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(54) **Support structure for uneven ground.**

(57) The structure basically comprises a series of modular reinforcements (1) made of metal, designed to be coupled with one another by simple fitting, for which purpose their marginal areas form female lodgings (4) for the rod ends (5) of the adjacent module, said modular reinforcements corresponding to the side closure of the slope, with horizontal nets (6) located between the earth layers or strata, preferably of a plastic nature, over which the earth is compacted, and which are provided with holes (7) in their marginal area through which pass said modular reinforcement rods (5), said nets (6) acting not only as ground stabilizing means but also as side retention means for the modular reinforcements (1) which maintain the surface of the outside face of the slope.

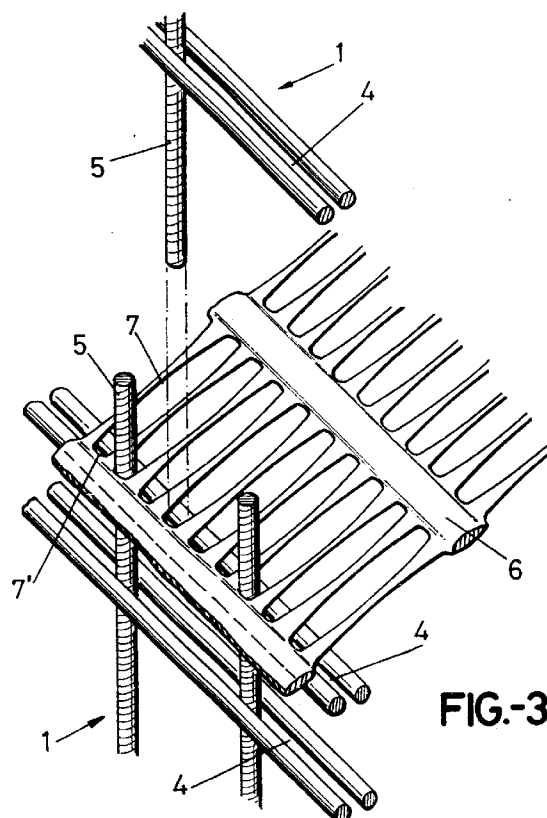


FIG-3

PURPOSE OF THE INVENTION

The present invention relates to a structure specifically designed to support uneven ground created by the characteristics of a given work or by the lateral offsetting of a natural or already existing unevenness.

The purpose of the invention is to provide a simple, cost effective, inexpensive transport and installation cost structure which is furthermore fully effective and which may be adapted to various ground slopes or gradients.

BACKGROUND OF THE INVENTION

A known technique involves providing a modular support grating fixed to the ground, said grating being a means of support for a cover padding acting both as a lateral earth containment means and as a physical support for seeds which might otherwise be washed away and which in time, after taking root, may form a vegetation mass providing a convenient lateral support means for the ground, while a reinforcement extending over the horizontal branch of the grating provides the actual means of support for the ground, regardless of the grating, which will in due course be destroyed by rusting.

In this respect, the Spanish invention patent ES 2023738 may be cited, among others, in regard to a sloping ground support reinforcement composed of several grate framing modules, each of which forms an acute dihedral angle, preferably a 60° angle, corresponding to the inclination specified for the sloping surface, in such a manner that lengthwise alignments are formed by said modules, each approximately 50 cm high, which, after being covered by the padding or appropriate material, receives a first layer of earth which is compacted for arranging thereon a new module alignment, the oblique or inclined face of which is on the same plane as that of the lower modules, whereby an appropriate surface continuity is established.

This solution involves two problems, on the one hand that the dihedral module configuration determines a volume which results in an increase of transport costs, while the lower branch - inactive as far as containment is concerned, conducted exclusively by the reinforcement padding - substantially increases the weight and generates a negative cost impact, while on the other hand the dihedral configuration produces a given inclination to the gradient which on occasion may not be the ideal one.

DESCRIPTION OF THE INVENTION

The uneven ground support structure proposed by the invention, as previously described, is designed and structured to solve the above problems in a fully

satisfactory manner.

Toward this end, initially and according to one of the characteristics of the invention, the structure's metal reinforcement modules are perfectly flat and affect the ground area corresponding exclusively to the slope, their dimensions and weight being minimal and their cost being consequently reduced as far as possible, while their flat condition allows them to be arranged in whatever inclination is imposed by the ground, whether it be the normal 60° inclination or any other inclination.

According to another characteristic of the invention, the reinforcement metal rods are arranged in a manner that provides a tongue and groove joint between the modules, in a perfectly co-planar disposition.

