**EUROPEAN PATENT SPECIFICATION**

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<tr>
<th>(45)</th>
<th>Date of publication and mention of the grant of the patent:</th>
<th>(51)</th>
<th>Int Cl.:</th>
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<tbody>
<tr>
<td>07.08.2019 Bulletin 2019/32</td>
<td><strong>E02D 29/02</strong>(2006.01) <strong>E01F 15/08</strong>(2006.01)</td>
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<th>(21)</th>
<th>Application number:</th>
<th>(86)</th>
<th>International application number:</th>
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<td>14753694.0</td>
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<td>PCT/US2014/015660</td>
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<th>(22)</th>
<th>Date of filing:</th>
<th>(87)</th>
<th>International publication number:</th>
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**PRECAST LEVELING SEGMENT BELOW A TRAFFIC BARRIER ATOP AN EARTH RETAINING WALL SYSTEM**

**VORGEFERTIGTES NIVELLIERUNGSELEMENT UNTER EINER VERKEHRSSCHRANKE ÜBER EINEN ERDSTÜTZWANDSYSTEM**

**SEGMENT PRÉFABRIQUÉ DE MISE À NIVEAU DESTINÉ À ÊTRE PLACÉ SOUS UNE GLISSIÈRE DE SÉCURITÉ, SUR UN SYSTÈME DE MUR DE SOUTÈNEMENT**

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<th>(30)</th>
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<td>US-B2- 7 695 268</td>
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Description

Background

[0001] Precast concrete earth retaining walls are commonly used for architectural, site development and roadway/highway construction applications. When roadways are located above or rest on top of the completed earth retaining wall, a traffic barrier segment is required to prevent vehicles from falling off of the retaining wall. Therefore, a traffic barrier segment is required to contain the impact from vehicles to keep them from falling over the retaining wall.

[0002] US 2011/0318100 relates to an earth retaining wall system including courses of modular blocks, each block having a front face portion and a web portion extending behind it. A traffic barrier is included in the top course of blocks.

Brief Description Of The Drawings

[0003] Many aspects of the invention can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present invention. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. 1 is a view of the exemplary precast traffic barrier segment in accordance with a first comparative example of the disclosure;
FIG. 2 is a cross sectional view of an earth retaining wall with the exemplary precast traffic barrier segment of FIG. 1 sitting on top of an earth retaining wall;
FIG. 3 is an elevation view of an earth retaining wall with the exemplary precast traffic barrier segment of FIG. 1 making up the top row of precast concrete segments;
FIG. 4 is a side view of the exemplary precast traffic barrier segment of FIG. 1;
FIG. 5 is a top view of the exemplary precast traffic barrier segment of FIG. 1;
FIG. 6 is a back view of the exemplary precast traffic barrier segment of FIG. 1.
FIG. 7 is a view of the exemplary precast traffic barrier segment that interact with adjacent segments in accordance with a second comparative example of the disclosure;
FIG. 8 is a cross sectional view of an earth retaining wall with the exemplary precast traffic barrier segment of FIG. 7 that interact with adjacent segments sitting on top of an earth retaining wall;
FIG. 9 is an elevation view of an earth retaining wall with the exemplary precast traffic barrier segment of FIG. 7 that interact with adjacent segments making up the top row of precast concrete segments;
FIG. 10 is a side view of the exemplary precast traffic barrier segment of FIG. 7 that interact with adjacent segments;
FIG. 11 is a top view of the exemplary precast traffic barrier segment of FIG. 7 that interact with adjacent segments;
FIG. 12 is a back view of the exemplary precast traffic barrier segment of FIG. 7 that interact with adjacent segments
FIG. 13 is a view of the exemplary precast leveling segment in accordance with a third example being an embodiment of the invention;
FIG. 14 is a cross sectional view of an earth retaining wall with the exemplary precast leveling segment of FIG. 13 sitting as the top course of an earth retaining wall and just underneath the traffic barrier course;
FIG. 15 is an elevation view of an earth retaining wall with the exemplary precast leveling segment of FIG. 13 making up the second from the top row of precast concrete segments;
FIG. 16 is a side view of the exemplary precast leveling segment of FIG. 13.

