device is that the plate is constructed from a stainless steel material, and is therefore heavy and cumbersome. Further, because this document is concerned with access only, it does not address the problems of aesthetics. A plain steel surface is generally not aesthetically pleasing, nor does it offer grip for standing users.

US2002066140A is concerned with the problem of providing a flush shower floor having the same finish as the surrounding floor area. A tile support is provided with a drain, and a ceramic floor tile rests on large lands on the support between which are provided channels. A peripheral gap around the tile drains water to the support channels. A first problem with this approach is that the support needs to be carefully designed to hold the brittle tile in a way that will prevent cracking- this reduces the availability of space for drainage. A second problem is that the tiles themselves are both heavy and fragile. Therefore there is a limit to the size of shower floor which can be installed.

It is an aim of the invention to overcome one or more of the problems with the prior art as discussed above.

According to a first aspect of the invention there is provided a shower assembly comprising:

a tray having a base comprising a drain, and a sidewall;

a removable shower floor panel;

at least one panel support separate to the tray;

in which the panel is positioned in the tray on the at least one panel support to space the panel from the base and the sidewall of the tray to allow water to flow around the periphery of the panel to the drain.

Advantageously, this arrangement facilitates both replacement of the surface pattern of the shower floor and allows for adequate drainage. Water can flow around the edges of the panel, past the panel supports. The panel can easily be changed by lifting it off the supports, for example if the user desires different surface decoration. This arrangement also facilitates a continuous bathroom floor- in other words, the top surface of the panel can be configured to be at the level of the surrounding floor area.

The at least one panel support may be attached to the panel. This allows for easy placement and alignment of the panel by simply lowering it, and the supports, in to the tray.

Alternatively, the at least one panel support may be separate to the panel, and comprise a panel abutment configured to constrain movement of the panel relative to the tray in use. This allows the panel to be reversed, for example if different surface decorations are provided on either side.

5 The panel abutment may comprise an upstanding formation from a surface of the at least one panel support. The upstanding formation may comprise an angled section configured to receive a corner of the panel. If the panel is a quadrilateral, a panel support is provided at each corner. A panel support may be provided on at least one side of the panel.

10 Preferably the panel comprises a convex upper surface in use, to encourage run-off of water. Alternatively, the panel supports may vary in thickness to support the panel at an angle relative to the tray in use.

Preferably the panel is constructed at least in part from a fibre reinforced polymer material. The panel may be exclusively constructed from such a material, or the material may be combined with e.g. a foam core as will be described below.

According to a second aspect there is provided a removable shower floor panel comprising:

15 a foam core;

a layer of composite material surrounding the foam core.

20 Advantageously, this allows for the panel to be made extremely lightweight and strong. Therefore, by contrast with the prior art, the panel can be made very large to form a single continuous surface area for the application of surface decoration. It also facilitates complete coverage of a shower floor (i.e. from wall to wall) by the tray containing the panel (with a clearance gap of less than or equal to 8mm around the panel).

25 Preferably the layer of composite material is a carbon fibre reinforced polymer. More preferably, the layer of composite material comprises a layer of biaxial fibre material which offers significant strength benefits. Preferably there is provided at least two layers of biaxial fibre material. There may be an outer surface layer of woven-fibre composite material.

The panel may comprise an outer layer and a release layer configured to facilitate removal of the outer layer from the layer of composite material. This allows the panel to be re-used if the user wishes to change decoration.

30 Preferably the panel comprises an illuminated display layer. The illuminated display layer may be a screen capable of displaying an image. There may be provided a touch sensitive layer, which touch sensitive layer is configured to control the illuminated display layer.

Preferably a surface of the panel is convex, to allow water run-off.

The invention also provides a shower assembly comprising:

a tray;

a removable shower floor panel according to the second aspect; and,

5 at least one panel support supporting the panel in the tray.

Preferably the tray comprises a base concave towards a drain opening.

The first and second aspects may be combined.

According to a third aspect there is provided method of manufacturing a shower floor panel comprising the steps of:

10 providing a foam core;

covering the foam core in a composite material.

Preferably the composite material comprises a plurality of layers of fibre reinforced polymer.

