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(71) Applicant: **Navati, Valter**
43123 Parma (IT)

(72) Inventor: **Navati, Valter**
43123 Parma (IT)

(74) Representative: **Bosman, Cesare et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

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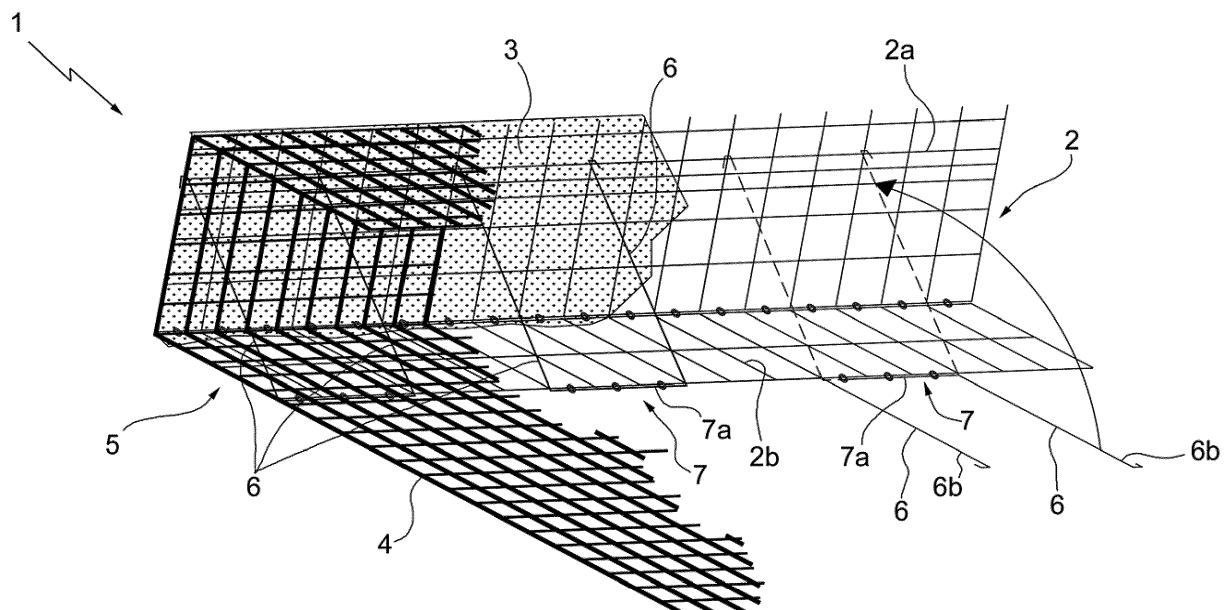
(54) STRUCTURE FOR THE CONTAINMENT OF SOIL

(57) A pre-assembled structure for the containment of soil (1) comprising in sequence and fixed to one another:

- a structural metal grid (2) having a first portion (2a) which defines, in use, a front portion, and a second portion (2b) which defines, in use, a base portion and is hinged to said first portion (2a) along one side;
- a retention layer (3), which is made of a natural or plastic fibre and is arranged at least in the area of the first portion (2a) of the structural metal grid (2);
- a structural reinforcement layer (4) consisting of a ge-

ogrid made of a plastic material; and

- a plurality of conformational stiffening elements (5), each hinged to the structural metal grid (2) so as to extend, in use, between the first portion (2a) and the second portion (2b) of the structural metal grid (2). The conformational stiffening elements (5) comprise a structure in the shape of a squared "U" (7) comprising a central side (7a) hinged to said structural metal grid (2) and two arms (6) each of which extends from a respective end of said central side (7a).



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Description

[0001] The present invention concerns a preassembled structure for the containment of soil for the creation, for example, of reinforced earth levees, containment works, consolidation works and visual or sound barriers.

[0002] For the creation of structures for the containment of soil, one of the solutions adopted so far concerns the use of a formwork made of a metal grid bent in such a way as to define a front portion and a base portion. Once this type of metal formwork is positioned in situ, a retention layer made of natural or plastic fibres is applied to it, at least on the front portion. Subsequently, transverse strips of a structural resistance layer made of plastic material and commonly known as "geogrid" are applied.