Detailed Description

[0004] Disclosed herein various embodiments of precast traffic barrier segments that are designed to rest above an earth retaining wall of precast segments to prevent traffic from falling over the retaining wall. The objective of the current invention as defined by claim 1 is to allow a uniform height precast traffic barrier be installed parallel and to the alignment grade of the proposed roadway grade above the wall even though the supporting retaining wall is constructed and installed in parallel uniform height segments along courses of modular precast units. In order to provide a differing height required to follow a roadway grade that varies along the wall length especially in vertical curves of the changing roadway grade, a leveling or variable height course of modular concrete segment block units is required. The current invention, with the use of a tilting table to cast the leveling units at various heights/angles, modifies the immediate course below the uniform height traffic barrier course to allow the traffic barrier to follow the changing vertical grade of the roadway.

[0005] When roadways, driveways or vehicle access is planned above an earth retaining wall, a barrier to prevent traffic from falling over the walls leading edge is typically required. Traditionally, a guard rail or poured in place concrete traffic barrier segment is installed above the retaining wall to contain vehicles above the earth retaining wall in the planned drive isle or roadway. The exemplary embodiments expedite installation of the traffic barrier segment by making it a part of the earth retaining wall system where the barrier segment can act as the top row of modular precast retaining wall system and provide resistance to overturning by using the backfill soil weight resting on the horizontal triangular stem. The downward pressure of the soil backfill beside
and on top of the horizontal stem provides the resisting pressure to have the exemplary precast traffic barrier segment act as a cantilever foundation/vertical wall and resist impact loads from vehicles on the portion of the barrier segment extending above grade.

Generally speaking, the portion of the traffic barrier segment extending above grade has a shape that varies depending upon a state’s rules and regulations (promulgated by the Department of Transportation), which define certain acceptable geometries and dimensions for barrier segments installed along roadways/highways of the state. Therefore, the geometry of the traffic barrier segment’s vertical portion extending above roadway grade may vary from state to state.

First Comparative Example(s)

Referring to FIG. 1, an exemplary precast traffic barrier segment 100 has a vertical face 130 that extends above roadway grade and a face 120 extending below roadway grade that consists of the upper part of the underlying earth retaining wall. The top of the barrier segment portion 140 above roadway grade is typically 32 inches above the roadway or driveway surface elevation. The back face of the barrier segment extending above grade is 180 where the vehicular impact would occur as well as the slanted portion 150. The overall stability of the exemplary precast traffic barrier segment is prevented from overturning by a counterweight from backfill soil resting beside and above the rear stem 190. A triangular portion 110 of the rear stem helps capture the surrounding backfill soils weight to add resisting force by means of downward weight on the exemplary traffic barrier segment stem 190. The top of the stem 160 is approximately 30 inches below the drive or roadway grade to allow the installation of utilities and pavement section not obscured by the precast traffic barrier piece or segment.

FIG. 2 shows a cross section 200 of the elevated roadway grade 220 sitting on top of the earth retaining wall. The stem 190 of the exemplary precast traffic barrier segment sits well below the pavement grade 220 to prevent interference. To keep the exemplary precast traffic barrier segment from sliding on top of the retaining wall, two protruding lugs 170 extend below the exemplary traffic barrier segment to lock into the top concrete precast segment of the earth retaining wall. For installation of the exemplary precast traffic barrier segment, a square hole 240 is cast into the exemplary precast traffic barrier segment to facilitate lifting and hoisting into place. A diagonal portion of the stem 210 is required to transfer the downward cantilever pressure on the stem 190 to the vertical portion of the exemplary precast traffic barrier segment to prevent impact on the face 120 of the barrier segment facing vehicular traffic.

In looking at an elevation view, FIG. 3, of the front face of the earth retaining wall, the exemplary precast traffic barrier segment 100 makes up the top row of the concrete earth retaining wall to complete or top out the earth retaining wall soil retention requirements. The grade of the proposed roadway 220 is below the barrier segment portion of the precast traffic barrier segment but above the stem portion 190 of the traffic barrier segment.