The method may comprise the steps of:

providing a sheet of fibre material;

15 laying the fibre material onto the core;

impregnating the fibre material with a polymer;

allowing the polymer to harden.

According to a fourth aspect there is provided a removable shower floor panel comprising an illuminated display.

20 The illuminated display may be a screen capable of displaying an image. The panel may comprise a touch sensitive layer, which touch sensitive layer is configured to control the illuminated display.

According to a fifth aspect there is provided a method of removing a removable shower panel comprising the steps of:

providing an assembly of a tray and a removable shower panel;

25 providing an inflatable bladder;

inserting the bladder between the tray and the panel;



inflating the bladder to lift the panel.

Advantageously, this facilitates panel removal which is otherwise difficult as the edge gap is typically less than or equal to 8mm.

An example shower floor assembly in accordance with the present invention will now be described  
5 with reference to the Figures, in which:

Figure 1 is an exploded perspective view of a first shower assembly in accordance with the present invention;

Figure 2 is an assembled perspective view of the first shower assembly of Figure 1;

Figure 3 is a section view of the first shower assembly of Figure 1 along III-III in Figure 2;

10 Figure 4 is a section view of a second shower assembly in accordance with the present invention;

Figure 5 is a detail view of a third shower assembly in accordance with the present invention;

Figure 6 is a section view of a fourth shower assembly in accordance with the present invention;

Figure 7 is a side section view of a component of the first shower assembly of Figure 1;

Figure 8 is a view of several stages of manufacture of the component of Figure 7;

15 Figure 9 is a side section view of a first installation of the shower assembly of Figure 1;

Figure 10 is a side section view of a second installation of the shower assembly of Figure 1;

Figure 11 is an exploded section view of a panel of a fifth shower assembly in accordance with the invention;

20 Figure 12 is an exploded section view of a panel of a sixth shower assembly in accordance with the invention;

Figure 13 is a side section view of a method of disassembly of the assembly of Figure 1;

Figure 14 is a plan view of a seventh shower assembly in accordance with the present invention;

Figure 15 is a side section view along XV-XV in Figure 14;

Figure 16 is a plan view of a part of the assembly of Figure 14;

25 Figure 17 is a detail view of part of the assembly of Figure 14;

Figure 18 is a plan view of a part of an eighth shower assembly according to the invention;

Figure 19 is a section detail view of a part of the shower assembly of Figure 19;

Figure 20 is a side view of a component part of the shower assembly of Figure 19; and,

Figure 21 is a side section view of a part of a ninth shower assembly in accordance with the invention.

Referring to Figures 1 to 3, a shower assembly 100 comprises a shower tray 102, a shower panel 104  
5 and eight panel supports 106.

The shower tray 102 is generally cuboid in shape having a square, flat, planar base 108 and four  
upstanding sidewalls 110 extending uninterrupted around its periphery. The base 108 has a drain 112  
installed in the centre thereof for the drainage of waste water in use.

The shower panel 104 is a solid, cuboid body having a square upper surface 114, lower surface 116  
10 and sidewalls 118. The upper surface is curved and convex having its highest point at the geometric  
centre C (Figures 2 & 3). The construction of the panel 104 will be described in detail below. The  
shower panel 104 is smaller in dimension compared to the shower tray 102 such that insertion therein  
(with reference to Figure 2) leaves a drainage gap of width G around the periphery.

The panel supports 106 are each cuboid-shaped and constructed from a solid composite material. The  
15 supports 106 are substantially identical. Each support has an upper surface 120, a lower surface 122  
and sidewalls 124. The lower surface 122 of each defines a series of ridges formed from combed  
modified silane polymer adhered to the foam to enhance friction when wet and attenuate sound /  
vibration through the floor.

Each of the upper surfaces 120 of the panel supports 106 is attached to the lower surface 116 of the  
20 shower panel 104 such that it projects therefrom by distance G. Four of the supports 106 are attached  
to the corners (leaving L-shaped regions exposed extending from the panel 104) and four at the mid-  
points (leaving straight regions extending from the panel 104). The attachment between the panel  
supports 106 and the panel 104 is permanent in this embodiment- for example with an adhesive or  
less preferably with a mechanical fixing such as a screw.