[0003] Although structural resistance layers also made of metal exist, the containment structure solution described above requires the use of polymer geogrids to ensure correct adaptation of the structural resistance layer to the bent shape of the formwork.

[0004] The above containment structure is completed by fixing specific tie rods, each of which comprises respective hook-shaped ends adapted to engage both the front and base portions of the metal grid constituting the formwork. The function of the tie rods is to give the containment structure adequate rigidity, thus preventing alteration of the angle of the metal grid constituting the formwork during use due to the thrust exerted by the soil contained in it.

[0005] As will be immediately evident to a person skilled in the art, although this solution is extremely advantageous in terms of costs and structural resistance, it has a series of drawbacks due to assembly complexities, large quantity of material to be transported, the need for skilled labour, the hazard represented by the metal spikes of the formwork and the waste of material resulting, in particular, from cutting of the geogrid and retention layers.

[0006] In another solution generally used, the containment structure consists of preassembled panels comprising, in sequence, a supporting metal grid constituting a front formwork portion, a retention layer which, as for the above solution, can be made of natural or polymer fibres, and a structural resistance layer consisting of a metal grid with rigidity lower than that of the grid constituting the formwork, for example a galvanized hexagonal wire mesh.

[0007] In particular, these preassembled panels, during transport or storage, foresee that the structural resistance layer is bent onto the metal grid constituting the formwork.

[0008] A plurality of metal triangles are hinged to the metal grid constituting the formwork; said triangles have a conformational support function and define, once open, the angle which the formwork must have in operating conditions with respect to the horizontal line of the soil.

[0009] Once the structure in its closed conformation

has been located in situ, the structural resistance layer is unfolded and the metal triangles are set to an open position, perpendicular with respect to the metal grid to which they are framed. Unlike the preceding solution, in this case the formwork consists only of its front portion whereas a sort of base portion is provided by the structural resistance layer on which the bases of the various metal triangles rest.

[0010] Despite the presence of the above metal triangles, this solution cannot do without the use of tie rods which, also in this case, have the function of stiffening the structure.

[0011] This solution suffers from the drawback of being particularly costly, of not having sufficient rigidity to ensure the absence of front deformations, of not always having sufficient resistance for the various technical problems, unless external material with greater resistance than the hexagonal wire mesh employed is used as a support, and of making the panels excessively heavy, with the obvious problems which this entails during movement.

[0012] Furthermore, another limitation of the above-mentioned solutions is the impossibility of varying the angle of the formwork with respect to the horizontal line of the soil, as defined by the conformation of the metal triangles or by the fold of the metal grid. In other words, once the preassembled structure has been transported to the place of application, if the angle imposed by the triangles does not correspond to the original design, the entire preassembled structure necessarily has to be replaced, thus creating problems in terms of productivity.

[0013] The need was therefore felt for a solution which in a simple inexpensive manner does not involve the drawbacks of the known art as described above.

[0014] The subject of the present invention is a preassembled structure for the containment of soil comprising in sequence and fixed to one another:

- a structural metal grid having a first portion which defines, in use, a front portion and a second portion which defines, in use, a base portion hinged along one side to said first portion,
 - a retention layer made of natural or plastic fibre and arranged at least in the area of the first portion of structural metal grid,
 - a structural reinforcement layer consisting of a geogrid made of plastic material; and
 - a plurality of conformational stiffening elements, each of which is hinged to said structural metal grid to extend, in use, between said first and said second portion of said structural metal grid;
- said preassembled structure for the containment of soil being characterized in that said conformational stiffening elements comprise a structure in the shape of a squared "U" comprising a central side hinged to said structural metal grid and two arms, each of which extends from a respective end of said central side.

[0015] A purely illustrative and non-limiting embodiment example is given below with the help of the drawing of the attached figure, which is an overhead perspective view, with parts removed for clarity, of the containment structure subject of the present invention.

[0016] In the figure the preassembled structure for the containment of soil subject of the present invention is indicated overall by 1.

[0017] The preassembled structure 1 comprises a structural metal grid 2, a retention layer 3 and a structural reinforcement layer 4.

