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(71) Applicant *(for all designated States except US)*: **PAYNE FENCE PRODUCTS, LLC** [US/US]; 3309 SW Interstate 45, Ennis, TX 75119 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **PAYNE, John, F.** [US/US]; 1141 Mockingbird Circle, Ennis, TX 75119 (US).

(74) Agent: **TERRELL, Chad, D.**; Baker Botts L.L.P., 2001 Ross Avenue, Suite 600, Dallas, TX 75201 (US).

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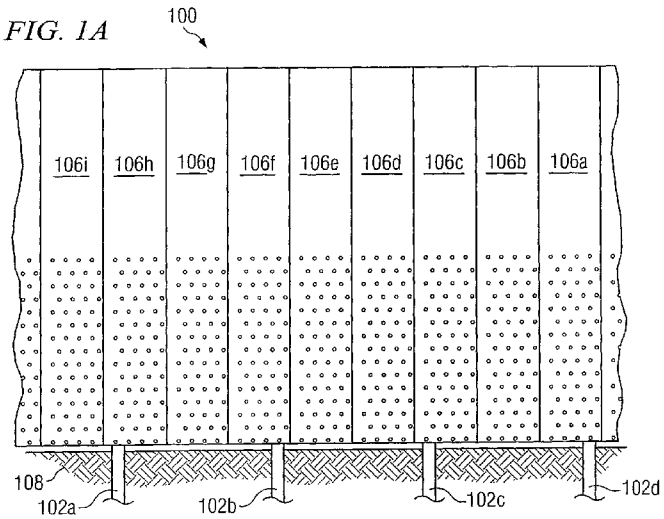
(54) Title: PANEL FENCE SYSTEM AND METHOD

FIG. 1A



(57) Abstract: In certain embodiments, a fence system (100) includes a support member (102) and a rail (104) attached to the support member (102) such that the rail (104) extends across the support member (102). The fence system (100) further includes a first panel (106) and a second panel (106) each comprising a primary panel portion (120) having a first edge (126) and a second edge (128). A first flange (122) is located along at least a portion of the first edge (126) of the primary panel portion (120), and a second flange (124) is locate along at least a portion of the second edge (128) of the primary panel portion (120). The first and second panels (106) are secured to the rail (104) such that the second edge (128) of the primary panel portion (120) of the first panel (106) is adjacent to the first edge (126) of the primary panel portion (120) of the second panel (106). The second flange (124) of the first panel (106) is matingly coupled to the first flange (122) of the second panel (106).

PANEL FENCE SYSTEM AND METHOD

TECHNICAL FIELD

This invention relates generally to fence systems and more particularly to a panel fence system and method.

BACKGROUND

It is often desirable or even necessary to prevent people from crossing boundaries, such as a perimeter of privately-owned real estate or another key asset. Free-standing fences may be used to attempt to prevent people from crossing these boundaries. Conventional fences may include, for example, chain link fencing and barbed wire fencing.

SUMMARY

According to embodiments of the present invention, disadvantages and problems associated with previous fence systems may be reduced or eliminated.

In certain embodiments, a fence system includes a support member and a rail attached to the support member such that the rail extends across the support member. The fence system further includes a first panel and a second panel each comprising a primary panel portion having a first edge and a second edge. A first flange is located along at least a portion of the first edge of the primary panel portion, and a second flange is located along at least a portion of the second edge of the primary panel portion. The first and second panels are secured to the rail such that the second edge of the primary panel portion of the first panel is adjacent to the first edge of the primary panel portion of the second panel. The second flange of the first panel is matingly coupled to the first flange of the second panel.

Particular embodiments of the present invention may provide one or more technical advantages. Conventional fences for preventing movement across a particular boundary may include, for example, chain link fencing and barbed wire fencing. Certain individuals attempting to cross the particular boundary may attempt to breach these conventional fences in a number of ways, such as by climbing over the fence, cutting through the fence (e.g., using a saw, axe, or torch), or disassembling

one or more exposed fasteners securing portions of the fence. For various reasons, these conventional fences may be ineffective in preventing these attempted breaches. Certain other conventional fences, such as those made of concrete, bricks, and/or stone, may be less susceptible to breach, but these alternative conventional fences may be prohibitively expensive to construct along boundaries of significant length.

The fence system of the present invention may include a number of panels forming a substantially continuous wall that is less susceptible to breach relative to certain conventional fences. In certain embodiments, the fence system of the present invention may reduce or eliminate hand and foot holds. Thus, the fence system of the present invention may be less susceptible to being breached by an individual attempting to climb over the fence system relative to certain conventional fences. In certain embodiments, the fence system of the present invention provides a substantially continuous wall. Thus, the fence system of the present invention may be less susceptible to being breached by an individual attempting to cut through it (e.g., using a saw, axe, or torch), as compared to certain conventional fences. In certain embodiments, the fence system of the present invention is assembled such that all fasteners are located on one side of the fence system (e.g., the "back side" on which the posts and rails are located). Furthermore, the fence system of the present invention may be oriented such that the back side of the fence system is on the secure side of a boundary other side of the fence system (the "attack side") is on the non-secure-side of the boundary. Thus, the fence system of the present invention may be assembled and/or repaired from the secure side of the boundary and may be less susceptible to being breached by an individual attempting to disassemble the fence system from the non-secure side of the boundary.

Additionally, the fence system of the present invention may not be prohibitively expensive to construct along boundaries of significant length. Thus, the fence system of the present invention may potentially be a more cost effective solution for certain applications. Furthermore, the fence system of the present invention may be less susceptible to damage than certain conventional fences (e.g., those made of concrete, bricks, metal, and/or stone), such as damage resulting from high winds and/or soil movement.

Certain embodiments of the present invention may include some, all, or none of the above advantages. One or more other technical advantages may be readily

apparent to those skilled in the art from the figures, descriptions, and claims included herein.

BRIEF DESCRIPTION OF THE DRAWINGS

To provide a more complete understanding of the present invention and the features and advantages thereof, reference is made to the following description taken in conjunction with the accompanying drawings, in which:

FIGURES 1A-1E illustrate an example panel fence system, according to certain embodiments of the present invention;

FIGURES 2A-2B illustrate an example configuration of a panel fence system constructed along a boundary having varying slope, according to certain embodiments of the present invention;

FIGURE 3 illustrates an example rail hanger of the panel fence system illustrated in FIGURE 1, according to certain embodiments of the present invention;

FIGURES 4A-4D illustrate example alternative configurations of a panel of the panel fence system illustrated in FIGURE 1, according to certain embodiments of the present invention; and

FIGURE 5 illustrates an example method for constructing a panel fence system, according to certain embodiments of the present invention.

DESCRIPTION OF EXAMPLE EMBODIMENTS

FIGURES 1A-1E illustrate an example panel fence system 100, according to certain embodiments of the present invention. Fence system 100 may include a number of support members 102 (referred to throughout the remainder of this description as posts 102 for simplicity) and a number of rails 104. Each rail 104 may be attached to at least one post 102 such that the rail 104 extends across the at least one post 102 to which it is attached. Fence system 100 may also include a number of panels 106 each secured to one or more rails 104.

In general, fence system 100 may deter and/or substantially prevent movement across a particular boundary. Example boundaries include perimeters of critical assets, perimeters of privately-owned real estate, national borders, or any other suitable boundaries. Certain individuals attempting to cross the particular boundary may attempt to breach fence system 100 in a number of ways, such as by climbing

over fence system 100, cutting through fence system 100 (e.g., using a saw, axe, or torch), or attempting to remove panels 106 of fence system 100. Because panels 106 may be secured to rails 104 such that hand and foot holds may be reduced or eliminated, fence system 100 may be less susceptible to being breached by an individual attempting to climb over it relative to certain conventional fences. Additionally, because panels 106 may be secured to rails 104 such that panels 106 form a substantially continuous wall, fence system 100 may be less susceptible to being breached by an individual attempting to cut through it relative to certain conventional fences. Additionally, because panels 106 may be secured to rails 104 such that all fasteners are located on one side (the "back side") of the fence system, fence system 100 may be less susceptible to being breached by an individual attempting to remove panels 106 of fence system 100 relative to certain conventional fences. Thus, in certain embodiments, fence system 100 may be more effective in preventing movement across a particular boundary relative to certain conventional fences.

Posts 102 may be constructed from aluminum, iron, stainless steel, galvanized steel, brass, plastic, or any other suitable material. Furthermore, posts 102 may have any suitable size and shape. For example, posts 102 may be constructed from tubing material of any desired cross section (e.g., rectangular, round, elliptical), solid material of any desired cross section (e.g., rectangular, round, elliptical), channel material, angle iron, I-beam, or any other suitable material. Furthermore, posts 102 may be any suitable length (e.g., four, eight, or twenty feet). As a particular example, posts 102 may be constructed from a twenty-foot length of galvanized steel round tubing. Although fence system 100 is illustrated and primarily described as including a particular number of posts 102, the present invention contemplates fence system 100 including any suitable number of posts 102, according to particular needs.

