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Cellular reinforcement for soil particle confinement

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Abstract: A cellular reinforcement for soil particle confinement. Transverse reinforcement cords and longitudinal reinforcement cords are interlaced with each other to form a netlike sheet having openings of a preset size, and after fusion-welding the sheets formed in this way at regular intervals in a widthwise direction, by pulling a resultant structure in both directions, a plurality of honeycombed cell nets is formed.
Description

CELLULAR REINFORCEMENT FOR SOIL PARTICLE CONFINEMENT

Technical Field

[1] The present invention relates to a cellular reinforcement for soil particle confinement which is used for environment-friendly protection of a slope and an embankment or for forming the base of a retaining wall, revetment, road, etc., and more particularly, it is formed by interlacing transverse reinforcement cords and longitudinal reinforcement cords with each other to form a netlike sheet having openings of a preset size and by fusion-splicing the sheets formed in this way in a widthwise direction. This confers advantages in that a high coefficient of permeability is obtained, the frictional force with the aggregate is increased, and thus material can be saved to decrease the manufacturing cost. Also, easy root formation is ensured, and the load acting upon the application of compressive stress is dispersed to prevent the deformation of the cellular reinforcement, whereby the ground can be stabilized.

Background Art

[2] In general, erosion and caving are likely to occur on slopes and embankments and deformation occurs easily in soft ground since the support force of a base is insufficient to withstand the load of a structure. Therefore, in the case of forming a slope or building an embankment, in order to prevent erosion and caving, a reinforcement should be installed. Also, in the case of building a bank or a road on a soft ground, in order to increase the support force of the ground and prevent the subsidence of the ground, a reinforcement should be placed.

[3] Referring to FIG. 1, a conventional construction of a reinforcement for protecting a slope or an embankment includes band-shaped sheets 100 which are made of polyethylene and have a preset length. These sheets 100 are superposed upon and coupled with one another through ultrasonic welding. Then, by pulling the resultants structure in both directions, a cellular reinforcement for soil particle confinement is formed to have the shape of a cellular net.

[4] Referring to FIG. 2, after producing the cellular reinforcement for soil particle confinement, holes 200 are subsequently punched through the sheets 100 in situ by a worker using a puncher so as to increase the coefficient of permeability of the cellular reinforcement to some extent.

[5] However, the conventional cellular reinforcement has drawbacks in that it has a low coefficient of permeability and small frictional force with respect to a filler, costly equipment is needed to manufacture it, the manufacturing cost increases, easy root
formation is not ensured, and the deformation of the sheets 100 occurs upon application of a compressive load, whereby the ground can be made unstable.

Disclosure of Invention

Technical Problem

Accordingly, the present invention has been made in an effort to solve the problems and an object of the present invention is to provide a cellular reinforcement for soil particle confinement which is formed by interlacing transverse reinforcement cords and longitudinal reinforcement cords with each other to form a netlike sheet having openings of a preset size and by fusion-splicing the sheets formed in this way in a widthwise direction. Advantages conferred include obtaining a high coefficient of permeability, increasing the frictional force with aggregate, saving material, thus decreasing the manufacturing cost, ensuring easy root formation, and finally dispersing the load acting upon application of compressive stress to prevent the deformation of the cellular reinforcement, so that the ground can be stabilized.

Technical Solution

In order to achieve the above object, the present invention provides a cellular reinforcement for soil particle confinement. Transverse reinforcement cords and longitudinal reinforcement cords are interlaced with each other to form a netlike sheet having openings of a preset size, and after fusion-welding sheets formed in this way at regular intervals in a widthwise direction, a plurality of honeycombed cell nets is formed by pulling a resultant structure in both directions.

Advantageous Effects

Thanks to the above features, the cellular reinforcement for soil particle confinement by the present invention is formed by interlacing transverse reinforcement cords and longitudinal reinforcement cords with each other to form a netlike sheet having openings of a preset size and by fusion-splicing the sheets formed in this way in a widthwise direction. Due to this fact, the present invention confers advantages in that a high coefficient of permeability is obtained, the frictional force with aggregate is increased, material can be saved to thus decrease the manufacturing cost, easy root formation is ensured, and the load acting upon the application of compressive stress is dispersed to thus prevent the deformation of the cellular reinforcement, whereby the ground can be stabilized.

Brief Description of the Drawings

The above objects and other features and advantages of the present invention will become more apparent after a reading of the following detailed description taken in conjunction with the drawings, in which:

FIGS. 1 and 2 are perspective views illustrating a conventional reinforcement made
of high density polyethylene:

[11] FIG. 3 is a perspective view illustrating a cellular reinforcement for soil particle confinement in accordance with an embodiment of the present invention;

[12] FIG. 4 is a partial perspective view illustrating the structure of a honeycombed cell net which constitutes the cellular reinforcement for soil particle confinement according to the present invention;

[13] FIG. 5 is a partial front view illustrating the structure of a sheet which forms the honeycombed cell net according to the present invention;

[14] FIG. 6 is a graph illustrating the relationship between displacement and shear stress in the conventional reinforcement made of high density polyethylene;

[15] FIG. 7 is a graph illustrating the relationship between normal stress and maximum shear stress in the conventional reinforcement made of high density polyethylene;

[16] FIG. 8 is a graph illustrating the relationship between displacement and shear stress in the cellular reinforcement for soil particle confinement according to the present invention; and

[17] FIG. 9 is a graph illustrating the relationship between normal stress and maximum shear stress in the cellular reinforcement for soil particle confinement according to the present invention.