[0018] The structural metal grid 2 is composed of a first portion 2a which, in use, constitutes a front structural portion, and a second portion 2b which, in use, constitutes a base structural portion. The two portions 2a and 2b are hinged to each other along respective adjacent edges.

[0019] As illustrated in the figure, the preassembled structure 1 comprises a plurality of conformational stiffening elements 5 extending in use between the two portions 2a and 2b of the structural metal grid 2 in order to give the formwork a defined stable conformation during use. The conformational stiffening elements 5 comprise a structure in the shape of a squared "U" 7 composed of a central side 7a hinged to the edge of the portion 2b and two arms 6 each extending from a respective end of the central side 7a.

[0020] Each of the arms 6 comprises a respective free end 6b which in use is hooked to the front portion 2a.

[0021] In particular, the structures in the shape of a squared "U" 7 hinged to the structural metal grid 2 are comprised in the preassembled structure 1 and extend between the two portions 2a and 2b providing the necessary stiffening to ensure effectiveness of the structure overall. Furthermore, the choice of the hooking point of the ends 6b on the portion 2a defines the size of the angle between the two portions 2a and 2b.

[0022] Differently from what is described above, the structures in the shape of a squared "U" 7 can be hinged to the portion 2a instead of to the portion 2b, or they can be hinged to an inner mesh of one of the two portions 2a and 2b instead of on their edge.

[0023] In other words, the preassembled structure subject of the present invention constitutes a compact and independent product, able to be easily transported in situ and used also by relatively unskilled personnel and therefore without the need for particular instrumentation or particular experience.

[0024] As can be seen from the above description, it is evident that the structure subject of the present invention has no element separate from the preassembled unit with obvious advantages in terms of storage and transport.

[0025] Furthermore, the possibility of being able to establish the size of the angle between the two portions 2a and 2b directly in situ gives the containment structure a great versatility which the containment structures of the known art do not have, with obvious advantages in terms

of productivity.

[0026] Lastly, to the best of the inventors' knowledge, none of the preassembled containment structures of the known art provide the presence of a structural reinforcement layer consisting of a geogrid made of plastic material.

[0027] In use, the preassembled structure subject of the invention, once it is taken to the site where the soil containment is required, is rendered functional by laying the structural reinforcement layer and positioning the two portions 2a and 2b so as to form between them the chosen effective angle, appropriately hooking the stiffening elements 5 to the structural metal grid 2.

Claims

1. A pre-assembled structure for the containment of soil (1), **characterized in that** it comprises, in sequence and fixed to one another

- a structural metal grid (2) having a first portion (2a) which defines, in use, a front portion, and a second portion (2b) which defines, in use, a base portion and is hinged to said first portion (2a) along one side;

- a retention layer (3), which is made of a natural or plastic fibre and is arranged at least in the area of the first portion (2a) of the structural metal grid (2);