In FIG. 4, the exemplary precast traffic barrier segment 100 is shown to illustrate the unique features. The lower locking lugs 170 extend below the bottom of the stem 190 to lock into the earth retaining wall system below. The front face 120 of the precast traffic barrier segment is in vertical alignment with the underlying retaining wall face to complete the earth retaining wall vertical plane alignment. FIG. 5 shows the top view to illustrate the triangular sides 110 of the stem 190 cover approximately 50% of the overall counterweight area of backfill soil that is available to provide weight for overturning resistance. The triangular stem portions 110 allow the reduced horizontal coverage area and hence save precast concrete area/volume.

It should be emphasized that the above described invention of the present disclosure is to implement an arching effect within the earth retaining wall backfill soils by the triangular stem to take advantage of the soil backfill vertical weight to provide resisting force from horizontal vehicular impact on the portion of the stem above the driveway or roadway grade. The dimensions of the portion of the barrier segment above grade may vary depending upon various Department of Transportation guidelines for impact barrier segments along roadways.

Second Comparative Example(s)

When roadways are located above or rest on top of the completed earth retaining wall, a traffic barrier segment may be required to handle large impact loads from trucks or other large vehicles. The results may be more pressure than the individual segments can resist from overturning and sliding. Therefore, the attachment of one segment to the next horizontally in order to share the impact load may be required. In this instance, a groove is cast in the side of the segment with a slip joint to allow the segments to work together in resisting the impact.

The exemplary embodiment allows the individual segments to carry more impact load by interacting with the adjacent segments to provide more resistance than any one segment can exhibit alone. Also, the groove is such that when setting the segments in place, the adjacent segment slides down over the top to expedite installation of these traffic barrier segments. Also, the groove allows the alignment of the segments to be kept in line so the segments do not protrude out from one another that could snag a vehicle that comes in contact
Referring to FIG. 7, the exemplary precast traffic barrier segment 300 has a vertical face 330 that extends above roadway grade and a face 320 extending below roadway grade that consists of the upper portion of the underlying earth retaining wall. The top of the barrier segment portion 340 above roadway grade is typically 36 inches above the roadway or driveway surface elevation. The back face of the barrier segment extending above grade is 380 where the vehicular impact would occur as well as the slanted portion 350. The overall stability of the exemplary precast traffic barrier segment is prevented from overturning by a counterweight from backfill soil resting beside and above the rear stem 390. A triangular portion 310 of the rear stem helps capture the surrounding backfill soils weight to add resisting force by means of downward weight on the exemplary traffic barrier segment 390. The top of the stem 360 is approximately 30 inches below the drive or roadway grade to allow the installation of utilities and pavement section not obscured by the precast traffic barrier segment piece or segment. A vertical node 430 protrudes out the side of the segment to fit into the adjoining segment grooves 440 to allow interconnectivity. The groove does not extend all the way to the top of the segment but terminates at 450 to not expose the joint and hide from view.

FIG. 8 shows a cross section 400 of the elevated roadway grade 420 sitting on top of the earth retaining wall. The stem 390 of the exemplary precast traffic barrier segment sits well below the pavement grade 420 to prevent interference. To keep the exemplary precast traffic barrier segment from sliding on top of the retaining wall, two protruding lugs 370 extend below the exemplary traffic barrier segment to lock into the top concrete precast segment of the earth retaining wall. For installation of the exemplary precast traffic barrier segment, a square hole 420 is cast into the exemplary precast traffic barrier segment to facilitate lifting and hoisting into place. A diagonal portion of the stem 410 is required to transfer the downward cantilever pressure on the stem 390 to the vertical portion of the exemplary precast traffic barrier segment to prevent impact on the face 380 of the barrier segment facing vehicular traffic. The vertical slot 440 receives the adjacent vertical node 430 to interlock and allow connectivity and shared resistance when impacted.

In looking at an elevation view, FIG. 9, of the front face of the earth retaining wall, the exemplary precast traffic barrier segment 300 makes up the top row of the concrete earth retaining wall to complete or top out the earth retaining wall soil retention requirements. The grade of the proposed roadway 420 is below the barrier segment portion of the precast traffic barrier segment, but above the stem portion 390 of the traffic barrier segment. The segments connect horizontally by a node and vertical channel 460 to share impact loads from vehicles.