Finally, and according to still another characteristic of the invention, the above metal reinforcement modules are complemented with a plastic net designed to be attached horizontally to the module upper and lower margin areas, said plastic net being immersed in the ground and acting as a means of support for the metal reinforcements, and as a means of preventing the lateral offsetting of said reinforcements as a result of ground pressure, serving as a final stratified means of ground containment.

This plastic net is provided with slit-shaped holes of a decreasing width toward the ends thereof, in a manner that the metal reinforcement rods fit easily through the middle section of the holes but become tightly blocked at the end area when the net is offset laterally in respect to the metal reinforcement, thus achieving a full coupling condition.

A metal net has been considered, in which case the holes are of a quadrangular or rhomboidal shape, or any other suitable configuration; the net may even be of a mixed nature, combining metal and plastic components.

Furthermore, the lateral metal reinforcement modules may be braced to the horizontal nets by the conventional procedure of using oblique struts, after which the structure is covered with a standard fibrous seed containing and/or supporting mass, of the type conventionally available in the market.

DESCRIPTION OF THE DRAWINGS

In order to complement this description and to provide a better understanding of the characteristics of the invention, a set of drawings is attached to this specification, being a part thereof, in which the following information is represented in an illustrative, non-limiting form:

Figure 1 is a perspective view of a metal module or reinforcement framework which is part of the uneven ground support structure of the present invention.

Figure 2 is also a perspective view of two rein-

forcement modules similar to the module in Figure 1, conveniently coupled by superimposing them.

Figure 3 is a partially exploded perspective view of the two reinforcement modules represented in the preceding figure, one of which is shown associated to the complementary net according to a practical embodiment, in which said net is made of plastic.

Figure 4, on ending, shows a profile view of the assembly represented in the preceding figure.

PREFERRED EMBODIMENT OF THE INVENTION

As seen from these figures, it is evident that, according to the essence of the invention, the proposed uneven ground support structure is obtained on the basis of using a plurality of modules (1), each of which is composed of a metal reinforcement composed of horizontal crosspieces (2) and vertical uprights (3) and providing the special feature that the marginal areas of the module, which can be either its vertical marginal areas, as shown in Figure 1, or its horizontal marginal areas, as shown in Figures 2, 3 and 4, the rods, bars or plates which make up the reinforcement framework are double in number, in a way that lodgings (4) are defined between them for the purpose of coupling the ends (5) of the rods or adjacent module elements, thus allowing for tongue and groove coupling between the modules to provide a perfect fit, very readily applied, and allowing adjacent modules to adopt a perfectly planar disposition or to form any kind of elbowed shape by the simple procedure of elbowing the rod ends (5) in a magnitude appropriate to specific requirements in each case.

As a complement to the structure described and according to the essence of the invention, these modules (1) made of metal reinforcement frameworks are complemented with a net (6) which in the practical embodiment shown in the figures is made of plastic, although in specific circumstances it can be made of a different material, as for example of a metal or mixed nature, said net (6) being designed to adopt a horizontal disposition at various ground levels, specifically at the joint level between modules (1).

Said net (6), if made of plastic, has slits or slit-shaped holes (7) which allow the ends of the rods or bars (5) which make up the metal reinforcement of the modules (1) to pass through, said slit-shaped holes (7) clearly having a narrower configuration at the ends thereof (7') in order to ensure a perfect locking of the rods or bars (5), as shown particularly in Figure 3. Should the net be made of metal, said holes may be of a quadrangular or rhomboidal shape, or any other shape.

Said nets (6), having adequate width dimensions, are immersed in the ground between the various earth layers, thus providing the actual earth retaining means for the slope; they are complemented by the typical interior wall lining of the reinforcement frame-

work (1), based on the equally typical vegetation padding, whose initial self retaining capacity is in time enhanced by the vegetation taking root, providing the surface retaining means for the earth in the slope.

As can be seen from the foregoing, the proposed structure allows for easy construction, adjusting the inclination of the modular reinforcement (1) to the specific requirements in each case and maintaining said inclination with the aid of typical braces or struts installed, in the present case, between the crosspieces (2) of the modular reinforcements (1) and an ideal place in the net (6) according to the inclination of the reinforcements (1), thereby providing either a slope with a straight line profile by simple tongue and groove coupling between modular reinforcements (1), or else a broken profile by previously elbowing the ends (5) of the rods in the reinforcement framework, in a magnitude in accordance with specific requirements as the case dictates, simultaneously fixing the corresponding net (6) between every two superposed reinforcements, designed to strengthen both the compacted ground and its front reinforcements (1) at the appropriate level.