Posts 102 of fence system 100 may be anchored in the ground (e.g., using concrete 108). In certain embodiments, posts 102 are anchored in the ground such that they are substantially vertical (and, as a result, substantially parallel with one another) regardless of ground slope (as illustrated in FIGURES 2A-2B, described below). Furthermore, the distance between any two adjacent posts 102 (e.g., post 102a and post 102b) may be any suitable distance (e.g., ten feet), and may vary from post 102 to post 102 if appropriate.

Rails 104 may be constructed from aluminum, iron, stainless steel, galvanized steel, brass, plastic, or any other suitable material. Furthermore, rails 104 may have any suitable size and shape. For example, rails 104 may be constructed from tubing material of any desired cross section (e.g., rectangular, round, elliptical), solid material of any desired cross section (e.g., rectangular, round, elliptical), channel material, angle iron, I-beam, or any other suitable material. Furthermore, rails 104 may be any suitable length (e.g., four, eight, or twenty feet). As a particular example, rails 104 may be constructed from a twenty foot length of galvanized steel square tubing. Although fence system 100 is illustrated and primarily described as including a particular number of rails 104, the present invention contemplates fence system 100 including any suitable number of rails 104, according to particular needs.

Rails 104 of fence system 100 may each be attached to one or more posts 102. In certain embodiments, a rail 104 may each be attached to a post 102 such that the rail 104 is coupled directly to post 102. For example, the rail 104 may be coupled directly to the post 102 using one or more fasteners, such as screws, bolts, rivets, or any other suitable attachment fasteners. As an additional example, the rail 104 may be coupled directly to post 102 such that the rail 104 is physically connected to the post 102 (e.g., using a weld).

In certain other embodiments, a rail 104 may be attached to a post 102 such that the rail 104 is coupled to the post 102 using a bracket component, such as a rail hanger 110. Rail hanger 110 may include a clamp 112 configured to be attached to a post 102 and a bracket 114 configured to be attached to a rail 104. The bracket 114 may be either physically attached to the clamp 112 (e.g., using a weld) or attached to the clamp 112 using a fastener (e.g., a screw, bolt, rivet, or any other suitable fastener). In certain embodiments, the clamp 112 is attached to a post 102, and a rail 104 is attached to the bracket 114 (either physically attached or attached using a fastener). Thus, rail hanger 110 is adapted to attach the rail 104 to the post 102.

Clamps 112 may include any conventional clamp that may be attached to a post 102, such as by tightening a nut 116 of a clamp bolt 118. In certain embodiments, a clamp 112 may have a size and/or shape that corresponds to the size and/or shape of the post 102 to which the clamp 112 is to be attached. For example, a clamp 112 of a rail hanger 110 to be attached to a round post 102 may include a circular metal band having an inner diameter slightly smaller than the outer diameter

of the post 102 to which the rail hanger is to be attached such that the claim 112 may be attached to the post 102 by tightening a nut 116 of a clamp bolt 118 (as illustrated in FIGURE 3, described below).

Although particular configurations of rails 104 and rail hangers 110 are illustrated and primarily described, rails 104 and rail hangers 110 may be configured in any of a number of ways.

Panels 106 of fence system 100 may be constructed from aluminum, iron, stainless steel, galvanized steel, brass, plastic, or any other suitable material. As a particular example, panels 106 may be constructed from rolled seven-gauge steel.

In certain embodiments, each panel 106 includes a primary panel portion 120 having a first edge 126 and a second edge 128. Each panel 106 may further include a first flange 122 located along a first edge 126 of the primary panel portion 120 and a second flange 124 located along a second edge 128 of the primary panel portion 120.

Each of the panels 106 of fence system 100 is adapted to be secured to one or more rails 104 such that the first flange 122 and second flange 124 of each panel 106 matingly couple with flanges of adjacent panels 106. More particularly, the first flange 122 of a particular panel 106 may be configured to matingly couple with a second flange 124 of a first adjacent panel 106, and the second flange 124 of the particular panel 106 may be configured to matingly couple with a first flange 122 a second adjacent panel 106 (as described below). As a result, the primary panel portions 120 of the number of panels 106 of fence system 100, when secured to one or more rails 104, may form a substantially continuous wall. Furthermore, because the primary panel portions 120 of panels 106 may form a substantially continuous wall, panels 106 may further include a plurality of apertures 132 that may facilitate visibility through the substantially continuous wall.

Although primary panel portions 106 of panels 106 are described as forming a substantially continuous wall, in certain applications there may be gaps between adjacent edges of primary panel portions 120 of adjacent panels 106. As described in further detail below with respect to FIGURES 2A-2B, an advantage of certain embodiments of the present invention is that the gaps between adjacent edges of primary panel portions 120 of adjacent panels 106 may not pass through fence system 100 as adjacent flanges of the adjacent panels 106 may be matingly coupled such that adjacent flanges close the gap between the adjacent edges.

Panels 106 may be secured to one or more rails 104 using one or more fasteners, such as a screws, bolts, rivets, staples, or any other suitable fasteners. As a particular example, a panel 106 may be secured to one or more rails 104 using a bolt (e.g., bolt 130a illustrated in FIGURE 1C). In certain other embodiments, a panel 106 is secured to a rail 104 by physically joining the panel 106 to the rail 104 (e.g. by welding the panel 106 to the rail 104 or "clinching" the panel 106 to the rail 104). As a particular example, a panel 106 may be clinched the panel 106 to a rail 104 using and a TOG-L-LOC® sheet metal joining system manufactured by BTM CORPORATION (e.g., clinch point 130b, illustrated in FIGURE 1C).

As a particular example, panel 106g may be secured to one or more rails 104 (e.g., using a fastener or physically joined) such that panel 106g is adjacent to panel 106f and panel 106h (as illustrated in FIGURED 1A-1C). Furthermore, panel 106g may be oriented with respect to panel 106f such that first edge 126g is adjacent to second edge 128f and first flange 122g is matingly coupled to second flange 124f. Additionally, panel 106g may be oriented with respect to panel 106h such that second edge 128g is adjacent to first edge 126h and second flange 124g is matingly coupled to first flange 122h. Thus, the primary panel portions 120e-120g of panels 106e-106g may form a substantially continuous wall.

In certain embodiments (as illustrated in FIGURES 1D-1E), the first flange 122 of each panel 106 includes a protrusion 122' extending from the first edge 126 of the primary portion 120 of the panel 106, and a tab 122'' extending from the protrusion 122'. As a particular example, the protrusion 122' of a first flange 122 of a panel 106 may extend in a direction substantially perpendicular to the primary panel portion 120 of the panel 106, and the second portion 122'' of the first flange 122 may extend in a direction substantially parallel to the primary panel portion 120 of the panel 106. Additionally, in certain embodiments (illustrated in FIGURES 1D-1E), the second flange 124 of each panel 106 includes a protrusion 124' extending from the second edge 128 of the primary portion 120 of the panel 106 and a tab 124'' extending from the protrusion 124'. As a particular example, the protrusion 124' of the second flange 124 of a panel 106 may extend in a direction substantially perpendicular to the primary panel portion 120 of the panel 106 and the tab 124'' of the second flange 124 of the panel 106 may extend in a direction substantially parallel to the primary panel portion 120 of the panel 106 (and in the same direction relative to

the primary panel portion 120 of the panel 106 as the second portion 122'' of the first flange 122 of the panel 106).

Furthermore, the first flange 122 of a particular panel 106 may be configured to matingly couple with a second flange 124 of a first adjacent panel 106 such that the tab 122'' of the first flange 122 of the particular panel 106 is substantially parallel with the tab 124'' of the second flange 124 of the first adjacent panel 106. The tabs 122'' and 124'' may also be substantially parallel to a rail 104 such that the particular panel 106 and the first adjacent panel 106 may be secured to the rail 104 at a single point using a single fastener. For example, the rail 104 may be attached to tabs 122'' and 124'' using a single bolt 130a passing through rail 104, tab 122'', an tab 124''. As an additional example, in embodiments in which rail 104 is constructed of a channel, a TOG-L-LOC® sheet metal joining system (described above) may be inserted into the opening defined by the channel such that rail 104 may be attached to tabs 122'' and 124'' using a clinch point 130b.

Similarly. the second flange 124 of the particular panel 106 may be configured to matingly couple with a first flange 122 of a second adjacent panel 106 such that the tab 124'' of the second flange 124 of the particular panel 106 is substantially parallel with the tab 122'' of the first flange 122 of the adjacent panel 106. The tabs 124'' and 122'' may also be substantially parallel to the rail 104 such that the particular panel 106 and the second adjacent panel 106 may be secured to the rail 104 at a single point using a single fastener. For example, the rail 104 may be attached to tabs 124'' and 122'' using a single bolt 130a passing through rail 104, tab 124'', an tab 122''. As an additional example, in embodiments in which rail 104 is constructed of a channel, a TOG-L-LOC® sheet metal joining system (described above) may be inserted into the opening defined by the channel such that rail 104 may be attached to tabs 124'' and 122'' using a single clinch point 130b.