In FIG. 10, the exemplary precast traffic barrier segment 300 is shown to illustrate the unique features. The lower locking lugs 370 extend below the bottom of the stem 390 to lock into the earth retaining wall system below. The front face 320 of the precast traffic barrier segment is in vertical alignment with the underlying retaining wall face to complete the earth retaining wall vertical plane alignment. The vertical slot 440 is to receive the vertical node from the adjacent segment. FIG. 11 shows the top view to illustrate the triangular sides 310 of the stem 390 to receive vertical slot or channel 440. FIG. 12 is a rear view of the exemplary precast traffic barrier segment 300 which shows the diagonal connection arm 410 from the top of the stem 360 up to the vertical portion of the traffic barrier segment 380 and 350. The vertical node 430 is shown as well as the receiving vertical slot or channel 440.

It should be emphasized that the second embodiment implements an arching effect within the earth retaining wall backfill soils by the triangular stem to take advantage of the soil backfill vertical weight to provide resisting force from horizontal vehicular impact on the portion of the stem above the drive isle or roadway grade. The dimensions of the portion of the barrier segment above grade may vary depending upon various Department of Transportation guidelines for impact barrier segments along roadways. The vertical node on one side and vertical slot or channel on the opposite side allows horizontal interaction of adjacent segments to share vehicle impact loads.

In FIG. 13, shown is an exemplary precast leveling segment 500. The precast leveling segment 500 has a front portion 320, horizontal stem 390, and an alignment seat 185. The front portion 320 comprises a front surface 530, a rear surface 535, a top surface 540, and a bottom surface 545. The top surface 540 may slope in parallel to an above roadway. The bottom surface 545 is parallel to an underlying earth retaining wall. For example, the top surface 540 may run parallel to a roadway above the precast leveling segment 500 that slopes from the left side 560 to the right side 550 whereas the bottom surface 545 may run parallel to an underlying earth retaining wall that does not slope. In this example, the top surface 540 is not parallel to the bottom surface 545 but the bottom surface 545 is perpendicular to the front surface 530. Continuing the example, the height of the left side 560 is greater than the height of the right side 550 to facilitate the top surface 540 running parallel to the roadway above. Allowing the top surface 540 to run parallel to the roadway and the bottom surface 545 to run parallel to the underlying earth retaining wall.
prevents the need to slope the underlying earth retaining wall.

The horizontal stem 590 extends outwardly from a rear surface 535 of the front portion 320. The horizontal stem 590 comprises a triangular portion 310 extending left and right from the top surface 570 of the horizontal stem 590. The triangular portion 310 of the horizontal stem 590 helps capture the weight of the surrounding backfill soil to add resisting force by means of downward weight on the precast leveling segment 500. Two open boxed cavities 520 are cast into the lower section of the precast leveling segment 500 to allow lifting for placement. The alignment seat 165 has right and left aligning elements 370 that align the leveling segment to an underlying earth retaining wall.

In reference to FIG. 14, a cross section 600 of a sloping elevated roadway grade 420 is shown sitting on top of an earth retaining wall. The elevated roadway grade 420 slopes toward the viewer of FIG. 14. The top surface 540 of the front portion of the precast leveling segment 500 slopes toward the viewer of FIG. 14 parallel to the elevated roadway grade 420. One of two protrusions 170 is shown. The protrusion 170, along with the other, nonvisible protrusion, locks into the precast segment below. A horizontal stem 590 comprises at least a triangular portion 310 and square holes 240. For installation of a precast leveling segment 500, two square holes 240 are cast into the precast leveling segment 500 for lifting and hoisting the precast leveling segment 500 into place. A horizontal stem 590 parallel to the traffic barrier above is required to transfer downward vertical pressure from a traffic barrier above to the horizontal stem 590 below the precast leveling segment 500.