As can also be seen from the foregoing, the flat condition of the modular reinforcements (1) makes them lighter and thus easier to handle, with no auxiliary material being required for assembling the modules as a result of their tongue and groove coupling design. This flat configuration of the reinforcements (1) enables easier storage and transport conditions and poses no difficulty whatsoever in the course of subsequent earth filling and compacting operations.

Slopes of any inclination may be constructed, even up to the vertical, totally or partially stepped and with gradients that may be varied at will for adapting them to any ground profile foreseen.

More specifically, the normal construction procedure for a structure of this type is the following:

A traction net is laid over previously conditioned ground (the length of the net being calculated by a known conventional method), located perpendicular to the front of the future structure. A grating module is inserted through the characterizing holes at the front of the net, its lower rods planted in the ground up to the point where the horizontal rods come in contact with the net.

In this manner, the module is firmly fixed in the ground (with the chosen inclination, e.g. 60°), placing it in intimate contact with the net. Subsequently, the vegetation padding is installed and the grating is propped up to the horizontal net with the help of simple hooks.

Earth is then poured until the space behind the structure is completely filled, at which point the horizontal net should normally be covered. The earth is then compacted, providing a flat platform at a height of, for example, 0,5 meters above the original ground level; the above operations are thereafter repeated

until the desired level is obtained, with the sole exception that the modules are now inserted one inside the other, as required, to provide a final flat surface. On completion of this work, the surface is prepared to permanently accommodate vegetation.

Further description is deemed unnecessary for any person knowledgeable on the subject to understand the scope of the invention and the advantages deriving from it.

The materials, shape, size and arrangement of the elements are liable to variation provided no alteration of the essence of the invention is involved.

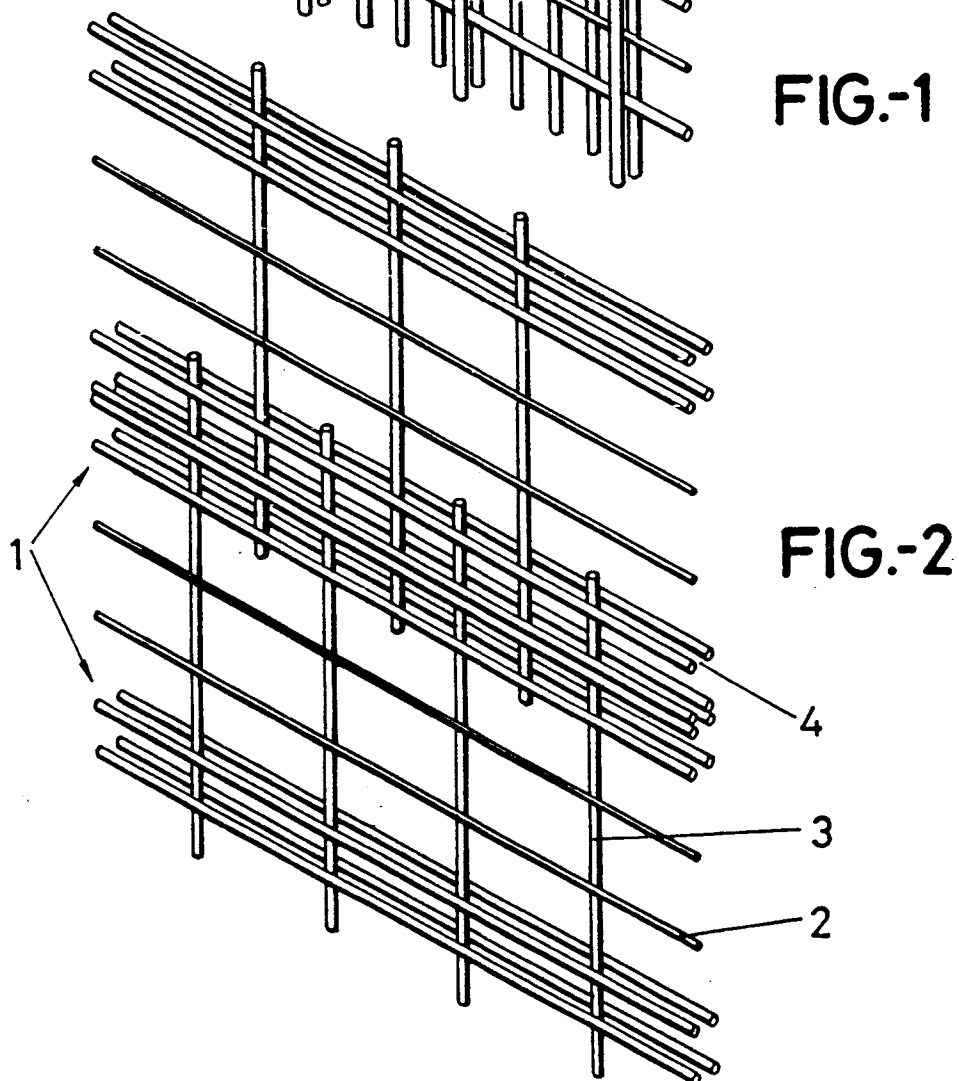
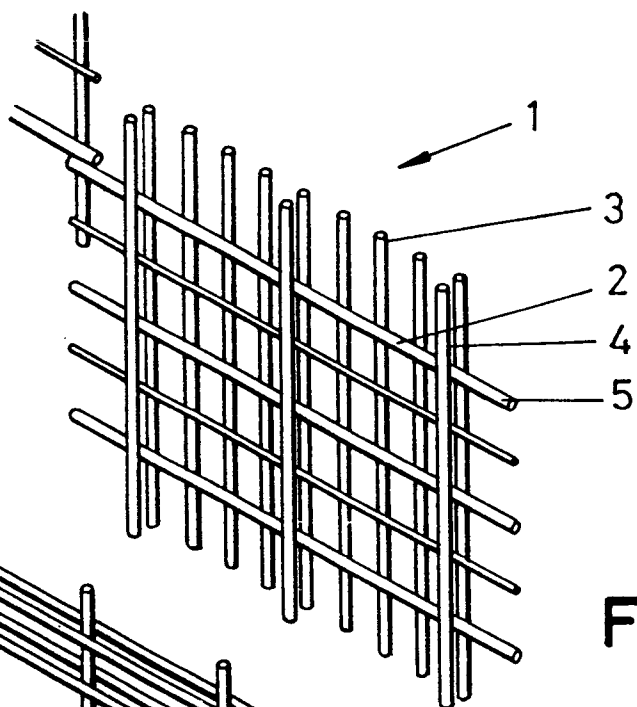
The terms of this specification must be taken in their broad, non-limiting sense.

