



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.03.2011 Bulletin 2011/10

(51) Int Cl.:
E02D 17/20 (2006.01)

(21) Application number: **09009646.2**

(22) Date of filing: **25.07.2009**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR**
Designated Extension States:
AL BA RS

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(54) **Geosynthetic reinforcement for soils**

(57) Geosynthetic grid, wherein at least some of the strips 2 making up the grid are on at least one side provided with the stabilizing tips 3, said tips being integral

parts of the respective strips 3 or inseparably attached to the strips 2, e.g. by glueing or by means of a thermal process, and oriented perpendicularly with respect to the plane of the strips 2 when set in the working position.

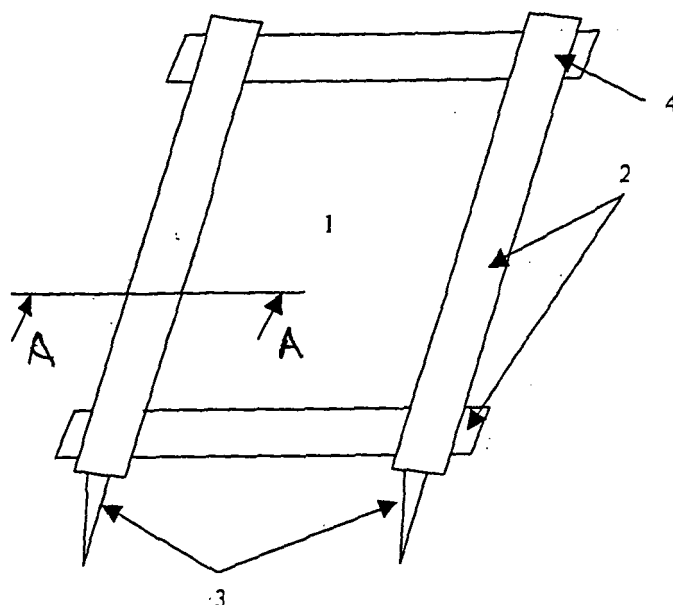


Fig.1

Description

Technical background

[0001] The present invention relates to a geosynthetic material forming a layer used for reinforcing the base course.

State of the art

[0002] The importance of geosynthetics used in the ground body has been known in the art for a long time. In addition to the separating, draining, filtering, protecting or surface antieroding functions, the reinforcing function is also useful. Fills of subgrades for roadways and railways, which are reinforced by geosynthetics, are widely used applications of reinforcing geosynthetic materials. The reinforcing function of geosynthetics understood as a tool for increasing the load-bearing capacity of poor bearing grounds, as mentioned in the literature, is unverifiable in some specific cases. This may be caused by the above mentioned separating function of geosynthetics where the individual layers of the ground body do not act as an aggregate unit but rather as independent, separated layers. It is generally known, that the deflection of a structure is dependent on the moment of inertia of such structure. In the case of the individual layers, the moment of inertia is always lower than that of a single layer would be in case that the thickness of such a single layer would be equal to the sum of the thicknesses of the individual separated layers.

[0003] US 4,472,086 discloses a geogrid wherein the fibres extending in one direction, i.e. either in the longitudinal or in the transversal direction, are wrapped by an additional fibre that forms loops in the points where knots are situated. Although this enables to make the entire area rougher, the technological procedure used is arduous and the roughing effect achieved is not sufficient.

[0004] EP 1 458 912 B1 discloses a geogrid wherein the fibres are formed by braids made of multiple fibres and having the shape of spherical elements in the points where knots are situated. Although this enables to make the entire area rougher, the technological procedure used is arduous and the roughing effect achieved is not sufficient. A similar grid is disclosed in DE 4123055.

[0005] EP 0 333 576 B1 discloses a geogrid wherein the fibres are formed by strips that are twisted in one direction, forming spindle-shaped segments. This enables to achieve such arrangement where the strips are partly oriented with respect to the plane of the geosynthetic material. However, the production of such geogrid is demanding and an increased volume of the geogrid must be handled when the latter is coiled.