Although adjacent panels 106 are capable of being secured to a rail 104 at a single point (as described above), the present invention contemplates adjacent panels being secured to the rail 104 at any suitable number of points, according to particular needs.

As a particular example, in the above-described example in which panel 106g is secured to a rail 104 such that panel 106g is adjacent to panel 106f and panel 106h, panels 106f-106h may each include a first flange 122 having a protrusion 122' and tab

122'' and a second flange 124 having a protrusion 124' and a tab 124'' (as described above).

Furthermore, first flange 122g of panel 106g may be matingly coupled with second flange 124f of panel 106f such that:

- protrusion 122g' of first flange 122g is adjacent to protrusion 124f' of second flange 124f; and
- tab 122g'' of first flange 122g is adjacent to and substantially parallel with tab 124f'' of second flange 124f.

In certain embodiments (e.g., embodiments in which panel 106f and panel 106g are oriented at substantially the same angle, as illustrated in FIGURES 1A-1C), protrusion 122g' of first flange 122g may be substantially parallel with protrusion 124f' of second flange 124f. In certain other embodiments (e.g., embodiments in panel 106f and panel 106g are oriented at different angles, as illustrated in FIGURES 2A-2C) protrusion 122g' of first flange 122g may not be substantially parallel with protrusion 124f' of second flange 124f

Additionally, tab 122g'' of first flange 122g and tab 124f'' of second flange 124f, in addition to being substantially parallel with one another, may also be substantially parallel with the rail 104 to which panels 106f and 106g are attached (or tangent to the rail 104 in embodiments in which the rail 104 is round) such that tabs 122g'' and 124f'' (and, as a result, panels 106f and 106g) may be attached to one another as well as the rail 104 at a single point using a single fastener. For example, tabs 122g'' and 124f'' may be attached to rail 104 using a single bolt 130a passing through rail 104, tab 122g'', and 122f''. Alternatively, in embodiments in which rail 104 is constructed of a channel, a TOG-L-LOC® sheet metal joining system (described above) may be inserted into the opening defined by the channel such that rail 104 may be attached to tabs 122g'' and 124f'' using a single clinch point 130b.

Similarly, second flange 124g of panel 106g may be matingly coupled with first flange 122h of panel 106h such that:

- protrusion 124g' of second flange 124g is adjacent to protrusion 122h' of first flange 122h; and
- tab 124g'' of second flange 124g is adjacent to and substantially parallel with tab 122h'' of first flange 122h.

In certain embodiments (e.g., embodiments in panel 106g and panel 106h are

oriented at the same angle, as illustrated in FIGURES 1A-1C), protrusion 124g' of second flange 124g may be substantially parallel with protrusion 122h' of first flange 122f. In certain other embodiments (e.g., embodiments in panel 106g and panel 106h are oriented at different angles, as illustrated in FIGURES 2A-2C) protrusion 124g' of second flange 124g may not be substantially parallel with protrusion 122h' of first flange 122h.

Additionally, tab 124g'' of second flange 124g and tab 122h'' of first flange 122h, in addition to being substantially parallel with one another, may be substantially parallel with the rail 104 to which panels 106g and 106h are attached (or tangent to the rail 104 in embodiments in which the rail is round) such that panels 106g and 106h may be attached to the rail 104 at a single point. For example, tabs 122g'' and 124f'' may be attached to rail 104 using a single bolt 130a passing through rail 104, tab 122g'', and 122f''. Alternatively, in embodiments in which rail 104 is constructed of a channel, a TOG-L-LOC® sheet metal joining system (described above) may be inserted into the opening defined by the channel such that rail 104 may be attached to tabs 122g'' and 124f'' using a clinch point 130b.

Securing adjacent panels 106 to a rail 104 using tabs of matingly coupled flanges of the adjacent panels 106 (as described above) may allow fence system 100 to be constructed and/or repaired from a single side (i.e., the side on which posts 102 and rails 104 are located), which may be important in applications in which fence system 100 is constructed along a secure boundary. Additionally, in embodiments in which a fastener (e.g., bolt 130a) is used to secure the tabs of the flanges of adjacent panels 106 to a rail 104, securing adjacent panels 106 to a rail 104 using tabs of the matingly coupled flanges of the adjacent panels 106 (as described above) may prevent the fastener from passing through the primary panel portion 120 of either panel (as illustrated in FIGURE 1C), which may reduce the susceptibility of fence system 100 to being breached by an individual attempting remove panels 106 from fence system 100 as well as by an individual attempting to climb over fence system 100 (as a fastener passing through the primary panel portion 120 of a panel may provide a hand or foot hold).

Although panels 106 are illustrated and primarily described above as including primary panel portions 120, first flanges 122, and second flanges 124 each having particular configurations, the present invention contemplates panels 106 comprising

primary panel portions 120, first flanges 122, and second flanges 124 having any suitable configurations such that a flange of a first panel 106 is adapted to matingly couple with a flange of an adjacent panel 106 when the panels 106 are secured to one or more rails 104. For example, panels 106 including primary panel portions 120, first flanges 122, and second flanges 124 having example alternative configurations are illustrated in FIGURES 4A-4D, described in further detail below.

Particular embodiments of the present invention may provide one or more technical advantages. Conventional fences for preventing movement across a particular boundary may include, for example, chain link fencing and barbed wire fencing. Certain individuals attempting to cross the particular boundary may attempt to breach these conventional fences in a number of ways, such as by climbing over the fence, cutting through the fence (e.g., using a saw, axe, or torch), or disassembling one or more exposed fasteners securing portions of the fence. For various reasons, these conventional fences may be ineffective in preventing these attempted breaches. Certain other conventional fences, such as those made of concrete, bricks, and/or stone, may be less susceptible to breach, but these alternative conventional fences may be prohibitively expensive to construct along boundaries of significant length.

Because fence system 100 may include a number of panels 106 forming a substantially continuous wall, fence system 100 may be less susceptible to breach relative to certain conventional fences. In certain embodiments, fence system 100 may reduce or eliminate hand and foot holds. Thus, the fence system 100 may be less susceptible to being breached by an individual attempting to climb over fence system 100 relative to certain conventional fences. In certain embodiments, the fence system 100 provides a substantially continuous wall. Thus, the fence system 100 may be less susceptible to being breached by an individual attempting to cut through it (e.g., using a saw, axe, or torch), as compared to certain conventional fences. In certain embodiments, fence system 100 is assembled such that all fasteners are located on one side of the fence system (e.g., the "back side" on which the posts and rails are located). Furthermore, fence system 100 may be oriented such that the back side of the fence system is on the secure side of a boundary other side of the fence system (the "attack side") is on the non-secure-side of the boundary. Thus, fence system 100 may be assembled and/or repaired from the secure side of the boundary and may be

less susceptible to being breached by an individual attempting to disassemble fence system 100 from the non-secure side of the boundary.

Additionally, fence system 100 may not be prohibitively expensive to construct along boundaries of significant length. Thus, fence system 100 may potentially be a more cost effective solution for certain applications. Furthermore, fence system 100 may be less susceptible to damage than certain conventional fences (e.g., those made of concrete, bricks, metal, and/or stone), such as damage resulting from high winds and/or soil movement.

Although a particular implementation of fence system 100 is illustrated and primarily described, the present invention contemplates any suitable implementation of fence system 100 according to particular needs. Although a particular number components of fence system 100 have been illustrated and primarily described above, the present invention contemplates fence system 100 including any suitable number of such components.

FIGURES 2A-2B illustrates an example configuration of a panel fence system 100 constructed along a boundary having varying slope, according to certain embodiments of the present invention. In the illustrated configuration, a number of posts 102 are anchored in the ground (e.g., using concrete 108) such that they are substantially vertical (and, as a result, substantially parallel with one another) regardless of ground slope. Additionally, a number of rails 104 are coupled to the one or more of the posts 102 (e.g., using rail hangers 110, as described above). Each rail 104 may extends across the one or more posts 102 to which it is attached and may be oriented generally parallel to the ground at the location along the boundary at which it is installed.

A number of panels 106 may each be secured to the rails 104. Furthermore, each panel 106 may be oriented substantially perpendicular to the ground at the point along the boundary at which it is located. As a result, adjacent panels 106 may be oriented at different angles such that a gap exists between adjacent edges of the primary panel portions 120 of the adjacent panels 106 (e.g., gap 134 between primary portions 120a and 120b of adjacent panels 106a and 106b, described below). Furthermore, the gap between adjacent edges of primary panel portions 120 of adjacent panels 106 may vary in width, the variance in width corresponding to the difference in the angles at which the adjacent panels 106 are oriented.

The gap between the adjacent edges of the first portions 120 of the adjacent panels 106, however, may not pass through fence system 100, as adjacent flanges of the adjacent panels 106 may be matingly coupled such that adjacent flanges close the gap between the adjacent edges. In other words, adjacent flanges of adjacent panels 106 may permit a certain degree of "fanning" between the panels such that fence system 100 may be installed along a boundary having varying ground slope.