25 The assembly of the panel 104 and supports 106 can then be placed into the tray 102 as shown in  
Figures 2 and 3 such that the supports 106 rest on the base 108 of the tray 102. The supports are  
positioned on the shower panel 104 such that they bear against, and form a tight fit with, the sidewalls  
110. This means that the panel 104 is both offset from the base 108 of the tray 102, and from the  
sidewalls 110 of the tray 102 by gap G.

30 When water falls on the upper surface 114 of the panel 104, it runs off and into the gap G before  
returning under the panel 104 to the drain 112. The presence of the supports 106 attached to the

panel 104 prevents the panel 104 from moving in use. It also allows the water to run under the panel to the drain.

It will be noted that removeable hair traps may be provided in the gaps G. It will also be noted that the gap G is set to be less than 8mm to avoid any entrapment of toes. This is necessary to comply with UK building regulations.

Figure 4 shows a section through an alternative shower floor assembly 200 in which a panel 204 is installed into a tray 202 with supports 206a, 206b. The difference between the panel 204 and the panel 104 is that the panel 204 has a flat top surface 214. In order to provide quick drainage, the supports 206a, 206b are configured to tilt the panel at a small angle. In this embodiment, the supports 206a at a first end are of a higher thickness than the supports 206b at a second end which provides a slight angle to the panel 204.

Figure 5 shows a detail view of part of a further shower floor assembly 300 which has many similarities with the shower floor assembly 100. A panel 304 is installed into a tray 302 with supports 306. The supports 306 have an upper surface 320, a lower surface 322 and sidewalls 324. The difference between the supports 306 and the supports 106 is that the supports 306 have a panel abutment 326 projecting from the upper surface 320. The panel abutment 326 (for the corner supports) comprises an "L" section protrusion having a first wall 328 joined normal to a second wall 330. Instead of being attached to the underside of the panel 304 (like supports 106 to panel 104), the supports 306 can locate the panel 304 mechanically. As shown in Figure 5, the panel 304 abuts against the panel abutment 326 such that the corner nests into the "L". This prevents lateral movement of the panel 304 in use. It will be noted that the side supports have straight panel abutments (not visible).

This is advantageous because it allows the panel 304 to be inverted. For example:

- The panel 304 may have different surface decorations on each side for the user to select at will;
- The panel 304 may have different surface features or materials on each side allowing for one side to be e.g. a high-grip surface for elderly or infirm users;
- The panel 304 may have an exfoliant or similar on one side for use on the underside of the user's feet.

Figure 6 shows a section through an alternative shower floor assembly 400 in which a panel 404 is installed into a tray 402 having a concave base 408. This encourages water to run down towards a central drain 412 at the bottom of the base 408.

The construction of the panel 104 is shown in section in more detail in Figure 7. The panel 104 generally comprises a core 132 being homothetic with the outer shape of the panel 104. The core 104 is surrounded by an outer layer 134 which encapsulates the core 104.

The method of manufacture of the panel 104 will now be described with reference to Figure 8.

5 At stage I, the foam core 132 is formed e.g. by moulding or machining from solid. In particular, any features required of the final panel 104 such as a convex surface are defined at this point. The core 132 is constructed from a marine foam, more specifically a closed-cell SAN polymer foam. In this embodiment a foam with a density of 200 kg/m<sup>3</sup> is used. It will be understood that foams with density in the range of 75 – 200 kg/m<sup>3</sup> are suitable.

10 At stage II, a layer of biaxial non-woven carbon fibre 138 is laid. A solvent-free epoxy resin 140 is applied to impregnate or “wet-out” the carbon fibre layer 138 and a release film in the form of an open scrim 142 is placed onto the wetted out fibre. Once the resin has cured, the scrim 142 can be removed to reveal a textured impregnated surface for the next layer.

15 At stage III, a second layer of biaxial non-woven carbon fibre 144 is laid. Resin 146 is applied to impregnate the carbon fibre layer 144 and a release film in the form of an open scrim 148 is placed onto the resin layer 146. Once the resin has cured, the scrim 148 can be removed to reveal a textured surface for the next layer.

At stage IV, the decorative layer is applied. A layer of 2/2 twill (woven carbon fibre) 150 is laid. A resin layer 152 is applied to impregnate the carbon fibre layer 150.

