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(54) **Procedure for the creation of mattress type gabions for protective vegetable revetments**

Verfahren zur Ausbildung eines maträtzartigen Schanzkorbs für begrünbare Schutzwände

Procédé de réalisation de gabions du type matelas pour revêtements de protection végétalisables

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(56) References cited:
EP-A- 0 379 466 **EP-A- 0 437 171**
WO-A-90/12160 **GB-A- 2 078 833**

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Description

This invention refers to a procedure for the creation of artificial soil protection and lining structures in the form of mattress-type gabions made of double twist wire netting which are filled with soil to create a protective vegetable revetment.

It is known that revetments and other protective structures are employed to halt soil erosion caused by runoff or precipitation; these structures are constructed using so-called mattress gabions, i.e. rectangular containers filled with gravel, crushed stone and other material, fitted with a cover and consisting of galvanised or galvanised and plastic-coated double twist wire netting panels joined together with ties or wire stitches; these structures are corrosion-inhibiting and resistant to mechanical stresses.

One particular, well-known system for the creation of the above-mentioned structures consists in the construction and use of large, thin "mattress gabions" designed to cover, without any break, extensive tracts of land of the most disparate conformation, as if they were actual "mattresses". Preparation in the manufacturing plants consists of working the wire netting, the mattresses being divided into cells by means of vertical partition walls made with the netting of the bottom sheet.

Also known is the system which directly forms the transverse partitions, known as "ribs", obtaining them from the bottom sheet by transverse folds the same height as those of the "mattress", with similar folds for the long side walls and short end walls.

The connection together of the sides of each rib, obtained by bending the bottom sheet, with the cover sheet and with the side and end walls is accomplished using wire stitches, some of them fitted in the factory assemblea structure and some placed during installation.

When the container is filled with soil to act as ballast, there arises the problem of keeping the earth inside the structure and preventing leaching and dispersion.

Attempts are made to overcome this problem albeit with relatively unsatisfactory results, by using sheets of geotextile material extended under and around the gabion.

The Patent WO-A-90/12160 discloses a multiple-cell structure which is completely assembled in panels and covered with geotextile. This structure, being used for emergency operations, does not include a base and roof and the "accordion" type of folding makes total pre-assembly possible at the site.

The purpose of this invention is to permit the creation of a system designed to hold the soil inside each individual cell in a mattress gabion, having a continuous structure with a base and roof, after it has been filled with soil, in order to create a vegetale revetment to protect or consolidate the soil of the embankment to be treated.

The advantages are inherent in the formation of a

layer measuring approximately 15-30 cm, which is reinforced (by the wire netting of the mattress) and also protective and stable, to achieve which the growth of vegetation is encouraged inside the mattress gabion in order to afford natural protection to the bank, escarpment, etc. of soil.

Geotextile material must completely line the inside of the cells of the mattress, covering the bottom, walls, ends and partitions over the entire length of the inside retaining surfaces of the mattress itself. When the mattress is installed on the ground prior to being filled, the geosynthetic lining is fastened with wire stitches (manually or automatically) attached to the inside frame of the galvanised or galvanised and plastic-coated double twist wire netting which comprime the mattress gabion.

The material of the wire stitches will have the same characteristics as the wire netting of the mattress.

Also required is an element or layer to retain fine material after the installed mattress has been filled with earth, to prevent leaching of the soil before the vegetation grows. Designed to answer this purpose is a geotextile which covers the whole of the top surface of the mattress and which is secured with wire stitches to the top edges and partition walls of the cells; the geocompound is introduced first, beneath the double twist wire netting cover, and it is fastened with wire stitches to the edges above the mattress to close the top of the gabion. For the sake of practical application, the invention is characterised by two alternatives: one entails forming the geotextile cover (inside lining) with panels fastened with wire stitches to the individual cells of the inside surface of the mattress, connected individually therefore to the hexagonal structure of the netting; the other takes the form of a continuous sheet (single panel) fixed beforehand to one end of the element during production with wire stitches, but in this case it follows the unbroken profile of the inside surface of the mattress gabion both on the bottom and the transverse "ribs" (partitions) and end walls of the gabion structure.