As a particular example, adjacent panels 106a and 106b may each be secured to rails 104 such that second flange 124a of panel 106a is matingly coupled to first flange 122b of panel 106b. More particularly, second flange 124a of panel 106a may be matingly coupled with first flange 122a of panel 106a such that protrusion 124a' of second flange 124a is adjacent to protrusion 122b' of first flange 122b and tab 124g'' of second flange 124g is adjacent to and substantially parallel with tab 122h'' of first flange 122h, as described above. Because the severity of the ground slope is greater at the point at which panel 106b is located than at the point at which panel 106a is located, panel 106a may be oriented at an angle relative to horizontal that is smaller than the angle relative to horizontal at which panel 106b is oriented. As a result, there may be a gap 134 between second edge 128a of panel 106a and first edge 126b of panel 106b, gap 134 being widest at the point nearest the ground.

Tab 124a'' of second flange 124a of panel 106a, however, may be sufficiently wide as to close gap 134. In other words, tab 124a'' may be at least slightly wider that the widest portion of gap 134 (i.e., the point nearest the ground) such that at least a portion of tab 124a'' overlaps at least a portion of tab 122b'' of first flange 122b of panel 106b at all points along the adjacent edges 128a and 126b of panels 106a and 106b.

Thus, assuming that fence system 100 is to be installed such that there are no gaps (i.e., all gaps between adjacent edges of primary portions 120 of adjacent panels 106 are filled, as described above), the width of tabs 124'' of second flanges 124 of panels 106 may define the maximum variation in orientation angle between adjacent panels 106 (i.e., the degree of fanning that is permitted between adjacent panels 106). Furthermore, the maximum variation in orientation angle between adjacent panels 106 may define the maximum variation in ground slope over which fence system 100 may be installed. Stated differently, by increasing the width of tabs 124'' of second

flanges 124 of panels 106, fence system 100 may be adapted to traverse terrain with greater variations in ground slope.

Additionally, because panels 106 are oriented substantially perpendicular with the ground (as opposed to, for example, substantially parallel with posts 108), the top of fence system 100 may be a generally continuous smooth curve as fence system 100 traverses a boundary of varying ground slope.

FIGURE 3 illustrates an example rail hanger 110 of the panel fence system 100 illustrated in FIGURE 1, according to certain embodiments of the present invention. Rail hanger 110 may include a clamp 112 configured to be attached to a post 102 and a bracket 114 configured to be attached to a rail 104. The bracket 114 may be either physically attached to the clamp 112 (e.g., using a weld) or attached to the clamp 112 using a fastener (e.g., a screw, bolt, rivet, or any other suitable fastener). In certain embodiments, the clamp 112 is attached to a post 102, and a rail 104 is attached to the bracket 114 (either physically attached or attached using a fastener). Thus, rail hanger 110 is adapted to attach the rail 104 to the post 102.

Clamps 112 may include any conventional clamp that may be attached to a post 102, such as by tightening a nut 116 of a clamp bolt 118. In certain embodiments, a clamp 112 may have a size and/or shape that corresponds to the size and/or shape of the post 102 to which the clamp 112 is to be attached. For example, a clamp 112 of a rail hanger 110 to be attached to a round post 102 may include a circular metal band having an inner diameter slightly smaller than the outer diameter of the post 102 to which the rail hanger is to be attached such that the claim 112 may be attached to the post 102 by tightening a nut 116 of a clamp bolt 118.

FIGURES 4A-4D illustrate example alternative configurations of panels 106 of the panel fence system 100 illustrated in FIGURE 1, according to certain embodiments of the present invention. Although particular alternative configurations of panels 106 are illustrated and primarily described, the present invention contemplates any suitable configuration of panels 106, according to particular need. Furthermore, the present invention contemplates fence system 100 as including any suitable combination of panels 106 having varying configurations, according to particular needs.

In the configuration illustrated in FIGURE 4A, panel 106 includes a primary panel portion 120 protruding outwardly with respect to a first flange 122 and a second

flange 124. The primary panel portion 120 may include a first edge 126 and a second edge 128. The first flange 122 may include a protrusion 122' extending from the first edge 126 and a tab 122'' extending inwardly from the protrusion 122' such that the primary panel portion 120, protrusion 122', and tab 122'' form a channel. The second flange 124 may include a protrusion 124' extending from the second edge 128 and a tab 124'' extending outwardly from the protrusion 124' in substantially the same direction as tab 122'' extends from the protrusion 122'. Furthermore, protrusion 122' may be substantially parallel with protrusion 124' and tab 122'' may be substantially parallel with tab 124''.

In the configuration illustrated in FIGURE 4B, panel 106 includes a primary panel portion 120 protruding inwardly with respect to a first flange 122 and a second flange 124. The primary panel portion 120 may include a first edge 126 and a second edge 128. The first flange 122 may include a protrusion 122' extending from the first edge 126 and a tab 122'' extending from the protrusion 122' such that the primary panel portion 120, protrusion 122', and tab 122'' form a channel. The second flange 124 may include a protrusion 124' extending from the second edge 128 and a tab 124'' extending outwardly from the protrusion 124' in substantially the same direction as tab 122'' extends from the protrusion 122'. Furthermore, protrusion 122' may be substantially parallel with protrusion 124' and tab 122'' may be substantially parallel with tab 124''.

In the configuration illustrated in FIGURE 4C, panel 106 includes a generally planar primary panel portion 120, a first flange 122, and a second flange 124. The primary panel portion 120 may include a first edge 126 and a second edge 128. The first flange 122 may include a protrusion 122' extending from the first edge 126 and a tab 122'' extending inwardly from the protrusion 122' such that the primary panel portion 120, protrusion 122', and tab 122'' form a channel. The second flange 124 may include a protrusion 124' extending from the second edge 128 and a tab 124'' extending inwardly from the protrusion 124', tab 124'' extending from the protrusion 124' such that the primary panel portion 120, protrusion 124', and tab 124'' form a channel. Furthermore, protrusion 122' may be substantially parallel with protrusion 124' and tab 122'' may be substantially parallel with tab 124''.

In the configuration illustrated in FIGURE 4B, panel 106 includes a generally planar primary panel portion 120, a first flange 122, and a second flange 124. The

primary panel portion 120 may include a first edge 126 and a second edge 128. The first flange 122 may include a protrusion 122' extending from the first edge 126 and a tab 122'' extending outwardly from the protrusion 122'. The second flange 124 may include a protrusion 124' extending from the second edge 128 and a tab 124'' extending outwardly from the protrusion 124'. Furthermore, protrusion 122' may be substantially parallel with protrusion 124' and tab 122'' may be substantially parallel with tab 124''.

FIGURE 5 illustrates an example method 500 for constructing a panel fence system 100, according to certain embodiments of the present invention. The method begins at step 502. At step 504, a first post 102 (e.g., post 102a) may be set in a foundation (e.g., concrete 108) at a first location. At step 506, a second post 102 (e.g., post 102b) may be set in a second foundation (e.g. concrete 108) at a second location. In certain embodiments, first post 102a and second post 102b may be set in the first and second foundations such that they are substantially vertical regardless of ground slope.

As step 508, a first rail 104 (e.g., rail 104a) may be coupled to first post 102a and second post 102b such that rail 104a extends across first post 102a and second post 102b. At step 510, a second rail 104 (e.g., rail 104b) may be coupled to first post 102a and second post 102b such that rail 102b extends across first post 102a and second post 102b. At step 512, a third rail 104 (e.g., rail 104c) may be coupled to first post 102a and second post 102b such that rail 104c extends across first post 102a and second post 102b. Each rail 104 may be coupled to each post using a rail hanger 110, as described above. In certain embodiments, rails 104a-104c may each be attached to posts 102a-102b such that rails 104a-104c are substantially parallel to the ground.

At step 514, a first panel 106 (e.g., panel 106f) may be positioned on rails 104a-104c, panel 106f comprising a primary panel portion 120f having a first edge 126f and a second edge 128f. Panel 106f may also comprise a first flange 122f located along first edge 126f and a second flange 124f located along the second edge 128f.

At step 516, a second panel 106 (e.g., panel 106g) may be positioned on rails 104a-104c, panel 106g comprising a primary panel portion 120g having a first edge 126g and a second edge 128g. Panel 106g may also comprise a first flange 122g

located along first edge 126g and a second flange 124g located along the second edge 128g.

At step 518, the first panel (e.g. panel 106f) and the second panel (e.g., panel 106g) may be secured to the first, second, and third rails (e.g., rails 104a-c) such that the second edge 128f of the primary panel portion 120f of panel 106f is adjacent to the first edge 126g of the primary panel portion 120g of the second panel 106g, the second flange 124f of panel 106f being matingly coupled to the first flange 122g of panel 106g.

In certain embodiments, second flange 124f of panel 106f includes a protrusion 124f' extending from the second edge 128f of the primary portion 120f of the panel 106f and a tab 124f'' extending from the protrusion 124f'. Additionally, first flange 122g of panel 106g includes a protrusion 122g' extending from the first edge 126g of the primary portion 120g of the panel 106g and a tab 122g'' extending from the protrusion 122g'. Furthermore, second flange 124f of panel 106f may be matingly coupled to the first flange 122g of panel 106g such that protrusion 124f' of second flange 124f is adjacent to protrusion 122g' of first flange 122g; and tab 124f'' of second flange 124f is adjacent to and substantially parallel with tab 122g'' of first flange 122g.