20 In terms of the sides of the panel 104, prefabricated carbon fibre angle sections 154 are bonded to the panel. The underside is laid-up much like the upper surface to create a continuous, uninterrupted composite outer layer 134. The resulting panel is extremely stiff, and importantly has a high strength / weight ratio meaning that it can be made in large sizes without (i) breaking and (ii) causing problems for removal and replacement.

25 It will be noted that different surface finishes and materials may easily be bonded to the textured epoxy surface left after stage III. The surface is one which is readily adhered to.

In one variation of the above process, the scrim 148 in stage III is left on the layer of resin and stage IV is carried out (with 2/2 twill or another surface finish). The scrim 148 forms part of the outer layer 134. If it is desirable to change the surface finish of the panel 104 at any point, the scrim can be  
30 exposed (for example at a corner) and used to lift off the entire decorative layer leaving a textured epoxy for application of an alternative layer.

Figure 9 shows a first installation for the assembly 100. A wet room or bath room wall 10 comprises a layer of base material (in this case ply) 12, a waterproof “tanking” membrane layer 14, a layer of tile adhesive 16 and a layer of tiles 18. The tray 102 is installed with the upstanding sidewall 110 abutting the base layer 12. The membrane layer 14 is overlapped onto the sidewall 110 and the adhesive 16 and tile 18 applied over the membrane 14. In this manner, the shower is made waterproof. Water W can flow towards the tile 18, down past the supports 106 and into the tray 102.

Figure 10 shows a second installation for a variation on the assembly 100. In this case, the tray 108 as well as comprising an upstanding wall 110 comprises a horizontal flange 156 extending therefrom, generally parallel to the base 108.

A wet room or bath room floor 20 comprises a layer of base material (in this case ply) 22, a waterproof “tanking” membrane layer 24, a layer of tile adhesive 26 and a layer of tiles 28. The tray 102 is installed with the upstanding sidewall 110 abutting the base layer 22, and the flange 156 overlapping the upper surface thereof. The membrane layer 24 is overlapped onto the flange 156 and the adhesive 26 and tile 28 applied over the membrane 24. In this manner, the shower is made waterproof. Water W can flow towards the tile 18, down past the supports 106 and into the tray 102. It will be noted that the upper surface of the panel 104 is level with the floor tiles 28.

The construction of the panel 104 allows it to be large, light and stiff. Therefore if a shower area is defined by a number of shower walls (which may be e.g. glass screens) then the construction of the present invention facilitates at least 80%, if not 90% of the floor of the shower area being made up of the panel. In other words, the tray extends to adjacent, and / or opposite shower walls.

Referring to Figure 11, an alternative shower panel 504 is shown in exploded form. The panel comprises a foam core 532, a first biaxial composite layer 538, a second biaxial composite layer 544, a display layer 560 and a surface layer 562. It will be understood that like the panel 104, the panel 504 would be encased in composite. The display layer 560 is an illuminated display, which may simply be a series of LEDs or similar, for example the ZETA (TM) embedded LED panel. In this case, the surface layer 562 is a translucent patterned layer.

Alternatively, the display layer may be an LED or LCD screen capable of displaying images to the user’s preference.

The display later 560 is powered and controlled via a separate controller 562.

Referring to Figure 12, a variation of the panel 504 is shown in which an additional touch-sensitive layer 564 is provided between the display layer 560 and the surface layer 562. The touch sensitive layer 564 may take several known forms, for example it may be a capacitive or inductive touch

sensitive layer. It may also be pressure-sensitive. The touch sensitive layer is configured to detect contact between a user and the panel 504. Upon contact, signals reporting the position of the contact are sent to the controller 562 and then to the display layer 560. In this way, the panel 504 can provide a display that reacts to the user's presence.

5 Referring to Figure 13, the assembly is shown assembled in step I. In step II, a panel lifter 50 is provided. The panel lifter 50 comprises an inflatable bag 52, a hand pump 54 and a tube 56 therebetween. A non-return valve 58 is positioned along the tube 56. The bag 52 is positioned in the gap between the panel 104, base 108 and sidewall 110. The hand pump 54 is used to inflate the bag 52 to lift the panel 104 away from the tray 102. The non-return valve 58 inhibits flow of air back to the  
10 pump under the pressure of the panel 104. Once inflated (stage III), the panel 104 is lifted and can be removed from the tray 102. The bag 52 can be selectively deflated by manually actuating the non-return valve 58.