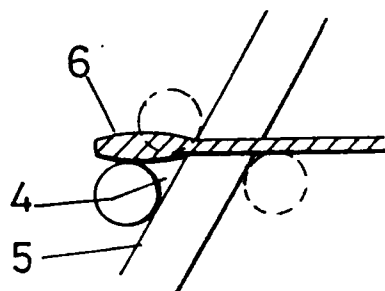
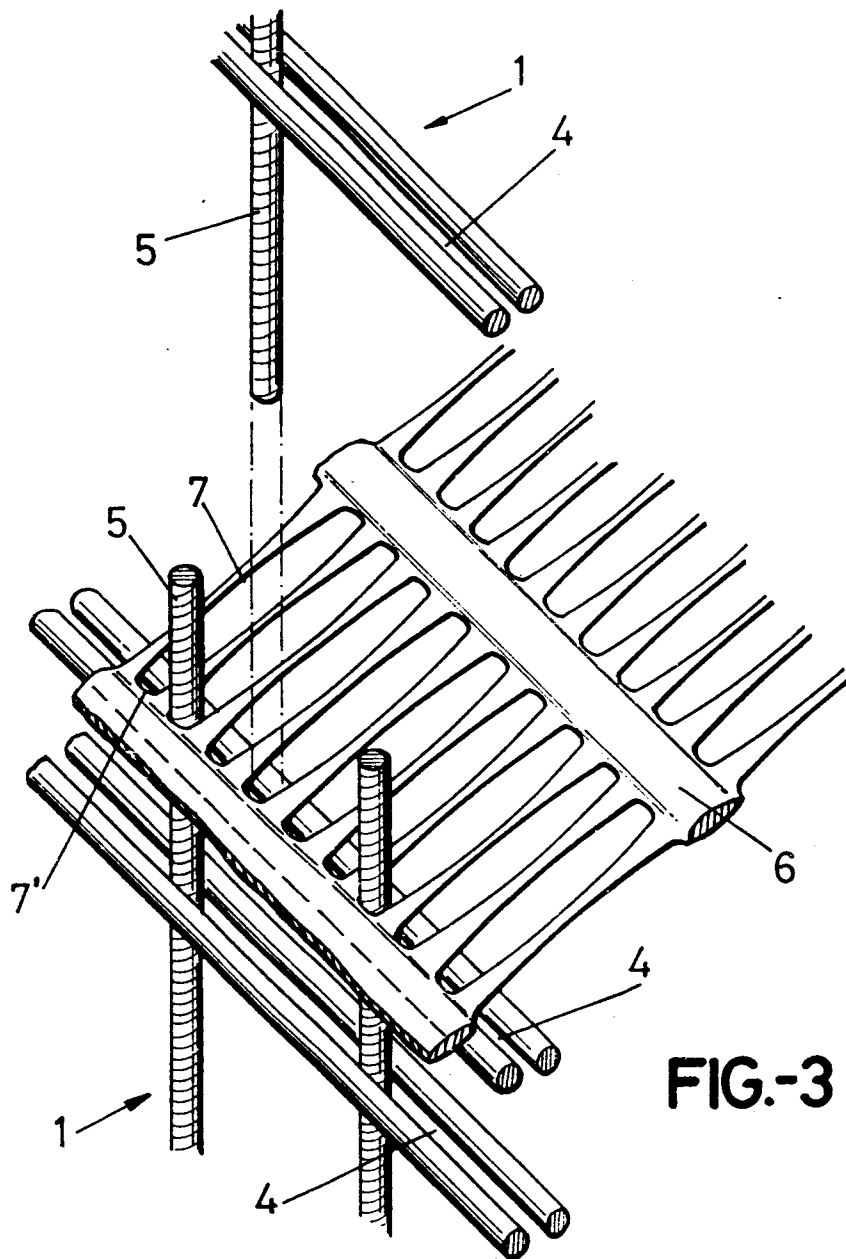
Claims