Although the present invention has been described with several embodiments, diverse changes, substitutions, variations, alterations, and modifications may be suggested to one skilled in the art, and it is intended that the invention encompass all such changes, substitutions, variations, alterations, and modifications as fall within the spirit and scope of the appended claims.

WHAT IS CLAIMED IS:

1. A fence system, comprising:

a support member;

a rail attached to the support member such that the rail extends across the support member;

a first panel and a second panel each comprising:

a primary panel portion having a first edge and a second edge;

a first flange located along at least a portion of the first edge of the primary panel portion; and

a second flange located along at least a portion of the second edge of the primary panel portion;

the first and second panels secured to the rail such that the second edge of the primary panel portion of the first panel is adjacent to the first edge of the primary panel portion of the second panel, the second flange of the first panel being matingly coupled to the first flange of the second panel.

2. The system of Claim 1, wherein the first and second panels comprise one or more apertures, the one or more apertures facilitating visibility through the first and second panels.

3. The system of Claim 1, wherein the rail is coupled to the post using a rail hanger component.

4. The system of Claim 1, wherein the first and second panels are secured to the rail using one or more fasteners.

5. The system of Claim 1, wherein the first and second panels are secured to the rail by clinching the first and second panels to the rail.

6. The system of Claim 1, wherein:

the second flange of the first panel comprises:

a protrusion extending from the second edge of the primary panel portion of the first panel; and

a tab extending from the protrusion; and

the first flange of the second panel comprises:

a protrusion extending from the first edge of the primary panel portion of the second panel; and

a tab extending from the protrusion; and

the second flange of the first panel is matingly coupled to the first flange of the second panel such that:

the protrusion of the second flange of the first panel is adjacent to the protrusion of the first flange of the second panel; and

the tab of the second flange of the first panel is adjacent to and substantially parallel with the tab of the first flange of the second panel.

7. The system of Claim 6, wherein the tab of the second flange of the first panel and the tab of the first flange of the second panel are both adapted to be secured to the rail and to each other using a single fastening mechanism.

8. The system of Claim 6, wherein the protrusion and the tab of the second flange of the first panel form a channel adapted to contain at least a portion of a fastener coupling the first and second panel to the rail.

9. The system of Claim 6, wherein:

the protrusion of the second flange of the first panel extends in a direction substantially perpendicular to the primary panel portion of the first panel;

the tab of the second flange of the first panel extends in a direction substantially parallel to the primary panel portion of the first panel;

the protrusion of the first flange of the second panel extends in a direction substantially perpendicular to the primary panel portion of the second panel; and

the tab of the first flange of the second panel extends in a direction substantially parallel to the primary panel portion of the second panel.

10. The system of Claim 1, wherein:

the first panel is secured to the rail at a first angle;

the second panel is secured to the rail at a second angle, the second angle being different than the first angle; and

the second flange of the first panel is matingly coupled to the first flange of the second panel such that one or more of the first and second flanges close a gap defined by the second edge of the primary panel portion of the first panel and the first edge of the primary panel portion of the second panel.

11. A method for constructing a fence system, comprising:

setting a support member in a foundation;

attaching a rail to the support member such that the rail extends across the support member;

securing a first panel and a second panel to the rail, the first and second panels each comprising:

a primary panel portion having a first edge and a second edge;

a first flange located along at least a portion of the first edge of the primary panel portion; and

a second flange located along at least a portion of the second edge of the primary panel portion;

the first and second panels being secured to the rail such that the second edge of the primary panel portion of the first panel is adjacent to the first edge of the primary panel portion of the second panel, the second flange of the first panel being matingly coupled to the first flange of the second panel.

12. The method of Claim 11, wherein the first and second panels comprise one or more apertures, the one or more apertures facilitating visibility through the first and second panels.

13. The method of Claim 11, comprising coupling the rail to the post using a rail hanger component.

14. The method of Claim 11, comprising securing the first and second panels to the rail using one or more fasteners.

15. The method of Claim 11, comprising securing the first and second panels to the rail by clinching the first and second panels to the rail.

16. The method of Claim 11, wherein:

the second flange of the first panel comprises:

a protrusion extending from the second edge of the primary panel portion of the first panel; and

a tab extending from the protrusion; and

the first flange of the second panel comprises:

a protrusion extending from the first edge of the primary panel portion of the second panel; and

a tab extending from the protrusion; and

the second flange of the first panel is matingly coupled to the first flange of the second panel such that:

the protrusion of the second flange of the first panel is adjacent to the protrusion of the first flange of the second panel; and

the tab of the second flange of the first panel is adjacent to and substantially parallel with the tab of the first flange of the second panel.

17. The method of Claim 16, wherein the tab of the second flange of the first panel and the tab of the first flange of the second panel are both adapted to be secured to the rail and to each other using a single fastening mechanism.

18. The method of Claim 16, wherein the protrusion and the tab of the second flange of the first panel form a channel adapted to contain at least a portion of a fastener coupling the first and second panel to the rail.

19. The method of Claim 17, wherein:

the protrusion of the second flange of the first panel extends in a direction substantially perpendicular to the primary panel portion of the first panel;

the tab of the second flange of the first panel extends in a direction substantially parallel to the primary panel portion of the first panel;

the protrusion of the first flange of the second panel extends in a direction substantially perpendicular to the primary panel portion of the second panel; and

the tab of the first flange of the second panel extends in a direction substantially parallel to the primary panel portion of the second panel.

20. The method of Claim 11, wherein

the first panel is secured to the rail at a first angle;

the second panel is secured to the rail at a second angle, the second angle being different than the first angle; and

the second flange of the first panel is matingly coupled to the first flange of the second panel such that one or more of the first and second flanges close a gap defined by the second edge of the primary panel portion of the first panel and the first edge of the primary panel portion of the second panel.

21. A panel, comprising:

a primary panel portion having a first edge and a second edge;

a first flange located along at least a portion of the first edge, the first flange comprising:

a protrusion adjoining the primary panel portion along the first edge and extending in a first direction; and

a tab adjoining the protrusion and extending in a second direction; and

the first flange adapted to matingly couple with a flange of another panel.

22. The panel of Claim 21, comprising a second flange located along at least a portion of the second edge, the second flange comprising:

a protrusion adjoining the primary panel portion along the second edge and extending in the first direction; and

a tab adjoining the protrusion and extending in the second direction.