Referring to Figures 14 to 17, a shower assembly 600 comprises a shower tray or base 602, a shower panel 604 and six panel supports 606. The shower assembly is installed in a wet room having a floor  
15 40 and a layer of tiles 42. The assembly is installed in a shower enclosure having a back wall 44, and sidewalls 46, 48.

The base 602 is generally square in plan view (Figure 16). It has a lower, or support surface 608 and an upper, or drainage surface 610 (Figure 17). The base 602 has a central drainage aperture 612. A flat support ledge 614 is provided around the periphery of the base 602 on the upper surface 610, which  
20 support ledge has a width wsl. The support ledge 614 is configured to be horizontal in use, or in this case parallel to the lower surface 608. Inwardly of the ledge 614, the upper surface 610 is angled downwardly (i.e. towards the lower surface 608) and towards the central drainage aperture 612. The direction of the downward slope is shown by the arrows in Figure 16. As can be seen in Figure 15, the base 602 has a tapered thickness (i.e. decreases in thickness) towards the drain aperture 612.

25 The base 602 is constructed from a closed-cell foam core 616 sandwiched between a lower and upper layer 618, 620 of composite material- specifically CFRP. It will be noted with reference to Figure 17 that the peripheral edges 622 of the foam core 616 are not sealed with composite material.

The base may be installed in a number of ways, but one preferred method is to use tile adhesive to secure it to the underlying substrate, and seal the periphery and drain.

30 The panel 604 is similar to the panel 104 described above, inasmuch as it is constructed from a foam core 624 surrounded by a layer of composite material 626, specifically CFRP. The panel is tapered from

a first edge 628 with a thickness  $t_1$ , to a second opposite edge 630 with thickness  $t_2$ , where  $t_1 > t_2$ . In this way, shower water runs towards the back of the shower enclosure (towards wall 44 in use).

The supports 606 are attached to the panel 604 each comprise a portion 632 of composite material and a non-slip layer 634 constructed from e.g. a rubber material. The supports 606 are each attached to the underside of the panel 604, and partially project therefrom in plan view as with the previous embodiments.

The shower panel 604 is smaller in dimension compared to the base 606 such that positioning thereon (with reference to Figure 14) leaves a drainage gap of width  $G$  around the periphery.

The assembly of the panel 604 and supports 606 can then be placed onto the base 602 such that the supports 606 rest on the support ledge 614 of the base 602. Because the ledge 614 is flat / horizontal, the non-slip layer 634 of each support can grip the base 602.

When water falls on the upper surface of the panel 604, it runs off and into the gap  $G$  before returning under the panel 604 to the drain 612. The presence of the supports 606 attached to the panel 604 prevents the panel 604 from moving in use. It also allows the water to run under the panel to the drain.

It will be noted that removeable hair traps may be provided in the gaps  $G$ . It will also be noted that the gap  $G$  is set to be less than 8mm to avoid any entrapment of toes. This is necessary to comply with UK building regulations.

The base 602 and panel 604 are manufactured using resin infusion as will be described below.

## 20 Base

- The foam core (constructed from a closed cell foam as discussed above) is cut and profiled to make a sloped surface for drainage. A hole is cut in the centre for the floor drain. Grooves are formed across the width and / or length of the foam core.;
- A work bench is provided, being flat and level with a sheet of glass on it;
- 25 • Layers of carbon fibre reinforcement (fabric) are cut to the size of the foam core and laid on the glass;
- The foam core (grooves side down) is placed on the reinforcement;
- Layers of carbon fibre reinforcement are cut to the size of the foam core and placed on top the foam core;
- 30 • A sheet of peel ply the size of the panel is placed on the carbon reinforcement;
- A sheet of infusion mesh slightly smaller than the peel ply is placed on the peel ply;