FIG. 15 depicts an elevation view of the front face of the earth retaining wall. A leveling course 505 of precast leveling segments 500a, 500b, and 500c makes up the designated row below the elevated roadway grade 420. Although many precast leveling segments are depicted, the leveling course 505 may comprise one or more precast leveling segments. The top surfaces 540a, 540b, and 540c of the precast leveling segments 500a, 500b, and 500c slope parallel to the sloping elevated roadway grade 420. Thus, the front surfaces 540 of the precast leveling segments 500a, 500b, and 500c may increase or decrease relative to the precast leveling segments 500a, 500b, and 500c immediately to the left or right as the elevated roadway grade 420 increases or decreases. The precast leveling segments are in an order that maintains a predefined distance between the elevated roadway grade 420 and the top surfaces 540a, 540b, and 540c. For example, the distance between a point at the top of the left edge 560a and a point 422a on the roadway that is on a line parallel to the left edge 560a equals the distance between a point at the top of the right edge 550a and a point 422b on the roadway that is on a line parallel to the right edge 550a.

In one embodiment, the first front surface height of the right edge 550a of a first precast leveling segment 500a is greater than a second front surface height of the right edge 550b of a second precast leveling segment 500b. Therefore, the top surfaces 540a and 540b slope parallel to the elevated roadway grade 420 above the leveling course 505. The precast leveling segments 500a, 500b, and 500c are aligned such that the height of the right edge 550a of the first precast leveling segment 500a is within a predefined delta of the height of the left edge 560b of the second precast leveling segment 500b to ensure a gradual slope parallel to the elevated roadway grade 420 above. In alternative embodiments, the height of the left edge 560b may be greater than the height of left edge 560a when the elevated roadway grade 420 increases slope or the height of the left edge 560b may be less than the height of left edge 560a when the elevated roadway grade 420 decreases slope.

In FIG. 16, a side view of a precast leveling segment 500 is shown. Shown is a front portion 520, horizontal stem 590, and alignment seat 515. The front portion 530 comprises a front surface 525, a top surface 540, a rear surface 535, and a bottom surface 545. The horizontal stem 590 attaches to the rear surface 535 of the front portion 520. The top surface 540 slopes downward, with a greater height of the left edge 560 than the height of the right edge 550. The horizontal stem 590 comprises a top surface 570 and a triangular portion 310. Two square holes 520 are cast into the horizontal stem 590 of the precast leveling segment 500 for lifting and hoisting the precast leveling segment 500 into place. The alignment seat 515 comprises at least lower aligning elements 370 that extend below the horizontal stem 310 to lock in to the earth retaining wall system below. The lower aligning elements 370 may be locking lugs.

Claims

1. A system comprising:

   a precast roadway barrier segment (100);
   a substantially level underlying earth retaining wall; and
   a leveling course (505) situated below the precast roadway barrier segment and above the substantial level underlying earth retaining wall, the leveling course comprising at least one precast leveling segment (500), the at least one precast leveling segment comprising at least:

   a top surface (540) parallel to a sloped road-
way (420) situated above the leveling course;
a bottom surface (545) parallel to a top precast segment of the substantially level underlying earth retaining wall situated below the leveling course;
a horizontal stem (590) extending outwardly from a rear surface (535) of a front portion (520) of the at least one precast leveling segment, wherein the horizontal stem extends from the top surface to the bottom surface, a lower portion of the horizontal stem comprising a triangular portion (310) extending outwardly from a left side and a right side of the horizontal stem, and the triangular portion of the horizontal stem comprising two cavities (520) disposed along a face of at least one side of the triangular portion; and
an alignment seat (165) extending along at least a portion of the horizontal stem, wherein the substantially level underlying earth retaining wall is nonparallel to the sloped roadway.

8. The system of claim 6, wherein the leveling course comprises a plurality of the precast leveling segments.

9. The system of claim 8, wherein a respective front portion of a first precast leveling segment of the plurality of the precast leveling segments is aligned with a respective front portion of a second precast leveling segment of the plurality of the precast leveling segments.

10. The system of claim 1, wherein at least a portion of the precast roadway barrier segment is above the sloped roadway.

Patentansprüche

1. System, aufweisend:

2. The system of claim 1, wherein the top surface (540) of the precast leveling segment (500) is accordingly nonparallel to the bottom surface (545).

3. The system of claim 1, further comprising a plurality of heights corresponding to a distance between a plurality of points on the top surface and respective ones of a plurality of points on the bottom surface (545) of the precast leveling segment (500).