FIG. 1A

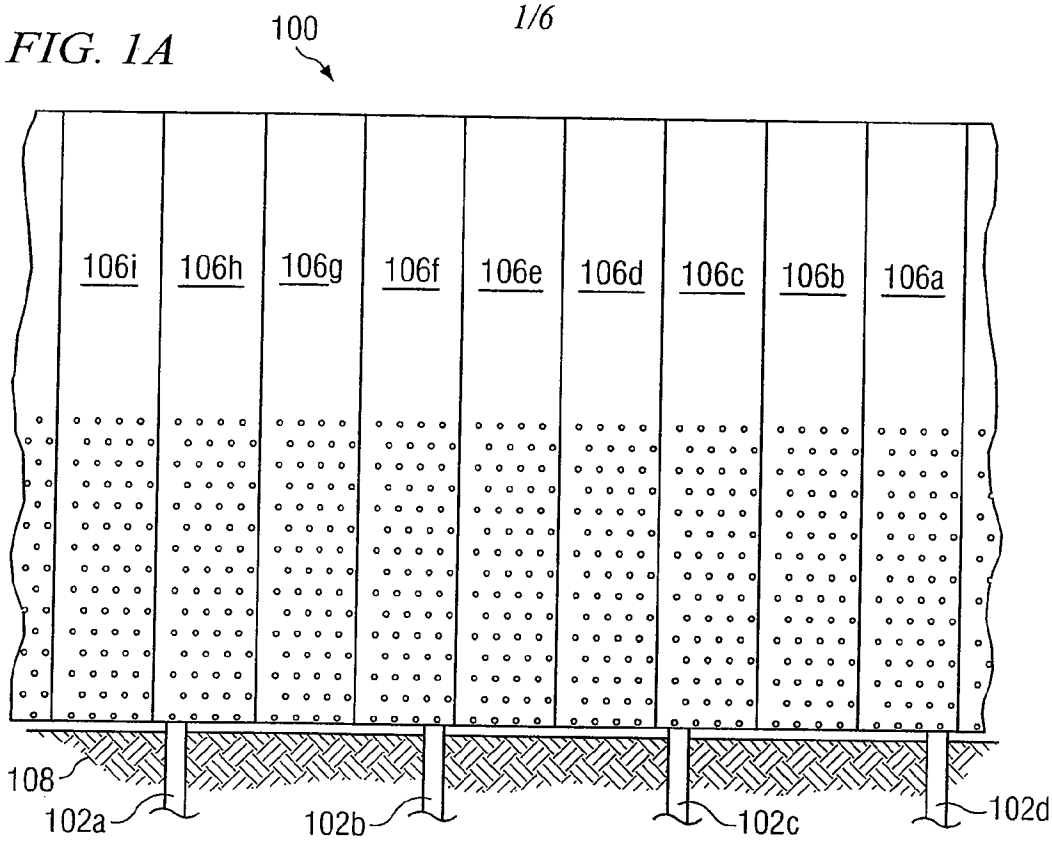
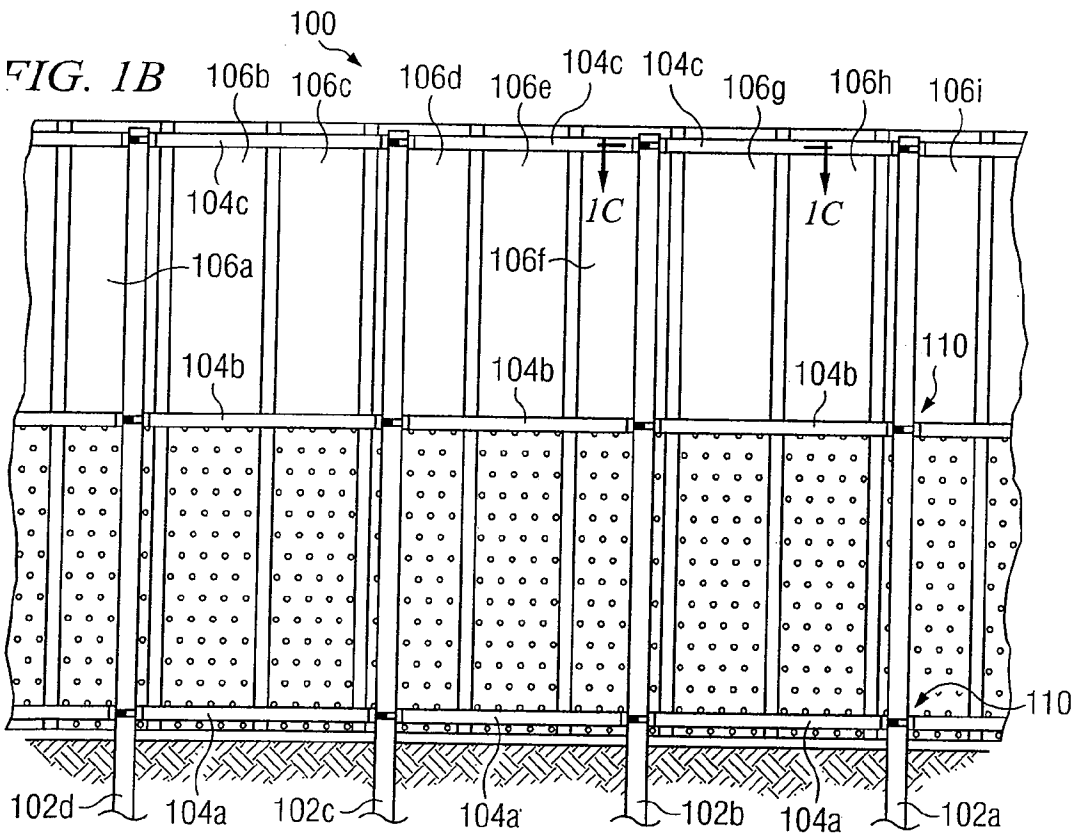

100
106i
106h
106g
106f
106e
106d
106c
106b
106a
108
102a
102b
102c
102d

FIG. 1B


100
106b
106c
106d
106e
104c
104c
106g
106h
106i
104c
1C
1C
106a
106f
104b
104b
104b
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102d
104a
102c
104a
102b
104a
102a

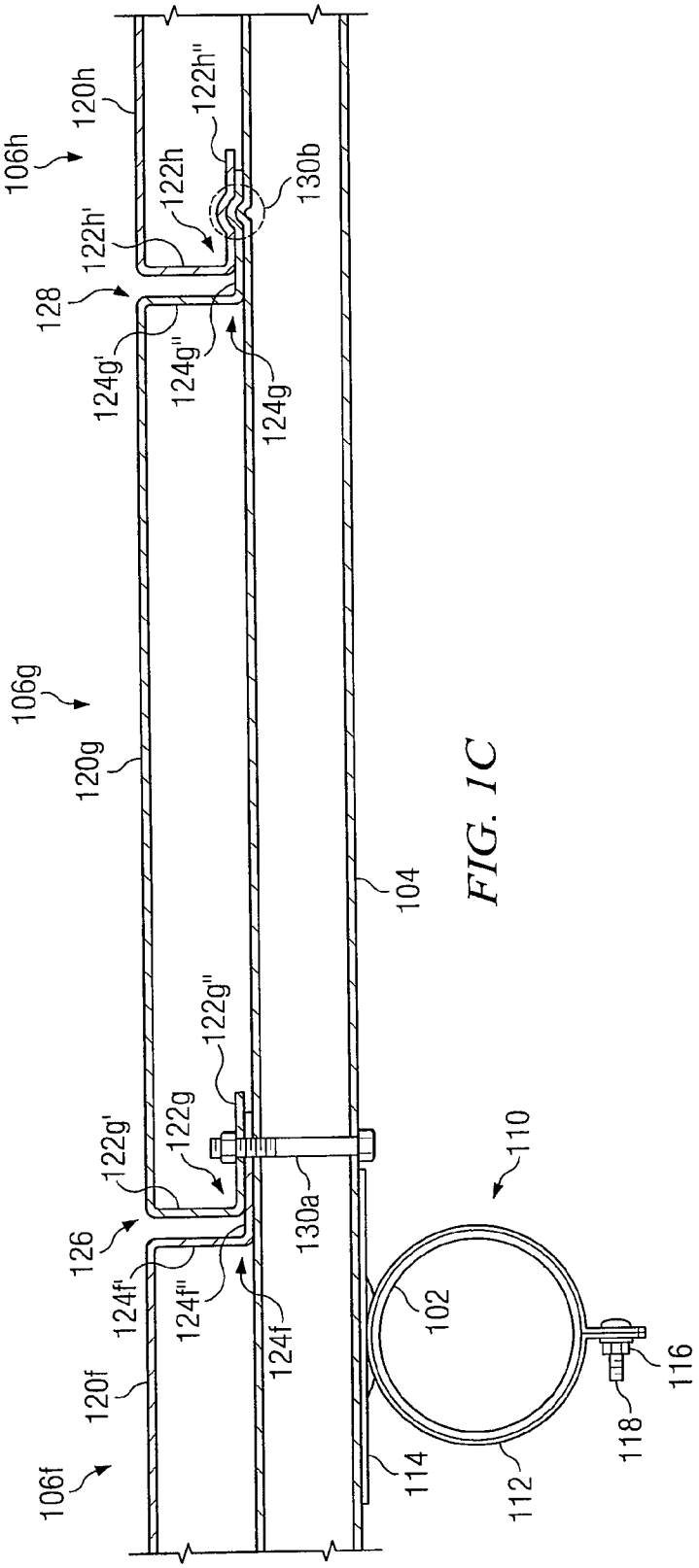

106h
120h
122h"
122h
130b
122h'
128
124g'
124g"
124g
106g
120g
104
122g"
122g
122g'
110
126
130a
124f'
124f"
124f
102
120f
116
106f
114
118
112