- Infusion spiral is placed around the perimeter of the infusion mesh, to two long sides and one short side;
- A silicone connector is place over the spiral on the short side;
- A silicone connector is place on the infusion mesh at the other end where there is no spiral;
- 5     • Bagging gum tape is stuck to the glass bed around the composite materials;
- A vacuum bag sheet is stuck to the gum tape covering the composite materials;
- A length of vacuum hose pierces the bag through the silicone connector, and is clamped off (spiral end, resin supply end);
- 10    • A length of silicone hose pierces the bag through the silicone connector, and is clamped off (other end, vacuum end);
- The hose at the vacuum end is connected to a vacuum pump, unclamped, and the pump is turned on;
- Air is drawn out of the bag until 100% vacuum is achieved;
- An infusion resin is mixed and the hose at the other end is placed in to the resin;
- 15    • The hose is unclamped;
- Atmospheric pressure pushing down on the resin, pushes it through the layers of composite material towards the vacuum hose at the other end;
- When the resin has encapsulated the composite materials completely it will start to work its way up the vacuum hose;
- 20    • At this point the hoses are clamped off and pump turned off;
- A heated blanket is placed over the bagging film and the polymer matrix cured. Additional heat is added to post-cure the matrix;
- All bagging material are pulled;
- The base is trimmed to size;
- 25    • A UV resin is poured over the upper surface left to cure and then polished.

It will be noted that the base is initially manufactured with an “oversized” ledge 614 which can be trimmed to suit the installation.

#### Panel 604

The process is the same but the foam core is cut and profiled to a wedge shape as discussed above.

- 30     Turning to Figures 18 to 20 an alternative panel 704 is shown. The panel 704 is constructed in a similar manner to the panel 604 but stiffeners 736 are provided at regular intervals running from one side to an opposite side of the panel 704.



Each stiffener 736 (Figure 20) has a first, upper edge 738 and a lower edge 740. The upper edge sits at the upper surface of the panel 704, and the lower edge at the lower surface (see section view in Figure 19). The stiffener 736 (with the exception of the grooves discussed below) is the same shape as the relevant cross-section of the panel.

5 The lower edge 740 has a series of notches or grooves 742 formed therein.

In this embodiment, the stiffener 736 is constructed from 3mm thick CFRP.

To manufacture the panel 704, the core 724 is cut across its short length and a the stiffener 736 is inserted. The stiffener is adhered between the two pieces of foam. The groves 742 on the underside of the stiffener allow resin to pass along the base of the drilled and grooved foam core preventing a  
10 resin block when manufacturing as described above.

In use, although the panels described above are very stiff and show little deflection, the stiffeners 736 act to reduce deflection further, and are used on very large panels.

Referring to Figure 21, a panel 804 is shown is constructed in a similar manner to the panel 604 but a heater 850 is provided, being elongate and recessed into the foam core in recesses 852. In this  
15 embodiment the heater 850 is provided in a serpentine path, but other paths are possible. During manufacture, the heater 850 is recessed into the foam recesses 852 and sealed by the outer layer of carbon fibre 826.

In use, when the panel 804 is installed, the heater 850 is connected to a power source (which may be an internal battery, or mains via a connector plug / socket) to heat the panel. This is beneficial for user  
20 comfort and safety (the panel dries at it is warmed).

The heater is preferably connected to a vanity unit where it is connected to the low voltage transformer. The heater and panel carry a temperature sensor such that the temperature can be thermostatically controlled.

The heater 850 may be electrical (e.g. resistive wire) or e.g. fed by warm water. Evidently electrical  
25 systems need to be properly sealed and earthed, but this is within the ability of the skilled person.

Variations fall within the scope of the present invention.

The combination of a foam core and composite material in the panel is important, but the type of foam and composite may be varied. Several types of form exist on the market, constructed from different polymers. Also, glass fibres could be used instead of carbon fibre.

Although the embodiments disclose a panel with a foam core, the panel may be constructed from a fibre reinforced polymer alone- i.e. it may be a multi-layer composite panel without a foam core. Although more layers of composite will need to be used in place of the foam core (thus increasing weight per unit area) this approach provides a very thin and strong panel in the event that e.g. it is not possible to fit a deep tray.

In an alternative manufacturing method, layers of fibre material are infused with resin and cured separate to the foam core. A foam core is then provided and the cured composite layer and the foam core are bonded (e.g. vacuum bonded) together.

The embodiment of Figure 15 may be provided with an upstanding flange projecting from the base to facilitate sealing.