Particular care is taken with installation prior to filling to ensure that the geotextile material is resting on and adheres to the wire netting of the gabion without forming pockets that would impair the perfect functioning of the invention.

This invention achieves the purpose, as has been briefly described, of permitting the formation of a system of mattress gabions with an internal vegetable protective lining to hold in and collect the soil inside each single cell or box of the mattress, encouraging the growth of vegetation inside the gabion itself.

The geotextile fabric of the panels is generally composed of woven or non-woven material fibres, obtained using the technology of thermoplastics such as polyethylene or other appropriate materials, in individual panels or continuous sheets to be connected with wire stitches to the inside of the wire netting of the gabion.

Other aims and advantages will emerge from the description that follows and from the attached figures

which show, in schematic form and by way of example, one form in which the invention can be realised.

With reference to these plates:

- FIG. 1 shows a mattress gabion element with internal lining in the form of geotextile panels (open side wall view).
- FIG. 2 shows a mattress gabion element with internal lining in the form of a continuous geotextile sheet (open side wall view).

The mattress gabion element in FIG. 1 (in the drawing it is without the left side wall) is made up with the standard factory assembly process.

The galvanised or galvanised and plastic-coated hexagonal double twist wire netting, extending from the bottom sheet 1, with the end walls 2, the sides 3 and the partitions 4, acquires on the installation site its typical box-like structure.

The galvanised and plastic-coated wire stitches 10, placed between the ribs and between these and the sides and also between the sides and the ends, give the structure stability.

On site, the structure is covered by the series of geotextile panels 5 which adhere perfectly to the wire netting, to which they are fastened with the wire stitches 6.

When all the cells in the mattress have been filled with soil 7, the mattress is covered first by a geocompound 8 to retain the fine materials and lastly by the wire netting cover 9 which will close the full mattress gabion when it is in place.

Similar wire stitches 10 fasten the sides of the ribs or partitions together, the geocompound to the sides of the gabion and the cover sheet to the sides.

In FIG. 2, the lining of the inside surfaces of the gabion is accomplished with a continuous sheet 5' of geotextile material, previously connected with wire stitches to one end of the mattress at the production stage. When installing the lining on site, the sheet, in addition to adhering to the surface, will also fold over and cover the ribs of the partitions 11, thereby covering the entire mattress without a break.

The wire stitching 6' of the continuous geotextile sheet will follow, maximum adherence to the inside surface being ensured to prevent the formation of voids.

The filling with earth 7, the laying of the geocompound 8 and the cover 9, and the wire stitching will follow as in the example of FIG. 1.

This invention, illustrated and described in schematic form and by way of example, may be extended to all those secondary variations regarding shape, size and material which, as such, fall within its scope, while the technical details may be replaced by others of an equivalent technical nature, without stepping beyond the scope of protection afforded by the following claims.

Claims

1. PROCEDURE FOR THE CREATION OF MATTRESS TYPE GABIONS FOR PROTECTIVE VEGETABLE REVETMENTS, comprising the steps of:

- (a) forming a wire mesh structure having a bottom (1) and a plurality of upwardly open cells defined between partitions (4) constituted by upstanding folds of wire mesh unitary with the bottom and subdividing said structure into said cells and longitudinal and transverse walls and wire stitching (6) said partitions to said longitudinal walls;
- (b) lining said partitions, said bottom and said walls internally of said cells with a geotextile material (5) capable of retaining soil in said cells;
- (c) filling said cells with a vegetation-growth supporting medium;
- (d) applying a geotextile to said structure over said cells and said medium after said cells are filled with said medium;
- (e) affixing said geotextile to said structure by wire stitching it to said partitions and said walls at upper edges thereof; and
- (f) affixing a cover (9) of wire mesh over said structure after filling it with said medium.

2. The procedure defined in claim 1 wherein said geotextile material fully lines all of said bottom, said partitions and said walls; said process further comprising the step of stitching said geotextile material to said wire mesh structure at least at said walls and said partitions.
3. The procedure defined in claim 2 wherein said geotextile material is affixed to said partitions and said walls as separate panels.
4. The procedure defined in claim 2 wherein said geotextile material is affixed to said partitions and said walls as a single continuous sheet.