FIG. 1C

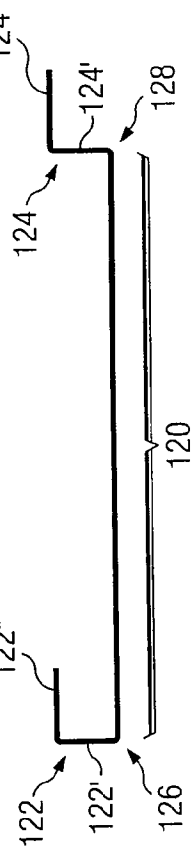

124"
124'
128
124
120
122"
122
122'
126

FIG. 1E

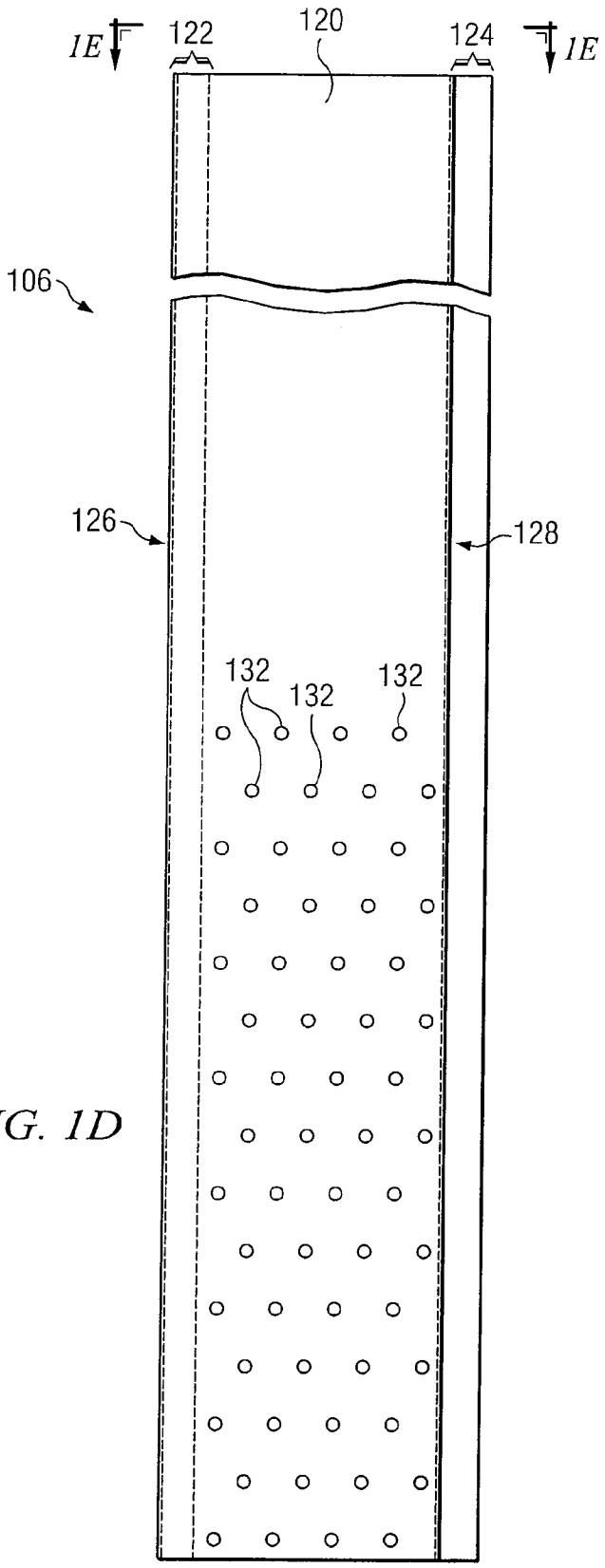


FIG. 1D

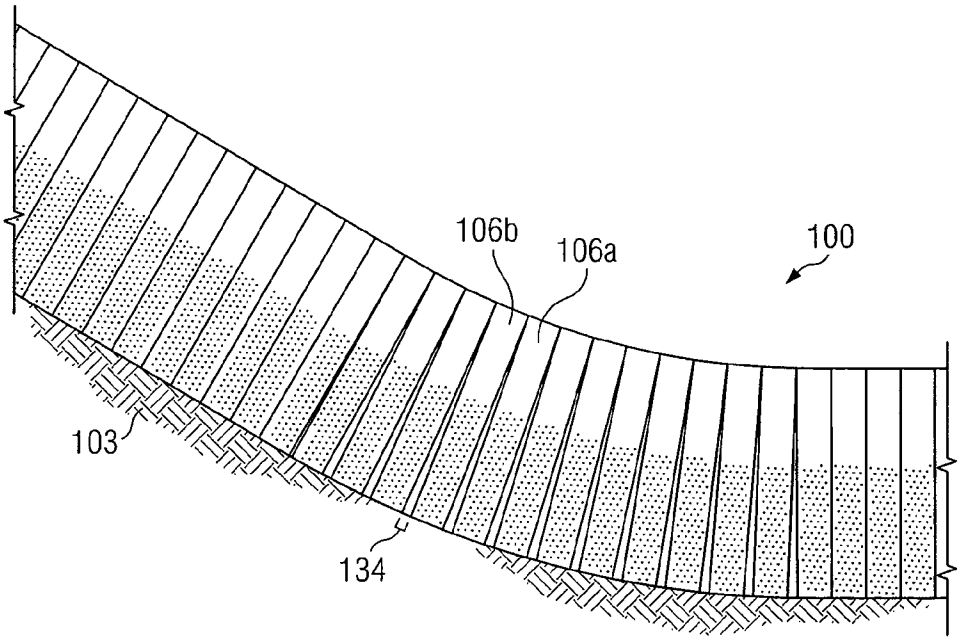


FIG. 2A

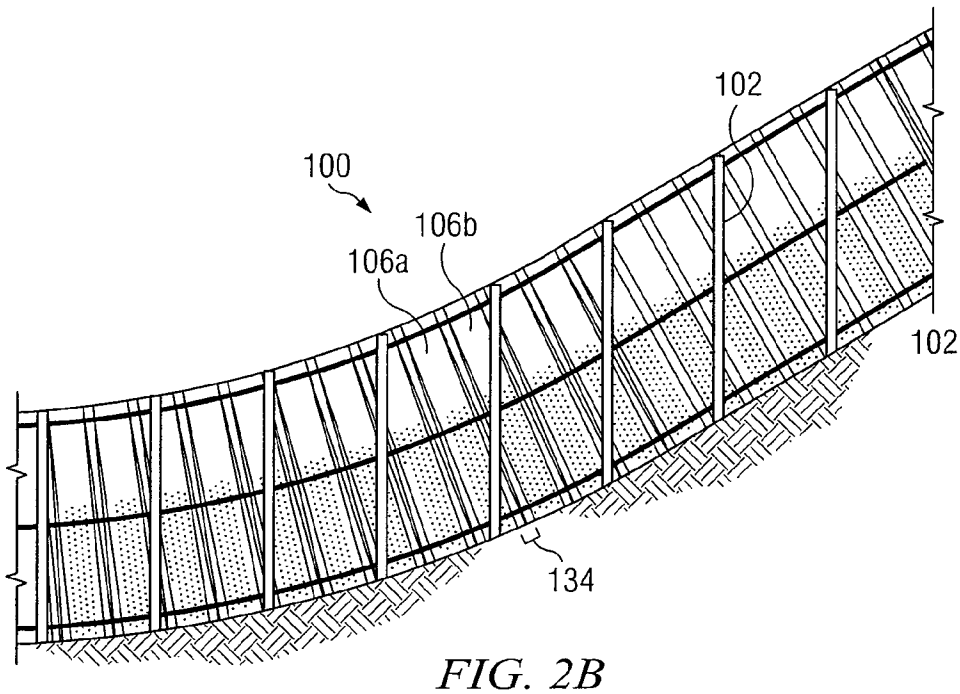


FIG. 2B

FIG. 3

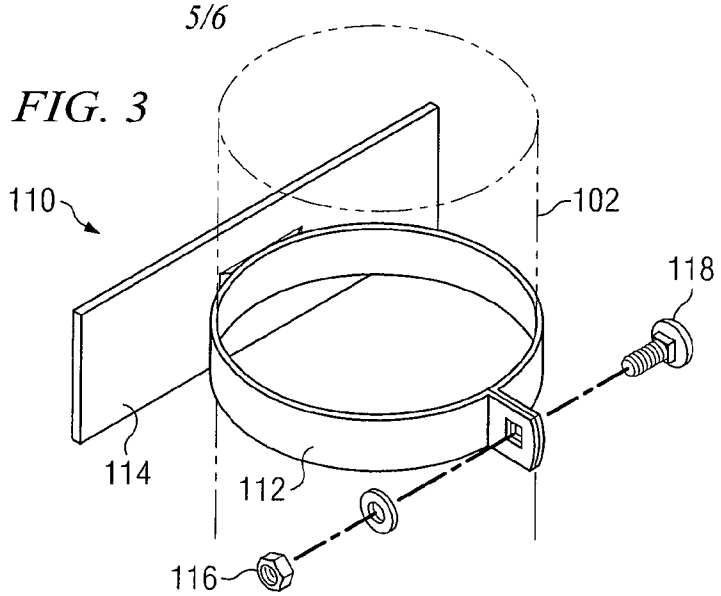


FIG. 4A

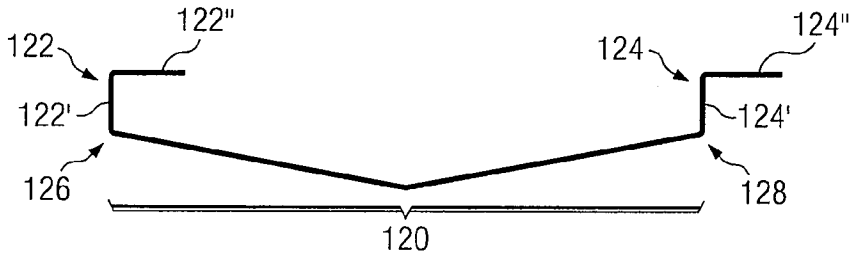


FIG. 4B

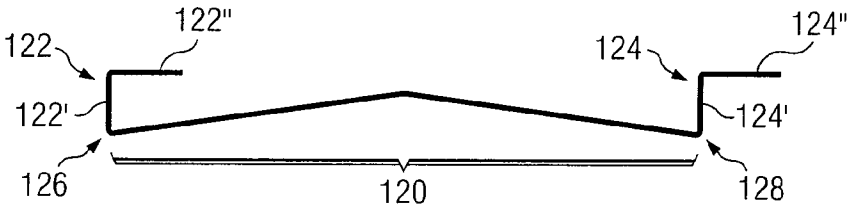


FIG. 4C

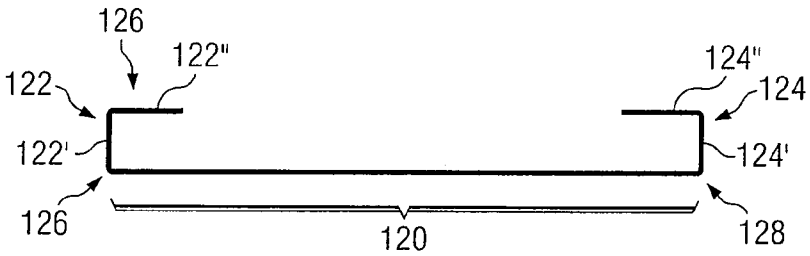
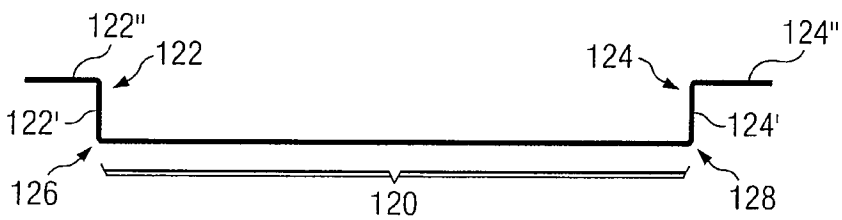


FIG. 4D



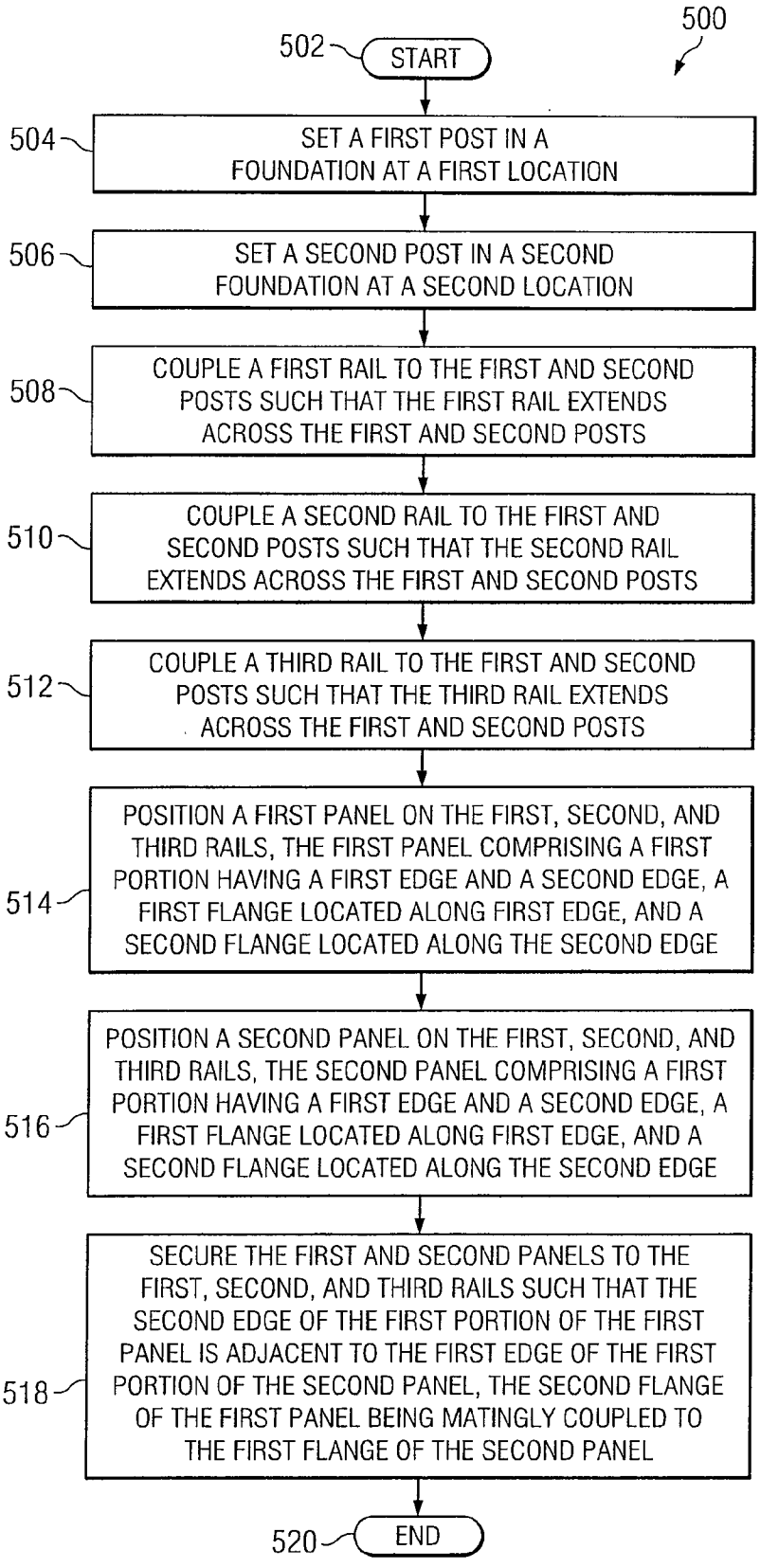

500
502
START
504
SET A FIRST POST IN A FOUNDATION AT A FIRST LOCATION
506
SET A SECOND POST IN A SECOND FOUNDATION AT A SECOND LOCATION
508
COUPLE A FIRST RAIL TO THE FIRST AND SECOND POSTS SUCH THAT THE FIRST RAIL EXTENDS ACROSS THE FIRST AND SECOND POSTS
510
COUPLE A SECOND RAIL TO THE FIRST AND SECOND POSTS SUCH THAT THE SECOND RAIL EXTENDS ACROSS THE FIRST AND SECOND POSTS
512
COUPLE A THIRD RAIL TO THE FIRST AND SECOND POSTS SUCH THAT THE THIRD RAIL EXTENDS ACROSS THE FIRST AND SECOND POSTS
514
POSITION A FIRST PANEL ON THE FIRST, SECOND, AND THIRD RAILS, THE FIRST PANEL COMPRISING A FIRST PORTION HAVING A FIRST EDGE AND A SECOND EDGE, A FIRST FLANGE LOCATED ALONG FIRST EDGE, AND A SECOND FLANGE LOCATED ALONG THE SECOND EDGE
516
POSITION A SECOND PANEL ON THE FIRST, SECOND, AND THIRD RAILS, THE SECOND PANEL COMPRISING A FIRST PORTION HAVING A FIRST EDGE AND A SECOND EDGE, A FIRST FLANGE LOCATED ALONG FIRST EDGE, AND A SECOND FLANGE LOCATED ALONG THE SECOND EDGE
518