4. The system of claim 3, wherein each one of the plurality of heights equals a distance between the bottom surface at a bottom surface point corresponding to a respective one of the plurality of points along the top surface and the sloped roadway at a roadway point corresponding to the respective one of the plurality of points on the top surface.

5. The system of claim 1, wherein the alignment seat interlocks the at least one precast leveling segment with at least one precast segment of the earth retaining wall.

6. The system of claim 1, wherein a front surface of the front portion of the precast leveling segment (500) has a left edge (560) and a right edge (550).

7. The system of claim 6, wherein:

- the left edge of the front portion is perpendicular to the bottom surface;
- the right edge of the front portion is perpendicular to the bottom surface;
- the left edge is non-perpendicular to the top surface; and
- the right edge is non-perpendicular to the top surface.

8. The system of claim 6, wherein the leveling course comprises a plurality of the precast leveling segments.

9. The system of claim 8, wherein a respective front portion of a first precast leveling segment of the plurality of the precast leveling segments is aligned with a respective front portion of a second precast leveling segment of the plurality of the precast leveling segments.

10. The system of claim 1, wherein at least a portion of the precast roadway barrier segment is above the sloped roadway.

1. System, aufweisend:

- ein vorgefertigtes Fahrbahn Barrieresegment (100);
- eine maßgeblich Level unterliegende Erdstützmauer; und
- eine Nievellierungsbahn (505), die sich unter dem vorgefertigten Fahrbahn Barrieresegment und über der maßgeblich Level unterliegenden Erdstützmauer befindet, wobei die Nievellierungsbahn mindestens ein vorgefertigtes Nievellierungssegment (500) aufweist, wobei das mindestens eine vorgefertigte Nievellierungssegment mindestens aufweist:

- eine obere Oberfläche (540) parallel zu einer geneigten Fahrbahn (420), die sich über der Nievellierungsbahn befindet;
- eine untere Oberfläche (545) parallel zu einem oberen vorgefertigten Segment der maßgeblich Level unterliegenden Erdstützmauer, die sich unter der Nievellierungsbahn befindet; einen horizontalen Stiel (590), der sich nach außen von einer hinteren Oberfläche (535) eines vorderen Bereichs (520) von dem mindestens einen vorgefertigten Nievellierungssegment erstreckt, wobei sich der horizontale Stiel von der oberen Oberfläche zu der unteren Oberfläche erstreckt, wobei ein unterer Bereich des horizontalen Stiels einen dreieckigen Bereich (310) aufweist, der sich nach außen erstreckt von einer linken Seite und einer rechten Seite des horizontalen Stiels, und wobei der dreieckige...
Bereich des horizontalen Stiels zwei Kavitäten (520) aufweist, die entlang einer Fläche von mindestens einer Seite des dreieckigen Bereichs angeordnet sind; und einen Ausrichtungssitz (165), der sich entlang mindestens eines Teils des horizontalen Stiels erstreckt,

wobei die maßgeblich Level unterliegende Erdstützmauer nicht parallel zur geneigten Fahrbahn ist.

2. System nach Anspruch 1, bei dem die obere Oberfläche (540) des vorgefertigten Nievellierungssegments (500) entsprechend nicht parallel zu der unteren Oberfläche (545) ist.

3. System nach Anspruch 1, weiterhin aufweisend eine Mehrzahl von Höhen, die zu einem Abstand zwischen einer Mehrzahl von Punkten auf der oberen Oberfläche und Entsprechenden einer Mehrzahl von Punkten auf der unteren Oberfläche (545) des vorgefertigten Nievellierungssegments (500) korrespondieren.


5. System nach Anspruch 1, bei dem der Ausrichtungssitz das mindestens eine vorgefertigte Nievellierungssegment mit mindestens einem vorgefertigten Segment der Erdstützmauer verbindet.

6. System nach Anspruch 1, bei dem eine vordere Oberfläche des vorderen Bereichs des vorgefertigten Nievellierungssegments (500) eine linke Kante (560) und eine rechte Kante (550) hat.

7. System nach Anspruch 6, bei dem:

   die linke Kante des vorderen Bereichs senkrecht zur unteren Oberfläche ist;
   die rechte Kante des vorderen Bereichs senkrecht zur unteren Oberfläche ist;
   die linke Kante nicht parallel zu der oberen Oberfläche ist; und
   die rechte Kante nicht parallel zur oberen Oberfläche ist.