Patentansprüche

1. VERFAHREN FÜR DIE ERRICHTUNG VON MATRATZENARTIGEN KÄSTEN FÜR BEPFLANZTE SCHUTZBÖSCHUNGEN, das folgende Schritte umfaßt:

- (a) Formen einer Drahtgeflechtstruktur mit einem Boden (1) und einer Vielzahl von nach oben offenen Zellen zwischen Trennwänden (4) aus aufrechten, mit dem Boden ein Ganzes bildenden Falten aus Drahtgeflecht, welche die genannte Struktur in die genannten Zellen auf-

teilen, und mit Längs- und Querwänden, und Heften (6) der genannten Trennwände an die genannten Längswände mit Draht.

- (b) Auskleiden der genannten Trennwände, des genannten Bodens und der genannten Wände in den genannten Zellen mit geotextilem Material (5), welches das Erdreich in den genannten Zellen zurückhalten kann; 5
- (c) Füllen der genannten Zellen mit einem das Pflanzenwachstum fördernden Medium; 10
- (d) Anbringen eines geotextilen Materials an der genannten Struktur über den genannten Zellen und dem genannten Medium nach Auffüllen der Zellen mit dem genannten Medium; 15
- (e) Befestigen des genannten geotextilen Materials an der genannten Struktur durch Heften mit Draht an die Oberkanten der genannten Trennwände und der genannten Wände; und
- (f) Befestigen einer Abdeckung (9) aus Drahtgeflecht über der genannten Struktur, nachdem sie mit dem genannten Medium gefüllt wurde. 20

- 2. Verfahren nach Anspruch 1, dadurch gekennzeichnet daß, das genannte geotextile Material den genannten Boden, die genannten Trennwände und die genannten Wände vollständig auskleidet; das genannte Verfahren umfaßt außerdem den Schritt, bei dem das genannte geotextile Material an die genannte Drahtgeflechtstruktur mindestens an den genannten Wänden und an den genannten Trennwänden mit Draht geheftet wird. 25 30
- 3. Verfahren nach Anspruch 2, dadurch gekennzeichnet daß, das genannte geotextile Material an den genannten Trennwänden und den genannten Wänden in Form von getrennten Bahnen befestigt wird. 35
- 4. Verfahren nach Anspruch 2, dadurch gekennzeichnet daß, das genannte geotextile Material an den genannten Trennwänden und den genannten Wänden in Form einer einzigen durchgehenden Bahn befestigt wird. 40

Revendications

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- 1. PROCÉDURE POUR LA CRÉATION DE GABIONS DU TYPE À MATELAS POUR LA RÉALISATION DE REVÊTEMENTS VÉGÉTAUX DE PROTECTION, comportant les étapes suivantes : 50

- (a) formation d'une structure en treillis constituée d'un fond (1) et d'une multiplicité de cellules ouvertes vers le haut et définies entre les cloisons (4) se composant de plis de treillis tenus debout et unitaires avec le fond et qui subdivisent ladite structure en les cellules précitées ainsi que de parois longitudinales et trans-

versales et de fil qui permet de coudre (6) lesdites cloisons aux parois longitudinales précitées ;

- (b) revêtement intérieur desdites cloisons, du dit fond et desdites parois des cellules précitées avec des matières géotextiles (5) capables de retenir la terre dans lesdites cellules;
- (c) remplissage desdites cellules avec un milieu de support de la croissance de la végétation ;
- (d) application d'une matière géotextile à ladite structure sur lesdites cellules et ledit milieu après avoir rempli lesdites cellules avec le milieu précité ;
- (e) fixation du géotextile précité à ladite structure, celui-ci étant joint par des coutures avec du fil aux cloisons et aux parois précitées au niveau de leurs bords supérieurs ; et
- (f) fixation d'un couvercle (9) en treillis sur ladite structure après avoir rempli celle-ci avec ledit milieu.