The base / tray of the present invention may be installed in two main ways.

1. The shower enclosure is provided with an aperture absent the base / tray. The aperture and surrounding area is then tanked (waterproof lined). The tray / base is then installed and secured using tile adhesive. The perimeter and drain is then sealed with e.g. MS polymer (CT1).
2. Alternatively, the base / tray may be installed into an aperture, and then "tanked-to"- in other words the waterproof liner is provided to meet the periphery of the base / tray and sealed thereto.

## Claims

1. A shower assembly comprising:  
base comprising a drain;  
a removable shower floor panel comprising a foam core and a layer of composite material  
5 surrounding the foam core;  
at least one panel support separate to the base;  
in which the panel is supported on the at least one panel support to space the panel from the  
base to allow water to flow around the periphery of the panel to the drain.
2. A shower assembly according to claim 1, in which an upper surface of the panel in use is  
10 shaped to influence the flow of water therefrom.
3. A shower assembly according to claim 2, in which the panel is tapered or convex.
4. A shower assembly according to any preceding claim, in which the base comprises a foam core  
and a layer of composite material on the panel side of the base.
5. A shower assembly according to claim 4, in which the base comprises an upper surface which  
15 is angled towards the drain.
6. A shower assembly according to claim 5, in which the base comprises a flat, planar lower  
surface.
7. A shower assembly according to claim 4, or 5, in which the base comprises a support ledge  
proximate at least two sides thereof, which support ledge is in contact with at least one panel support.
- 20 8. A shower assembly according to any preceding claim, in which the at least one panel support  
is attached to the panel.
9. A shower assembly according to any of claims 1 to 7, in which the at least one panel support  
is separate to the panel, and comprises a panel abutment configured to constrain movement of the  
panel relative to the tray in use.
- 25 10. A shower assembly according to claim 9, in which the panel abutment comprises an  
upstanding formation from a surface of the at least one panel support.
11. A shower assembly according to claim 10, in which the upstanding formation comprises an  
angled section configured to receive a corner of the panel.

12. A shower assembly according to any preceding claim, in which the at least one panel support comprises a non-slip material in contact with the base.
13. A shower assembly according to any preceding claim, in which the panel is reversible.
14. A shower assembly according to any preceding claim, in which the panel is a quadrilateral, and  
5 in which a panel support is provided at each corner.
15. A shower assembly according to claim 14, in which a panel support is provided on at least one side of the panel.
16. A shower assembly according to any preceding claim, in which the panel supports vary in thickness to support the panel at an angle relative to the base in use.
- 10 17. A removable shower floor panel comprising:  
a foam core;  
a layer of composite material surrounding the foam core.
18. A removable shower floor panel according to claim 17, in which the layer of composite material comprises a layer of fibre material.
- 15 19. A removable shower floor panel according to claim 18, comprising at least one layer of biaxial fibre material.
20. A removable shower floor panel according to any of claims 17 to 19, comprising an outer surface layer of woven-fibre composite material.
21. A removable shower floor panel according to any of claims 17 to 20, comprising an outer layer  
20 and a release layer configured to facilitate removal of the outer layer from the layer of composite material.
22. A removable shower floor panel according to any of claims 17 to 21, comprising a stiffener extending across the panel, which stiffener is at least partially embedded in the foam core.
23. A removable shower floor panel according to claim 22, in which the stiffener is constructed  
25 from a composite material.
24. A removable shower floor panel according to claim 23, in which the stiffener is generally planar and oriented normal to the panel lower surface in use.
25. A removable shower floor panel according to any of claims 22 to 24, in which the stiffener comprises notches, grooves or openings to enable resin flow during moulding of the composite layer.