8. System nach Anspruch 6, bei dem die Nievellierungsbahn eine Mehrzahl der vorgefertigten Nievellierungssegmente aufweist.


10. System nach Anspruch 1, bei dem mindestens ein Bereich des vorgefertigten Fahrbahn Barrieresegments über der geneigten Fahrbahn ist.

**Revendications**

1. Système comprenant :

   un segment de glissière de sécurité préfabriqué (100) ;
   un mur de soutènement sous-jacent sensiblement de niveau ; et
   un rang de mise à niveau (505) situé sous le segment de glissière de sécurité préfabriqué et au-dessus du mur de soutènement sous-jacent sensiblement de niveau, le rang de mise à niveau comprenant au moins un segment préfabriqué de mise à niveau (500), l’au moins un segment préfabriqué de mise à niveau comprenant au moins :

   une surface supérieure (540) parallèle à une route inclinée (420) située au-dessus du rang de mise à niveau ;
   une surface inférieure (545) parallèle à un segment préfabriqué supérieur du mur de soutènement sous-jacent sensiblement de niveau situé sous le rang de mise à niveau ;
   une tige horizontale (590) s’étendant vers l’extérieur à partir d’une surface arrière (535) d’une partie avant (520) de l’au moins un segment préfabriqué de mise à niveau, la tige horizontale s’étendant de la surface supérieure à la surface inférieure, une partie inférieure de la tige horizontale comprenant une partie triangulaire (310) s’étendant vers l’extérieur à partir d’un côté gauche et d’un côté droit de la tige horizontale, et la partie triangulaire de la tige horizontale comprenant deux cavités (520) disposées le long d’une face d’au moins un côté de la partie triangulaire ; et
   un siège d’alignement (165) s’étendant le long d’au moins une partie de la tige horizontale, le mur de soutènement sous-jacent sensiblement de niveau étant non parallèle à la
2. Système selon la revendication 1, dans lequel la surface supérieure (540) du segment préfabriqué de mise à niveau (500) est en conséquence non parallèle à la surface inférieure (545).

3. Système selon la revendication 1, comprenant en outre une pluralité de hauteurs correspondant à une distance entre une pluralité de points sur la surface supérieure et des points respectifs parmi une pluralité de points sur la surface inférieure (545) du segment préfabriqué de mise à niveau (500).

4. Système selon la revendication 3, dans lequel chacune parmi la pluralité de hauteurs est égale à une distance entre la surface inférieure à un point de surface inférieure correspondant à un point respectif parmi la pluralité de points le long de la surface supérieure et la route inclinée à un point de route correspondant au point respectif parmi la pluralité de points sur la surface supérieure.

5. Système selon la revendication 1, dans lequel le siège d’alignement verrouille l’au moins un segment préfabriqué de mise à niveau avec au moins un segment préfabriqué du mur de soutènement.

6. Système selon la revendication 1, dans lequel une surface avant de la partie avant du segment préfabriqué de mise à niveau (500) a un bord gauche (560) et un bord droit (550).

7. Système selon la revendication 6, dans lequel :
   - le bord gauche de la partie avant est perpendiculaire à la surface inférieure ;
   - le bord droit de la partie avant est perpendiculaire à la surface inférieure ;
   - le bord gauche est non perpendiculaire à la surface supérieure ; et
   - le bord droit est non perpendiculaire à la surface supérieure.

8. Système selon la revendication 6, dans lequel le rang de mise à niveau comprend une pluralité de segments préfabriqués de mise à niveau.

9. Système selon la revendication 8, dans lequel une partie avant respective d’un premier segment préfabriqué de mise à niveau, parmi la pluralité de segments préfabriqués de mise à niveau, est alignée avec une partie avant respective d’un deuxième segment préfabriqué de mise à niveau parmi la pluralité de segments préfabriqués de mise à niveau.

10. Système selon la revendication 1, dans lequel au moins une partie du segment de glissière de sécurité préfabriqué se trouve au-dessus de la route inclinée.
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

• US 20110318100 A [0002]