- 2. La procédure définie à la revendication 1 où la matière géotextile permet de revêtir intérieurement et complètement l'ensemble du fond précité et l'ensemble des cloisons et des parois précitées ; de plus, ledit processus comporte une étape qui consiste à coudre ladite matière géotextile à la structure en treillis précitée du moins au niveau des parois et des cloisons précitées.
- 3. La procédure définie à la revendication 2 où la matière géotextile est fixée aux cloisons et aux parois précitées comme des panneaux séparés.
- 4. La procédure définie à la revendication 2 où la matière géotextile est fixée aux cloisons et aux parois précitées comme une feuille continue et individuelle.

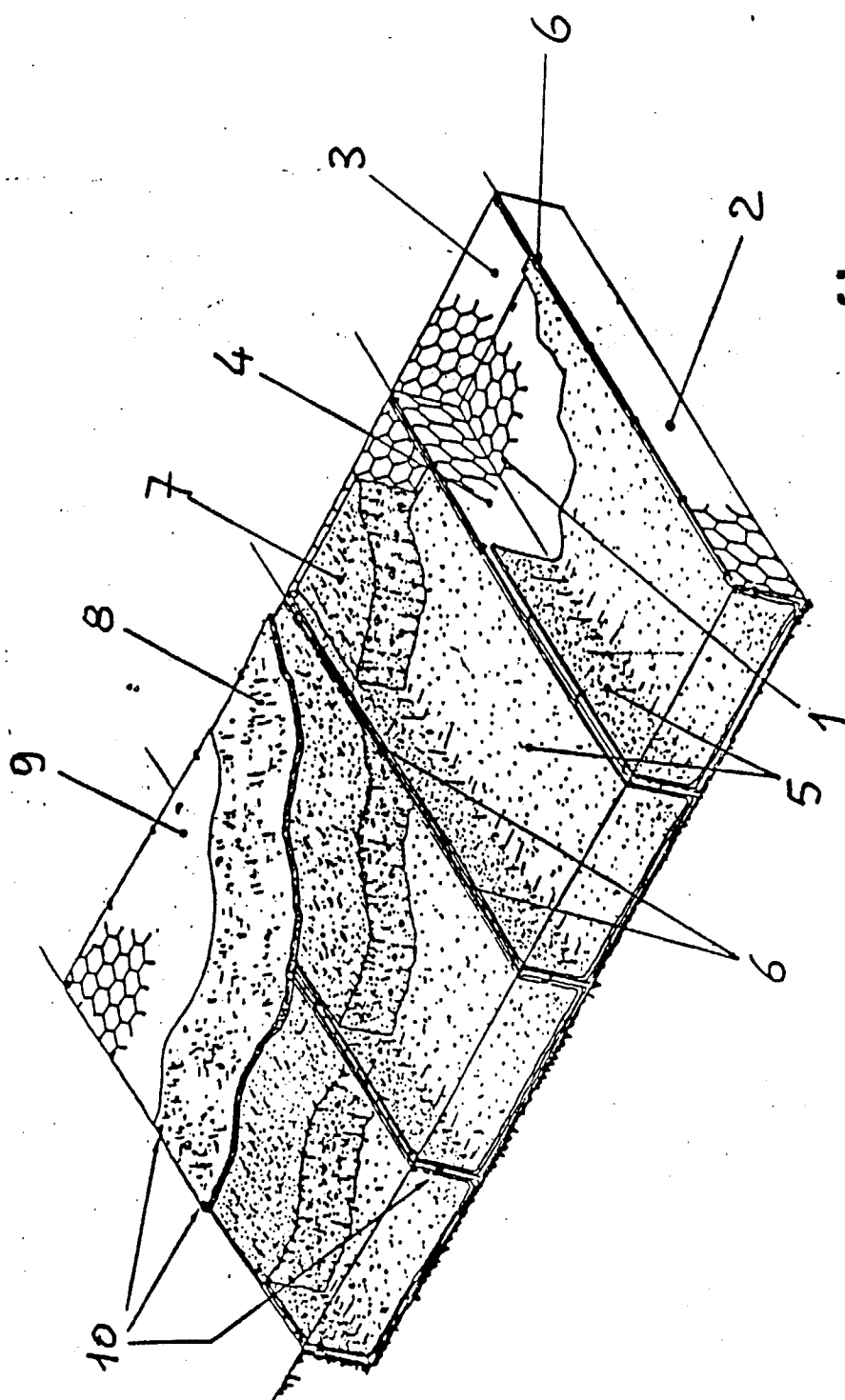


fig. 1

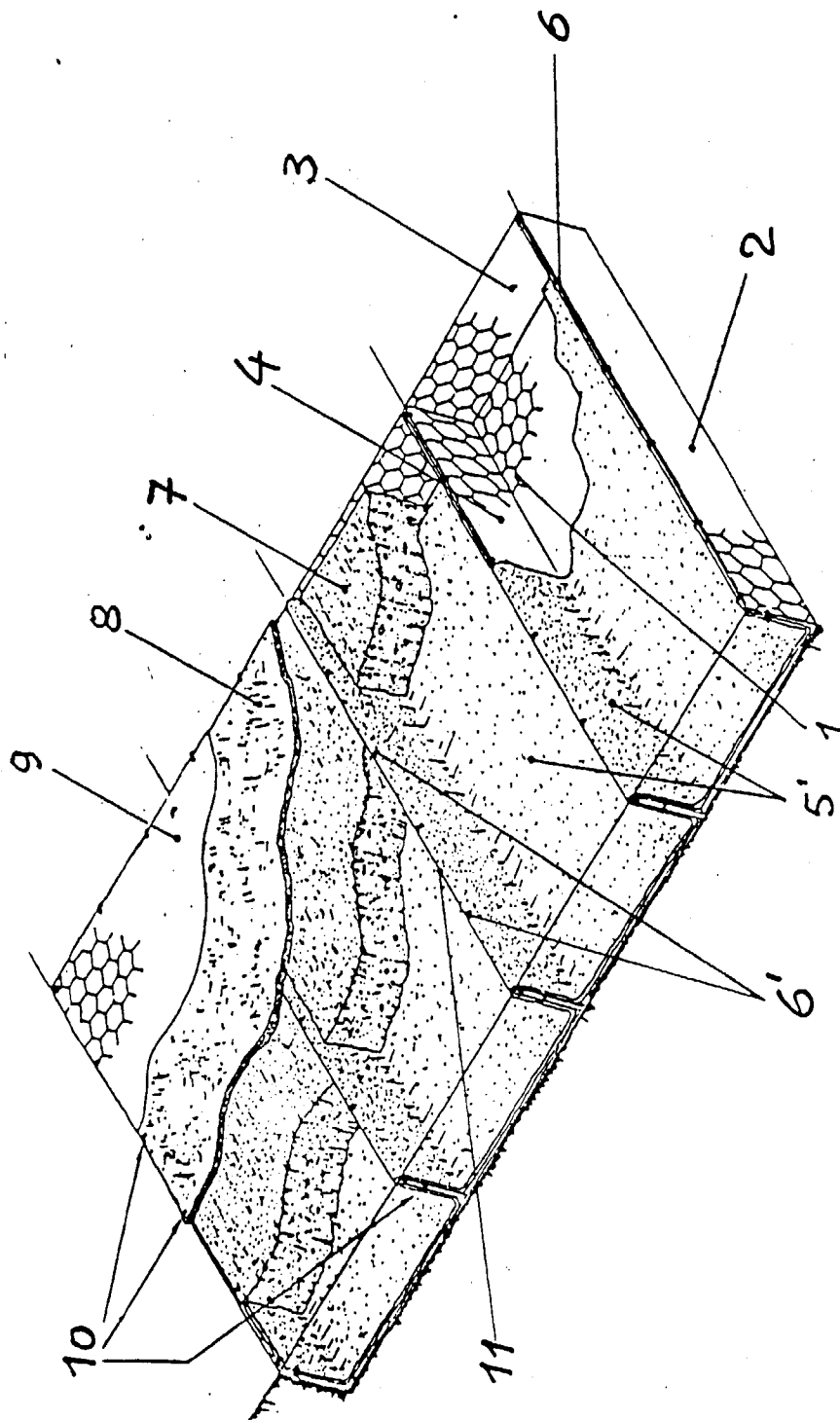


fig. 2