[0006] The aim of the invention is to provide a geosynthetic grid comprising a transversal element that would be large enough for stabilizing the grid on soft, small-grained grounds, wherein such transversal element would neither restrain the rolls from being coiled up nor

increase the volume of the rolls.

Disclosure of the invention

[0007] The above drawbacks are largely eliminated by the geosynthetic grid with stabilizing tips according to the present invention, wherein at least some of the strips making up the grid are on at least one side provided with the stabilizing tips, said tips being integral parts of the respective strips or inseparably attached to the latter, e.g. by glueing or by means of a thermal process, and oriented perpendicularly with respect to the plane of the strips when set in the working position. This will ensure the stability of the geogrid on the subsoil.

[0008] In a preferred embodiment, the tips are continuously arranged either only on the longitudinal strips of the web or on the transversal ones.

[0009] In another preferred embodiment, the tips are discontinuous with interruptions in the areas of the knots of the web. Such geogrid can be readily coiled onto rolls.

Overview of the figures

[0010] The invention will be further explained by means of the accompanying drawing wherein Fig. 1 shows a schematic view of one mesh of the geosynthetic grid with stabilizing tips according to the invention, Fig. 2 shows the magnified detail of section A-A led through one strip of the grid shown in Fig. 1, where the tip is in its working position, and Fig. 3 presents the same detail, where the tip is in its transporting position.

Preferred embodiment of the invention

[0011] The geosynthetic grid, which is the subject of the present invention, is composed of a synthetic material, such as polyester. Fig. 1 shows a schematic view of one mesh 1 of the geosynthetic grid with stabilizing tips 3, said tips being shown in the top view. Each mesh 1 comprises a first pair of longitudinal strips 2 and a second pair of transversal strips 2 extending perpendicularly with respect to said first pair. The transversal and longitudinal strips 2 are joint together in a known manner. Alternatively, the entire grid may be produced by press moulding, e.g. of a geomembrane. In both cases, the transversal and longitudinal strips 2 contact each other within the knots 4.

[0012] In the areas between the individual knots 4, there are the stabilizing tips 3 arranged on the strips. The stabilizing tips may either compose a part of the respective longitudinal or transversal strip 2 - in case that the geosynthetics is made in the way of subsequent joining the longitudinal or transversal strips within the knots 4 - or may be additionally attached to the longitudinal or transversal strips, e.g. by glueing or by means of a thermal process - in case that the geogrid is made as a whole by press moulding, wherein the workpiece is a solid planar element, such as a geomembrane. This is clearly

illustrated in Fig. 2 that contains a sectional view of a strip 2 with a tip 3 attached to it. As seen in the figure, the tip 3 is arranged substantially in a position where it is perpendicular with respect to the plane of the strip 2.

[0013] As further seen in a detailed section shown in Fig. 3, the tip 3 is pressed against the plane of the strip 2 by the upper layer of the geosynthetic grid when the latter is in the coiled condition. During uncoiling the geogrid, the released tips 3 return their original upright position owing to their inherent recovering capacity. The geogrid is then laid onto the subsoil with its upright and activated tips 3 pointing towards the subsoil. Subsequently, the effect of rolling the grid causes the tips 3 to bite into the underlying surface, thus stabilizing the position of the whole geogrid and preventing the same from undesirable sliding movement and displacement.

[0014] In order to press the tips 3 as far as possible against the strips 2 of the coiled web when they are brought into their transporting positions, it is advantageous if the tips 3 are discontinuous and do not extend up to the area of the knots 4, thus not hampering each other when the grid is being coiled for the purpose of transportation.

[0015] The resolution of the missing interaction of a poor bearing subsoil (typically with $E_{def,2} < 10 \text{ MPa}$) reinforced by the geosynthetic grid according to the invention consist in the application of the geosynthetic equipped with the tips 3 by means of which the geosynthetic can burrow into the above type of subsoil. The tips 3 pose a part of the geosynthetic, which is composed of a geosynthetic grid in the particular case, and are made of the same material as the geosynthetic grid is or of a different material. In the condition, where the geosynthetic is coiled onto a roll for the purpose of storing or transportation, the bits 3 are tilted in such a manner that they lean towards the plane of the strips 2 making up the geosynthetic grid. When the geosynthetic is being applied onto the base course, the tips 3 take up the upright position so that they become perpendicular with respect to the plane of the strips 2 making up the geosynthetic grid. After the geosynthetic has been laid down, the tips 3 bite into the subsoil, thus ensuring the desired interaction of the geosynthetic with the subsoil. The pavement bases, railway substructures or the like are laid onto the geosynthetic by means of usual techniques.