1. Support structure for uneven ground, of the type established on the ground with horizontal containment reinforcements located at different levels, and an external surface reinforcement framework, corresponding to the slope, where a vegetation padding, conventional in itself, facilitates the development and root taking of subsequent containment vegetation, basically characterized in that the functional combination of a series of modular reinforcement frameworks (1) based on a metal grating designed to construct a means of side coverage or protection, and a net (6), preferably made of plastic, although it could equally be of a metal or mixed nature, which is physically independent of said modular reinforcements and is liable to be coupled to them at the corresponding joint areas by superposition, so that the modular reinforcements (1) and nets (6) form flat elements initially independent of one another. 20
2. Support structure for uneven ground, according to claim 1, characterized in that each module or modular reinforcement (1) presents, on its marginally opposed areas, respective female lodgings (4) which allow for tongue and groove coupling between modules by direct mutual assembly, in the absence of auxiliary material, rod or bar ends (5) emerging from inside said casings or female lodgings (4) and designed to act as male elements to be inserted in the casing or lodging corresponding to the adjacent module. 45
3. Support structure for uneven ground, according to the preceding claims, characterized in that the end sections (5) of the bars or rods which make up the modular reinforcements (1) are included in the general and mean plane of the module, establishing a co-planar coupling between modules, or else are bent at their emerging point from the rest 55

of the structure to form an obtuse elbow when it is required that the adjacent modular reinforcements (1) form in turn an obtuse dihedron.

- 5 4. Support structure for uneven ground, according to the preceding claims, characterized in that the net (6), if made of plastic, presents slit-shaped holes (7) dimensionally adequate to allow the ends (5) of the rods (2-3) or elements making up the modular reinforcements (1) to pass through them, leaving a marginal area of said net (6) located between each pair of superposed modular reinforcements (1), while, if made of metal, said holes are of quadrangular, rectangular or rhomboidal shape. 10 15







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 50 0052

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	FR-A-2 590 291 (GUINTOLI FRERES) 22 May 1987 * the whole document * ---	1-4	E02D29/02
Y	US-A-4 856 939 (HILFIKER WILLIAM K) 15 August 1989 * abstract; figures * ---	1-4	
A	EP-A-0 574 233 (GEA SYSTEM S R L) 15 December 1993 * abstract; figures * ---	1-3	
A	FR-A-2 546 558 (ATLAS IND LTD) 30 November 1984 * abstract; figures * ---	1-3	
P,X	WO-A-95 00712 (VIDAL HENRI BREVETS ;SEGRESTIN PIERRE (FR); JAILLOUX JEAN MARC (FR) 5 January 1995 * abstract; figures * ---	1	
P,A		2,3	
P,X	WO-A-95 06784 (REINFORCED EARTH COMPANY ;ANDERSON PETER L (US); COWEL MICHAEL J () 9 March 1995 * abstract; figures * -----	1	
P,A		2,3	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 31 July 1995	Examiner Blommaert, S
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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