26. A removable shower floor panel according to any of claims 17 to 25, comprising an illuminated display layer.
27. A removable shower floor panel according to claim 26, in which the illuminated display layer is a screen capable of displaying an image.
- 5 28. A removable shower floor panel according to claim 26 or 27, comprising a touch sensitive layer, which touch sensitive layer is configured to control the illuminated display layer.
29. A removable shower floor panel according to any of claims 17 to 28, comprising heating means for heating an upper surface of the panel in use.
30. A removable shower floor panel according to claim 29, in which the heating means comprises  
10 a heating element at least partially embedded in the foam core.
31. A removable shower floor panel according to claim 29 or 30, in which the heating element is a resistive electrical element.
32. A removable shower floor panel according to claim 31, comprising a removable connector for connection to a power source.
- 15 33. A removable shower floor panel according to any of claims 17 to 32, in which a surface of the panel is sloped or convex.
34. A shower assembly comprising:  
a tray;  
a removable shower floor panel according to any of claims 17 to 33; and,  
20 at least one panel support supporting the panel in the tray.
35. A shower assembly according to claim 34, in which the tray comprises a base concave towards a drain opening.
36. A shower assembly according to any of claim 1 to 16, in which the panel is a panel according to any of claims 17 to 35.
- 25 37. A method of manufacturing a shower floor panel comprising the steps of:  
providing a foam core;  
covering the foam core in a composite material.

38. A method of manufacturing a shower floor panel according to claim 37, in which the composite material comprises a plurality of layers of fibre reinforced polymer.
39. A method of manufacturing a shower floor panel according to claim 37 or 38, comprising the steps of:
- 5 providing a sheet of fibre material;
- laying the fibre material onto the core;
- impregnating the fibre material with a polymer;
- allowing the polymer to harden.
40. A method of manufacturing a shower floor panel according to claim 39, in which the step of  
10 impregnating is via a resin infusion process.
41. A method of manufacturing a shower floor panel according to claim 39 or 40, comprising the step of:
- providing a reinforcement;
- embedding the reinforcement in the core before laying the fibre material onto the core.
- 15 42. A method of manufacturing a shower floor panel according to claim 41, in which the reinforcement comprises notches, grooves or openings to enable resin flow during the step of impregnating.
43. A removable shower floor panel comprising an illuminated display.
44. A removable shower floor panel according to claim 43, in which the illuminated display is a  
20 screen capable of displaying an image.
45. A removable shower floor panel according to claim 43 or 44, comprising a touch sensitive layer, which touch sensitive layer is configured to control the illuminated display.
46. A method of removing a removable shower panel comprising the steps of:
- providing an assembly of a tray and a removable shower panel;
- 25 providing an inflatable bladder;
- inserting the bladder between the tray and the panel;
- inflating the bladder to lift the panel.



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**Examiner:** Mrs Judith Peake

**Claims searched:** 1-42

**Date of search:** 8 May 2018

## Patents Act 1977: Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
Y	1-3, 12, 34-35.	US6240578 B1 (P V C LAGARES S A) See Figs 1-3 showing a shower assembly with base 1, drain 2, removable floor panel 6, supports 8 to space panel from base.
Y	1, 2, 4-6, 9-11, 14, 34-36	WO2005/046414 A1 (LAZER SARL et al) See Figs 1-3 and 5 showing panel supports 6 in frame configuration with panel abutment 9 and upstand to retain panel.
Y	1, 5, 7-8, 14-15, 34-36	DE102013017569 A1 (SCHOLPP) See WPI Abstract Accession Number 2015-257374 and Figs 4 & 5 showing removable panel bearing panel supports 16, 30 at each corner
Y	Y: 1-11, 14-15, 37-42 X: 17-20, 34-36	US2012/222209 A1 (SCHUELER ROBERT) Shower assembly with removable floor panel 200, the removable floor panel comprising a foam core 242 with opposing layers of fibreglass cloth impregnated with vinyl ester resin as shown in Figs 10D and 10E and described at paragraph [0052]
Y	37-42	EP3009056 A1 (NOVARALIS SL) Method for producing shower tray articles using polystyrene foam core and fiberglass fabric and resin coatings as shown in Figs 4a-4f
Y	37-42	GB2402363 A (ESL HEALTHCARE LTD) Method of moulding shower trays using foam core 14 and fibre mats 12, and mat impregnated with resin 11 to make shower article as shown in Fig 2.

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>X</sup> :

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Worldwide search of patent documents classified in the following areas of the IPC

A47K

The following online and other databases have been used in the preparation of this search report

Online: WPI, EPODOC, FULLTEXT

**International Classification:**

<b>Subclass</b>	<b>Subgroup</b>	<b>Valid From</b>
A47K	0003/40	01/01/2006