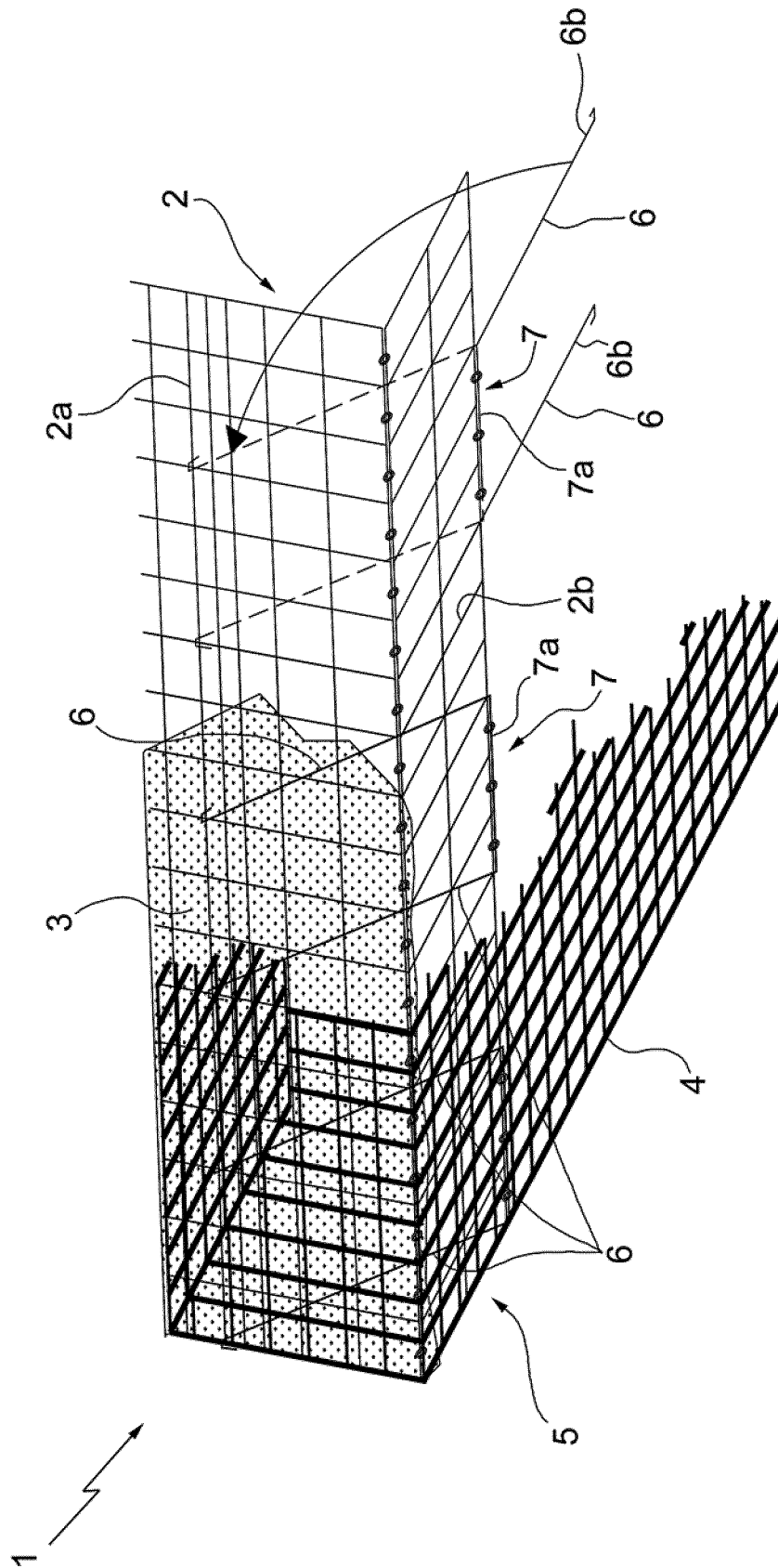
- a structural reinforcement layer (4) consisting of a geogrid made of a plastic material; and

- a plurality of conformational stiffening elements (5), each hinged to said structural metal grid (2) so as to extend, in use, between said first portion (2a) and said second portion (2b) of the structural metal grid (2);

said pre-assembled structure for the containment of soil **characterized in that** said conformational stiffening elements (5) comprise a structure in the shape of a squared "U" (7) comprising a central side (7a) hinged to said structural metal grid (2) and two arms (6) each of which extends from a respective end of said central side (7a).

2. A pre-assembled structure for the containment of soil (1), **characterized in that** each of said arms (6) comprises hooking means housed in the area of a free end (6b) thereof and adapted to provide a coupling with the other of the two portions (2a, 2b) of said structural metal grid (2).

3. A pre-assembled structure for the containment of soil (1), **characterized in that** each of said squared "U" structures (7) has its central side (7a) hinged to a free edge of the second portion (2b) of said structural metal grid (2).





EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2011/052333 A1 (RIDGWAY JON ROBERT [US]) 3 March 2011 (2011-03-03) * abstract * * paragraph [0031]; figure 5 * -----	1-3	INV. E02D29/02
			TECHNICAL FIELDS SEARCHED (IPC)
			E02D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 February 2017	Examiner Koulo, G
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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06-02-2017

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	US 2011052333 A1	03-03-2011	NONE	
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EPO FORM P0459

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