SECURE THE FIRST AND SECOND PANELS TO THE FIRST, SECOND, AND THIRD RAILS SUCH THAT THE SECOND EDGE OF THE FIRST PORTION OF THE FIRST PANEL IS ADJACENT TO THE FIRST EDGE OF THE FIRST PORTION OF THE SECOND PANEL, THE SECOND FLANGE OF THE FIRST PANEL BEING MATINGLY COUPLED TO THE FIRST FLANGE OF THE SECOND PANEL
520
END

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/049218

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04H17/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 442 587 A (TRASCHER KEN [US]) 9 April 2008 (2008-04-09)	1,6,9, 11,16, 19,21-22
Y	page 2, line 26 - page 3, line 30	3,13
A	page 5, lines 1-11 page 8, lines 1-8; figures 1,5,5A	5,7-8, 15,17-18
X	GB 2 440 723 A (FROUD ROBERT THOMAS JAMES [GB]) 13 February 2008 (2008-02-13)	1-2,4, 11-12,14
A	page 1, line 1 page 4, line 1 - page 5, line 25 page 6, lines 10-14; figures 1-4	5
X	US 5 904 343 A (PARTH LEOPOLD [US]) 18 May 1999 (1999-05-18) column 6, line 42 - column 8, line 43; figures 1-4	21-22

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 October 2009	13/10/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Decker, Robert

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/049218

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 931 449 A (GWALTNEY LORENE [US]) 3 August 1999 (1999-08-03) column 3, line 65 - column 4, line 15; figures 1-4	21-22
X	US 4 561 233 A (HARTER JAMES W [US]; SMAGIEL GARY S [US]) 31 December 1985 (1985-12-31) column 1, line 22 - column 3, line 14; figures 1,2,6 and 7	21-22
X	US 4 192 117 A (HEINRICH WILLIAM C [US]) 11 March 1980 (1980-03-11) column 2, line 39 - column 3, line 58; figures 1,2	21-22
Y	US 5 277 408 A (PARKER ALTON B [US]) 11 January 1994 (1994-01-11) abstract	3,13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/049218

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