2. Geosynthetic grid according to claim 1, **characterized in that** the tips (3) are continuously arranged either only on the longitudinal strips (2) of the web or on the transversal ones.
3. Geosynthetic grid according to claim 1 or 2, **characterized in that** the tips (3) are discontinuous with interruptions in the areas of the knots (4) of the web.

Claims

1. Geosynthetic grid, **characterized in that** at least some of the strips (2) making up the grid are on at least one side provided with the stabilizing tips (3), said tips being integral parts of the respective strips (3) or inseparably attached to the strips (2), e.g. by glueing or by means of a thermal process, and oriented perpendicularly with respect to the plane of the strips (2) when set in the working position.

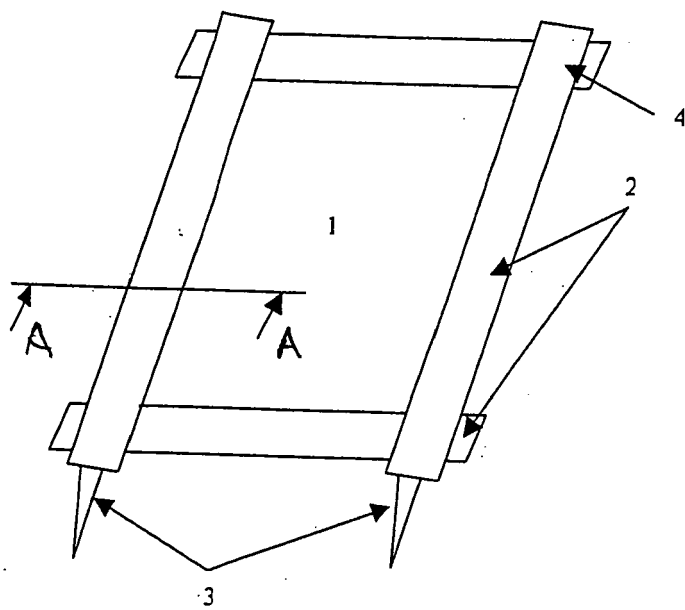


Fig.1

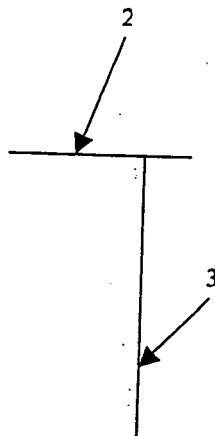


Fig.2

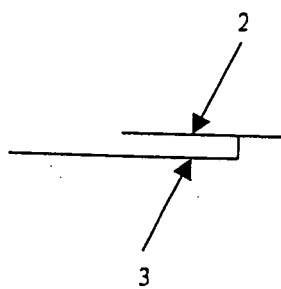


Fig.3



EUROPEAN SEARCH REPORT

Application Number
EP 09 00 9646

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 92 15 568 U1 (PIEPER, ROLF, 5600 WUPPERTAL, DE) 14 January 1993 (1993-01-14) * page 4, paragraph 3; figure 1 * -----	1-3	INV. E02D17/20
A	WO 95/11351 A (VIDAL HENRI BREVETS [FR]; PIESOLD ALEXANDER JAMES [GB]; JAILLOUX JEAN) 27 April 1995 (1995-04-27) * figure 2 * -----	1-3	
A	US 4 472 086 A (LEACH JACK [US]) 18 September 1984 (1984-09-18) * the whole document * -----	1-3	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) E02D
Place of search Munich		Date of completion of the search 22 October 2009	Examiner Geiger, Harald
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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EPO FORM 1503 03.82 (P04C01)

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

EP 09 00 9646

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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22-10-2009

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EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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- EP 1458912 B1 [0004]
- DE 4123055 [0004]
- EP 0333576 B1 [0005]