Mode for the Invention

[18] Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

[19] FIG. 3 is a perspective view illustrating a cellular reinforcement for soil particle confinement in accordance with an embodiment of the present invention. FIG. 4 is a partial perspective view illustrating the structure of a honeycombed cell net which constitutes the cellular reinforcement for soil particle confinement according to the present invention, and FIG. 5 is a partial front view illustrating the structure of a sheet which forms the honeycombed cell net according to the present invention.

[20] As shown in FIGS. 3 through 5, in a cellular reinforcement 1 for soil particle confinement in accordance with an embodiment of the present invention, transverse reinforcement cords 10 and longitudinal reinforcement cords 20, which are made of polyethylene and have a preset length, are interlaced with each other to form a netlike sheet 40 having a plurality of openings 30 of a preset size. At this time, as the occasion demands, the interlacing pattern of the transverse reinforcement cords 10 and the longitudinal reinforcement cords 20 can be changed between +, x and * shapes.

[21] When sheets 40 are formed in this way, the sheets 40 are connected with one another
at regular intervals in the widthwise direction thereof through fusion welding. At this time, the fusion welding can be conducted as ultrasonic welding, hot melt welding, hot wedge welding, hot air welding, etc.

[22] With the sheets 40 connected with one another at regular intervals, they are to be fusion-welded with other adjoining sheets. Fusion welding is performed on the middle portions of the connected sheets 40 such that fusion-welded points do not overlap.

[23] With a plurality of sheets 40 fusion-welded in this way, by pulling the resultant structure in both directions, a plurality of honeycombed cell nets 50 is formed.

[24] In the state in which the plurality of sheets is fusion-welded at regular intervals as described above and the plurality of honeycombed cell nets 50 is formed, aggregate including sand, soil, gravel, etc. can be placed in them. At this time, since a large number of openings 50 is formed uniformly over all surfaces of the sheets 40 constituting the honeycombed cell nets 50, even without subsequently conducting a separate process, advantages can be conferred in that a friction characteristic can be improved, material savings of over 20% can be realized compared to the conventional cellular reinforcement using band-shaped sheets, weight is reduced, and easy root formation can be ensured.

[25] By performing experiments for the cellular reinforcement 1 for soil particle confinement according to the present invention, constructed as described above, and the conventional reinforcement for protection of a slope made of high density polyethylene, as shown in FIG. 1, through shear tests, the results as given in the following tables were obtained.

| Experiment method: a shear test |
| Experiment condition: |
| Upper part weathered soil |
| Lower part reinforcement made of high density polyethylene |

| Normal stress (kg/cm²) | 0.7 | 1.4 | 2.6 |
| Maximum shearing load (kg) | 234 | 567 | 927 |
| Shear stress (kg/cm²) | 0.26 | 0.63 | 1.03 |
| Adhesion strength (kg/cm²) | 0.065 | Friction angle (°) | 19.5° |

[32] Experiment method: a shear test
[33] Experiment condition:
[34] Upper part weathered soil
[35] Lower part reinforcement made of high density polyethylene

[37] [Table 2]

<table>
<thead>
<tr>
<th>Normal stress (kg/cm²)</th>
<th>0.7</th>
<th>1.4</th>
<th>2.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum shearing load (kg)</td>
<td>742.5</td>
<td>969.3</td>
<td>1231.3</td>
</tr>
<tr>
<td>Shear stress (kg/cm²)</td>
<td>0.825</td>
<td>1.077</td>
<td>1.368</td>
</tr>
<tr>
<td>Adhesion strength (kg/cm²)</td>
<td>0.547</td>
<td>Friction angle (°)</td>
<td>28.5°</td>
</tr>
</tbody>
</table>

[40] The graphs illustrating relationships between displacement and shear stress according to the application of normal stress and between normal stress and maximum shear stress as given in Table 1 in the conventional reinforcement made of high density polyethylene are respectively shown in FIGs. 6 and 7. Also, the graphs illustrating relationships between displacement and shear stress according to the application of normal stress and between normal stress and maximum shear stress as given in Table 2 in the cellular reinforcement for soil particle confinement according to the present invention are respectively shown in FIGs. 8 and 9.

[41] From these graphs, it is to be readily understood that, in the cellular reinforcement for soil particle confinement according to the present invention, a friction characteristic is improved by about 50% and adhesion strength is increased to about 9 times compared to the conventional reinforcement made of high density polyethylene.

[42] Moreover, as can be seen from FIG. 3, due to the fact that the ends of the transverse reinforcement cords 10 and the longitudinal reinforcement cords 20 project sharply, the ends of the transverse reinforcement cords 10 and the longitudinal reinforcement cords 20 can be driven into the ground so that fastening force and frictional force can be increased, whereby the cellular reinforcement 1 for soil particle confinement according to the present invention can be stably installed.

[43] Although a preferred embodiment of the present invention has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of
the invention as disclosed in the accompanying claims.
Claims

[1] A cellular reinforcement for soil particle confinement, wherein transverse reinforcement cords and longitudinal reinforcement cords are interlaced with each other to form a netlike sheet having openings of a preset size and then after fusion-welding sheets formed in this way at regular intervals in a widthwise direction, a plurality of honeycombed cell nets is formed by pulling a resultant structure in both directions.

[2] The cellular reinforcement according to claim 1, wherein an interlacing pattern of the transverse reinforcement cords and the longitudinal reinforcement cords is selected from among shapes of +, x and *.

[3] The cellular reinforcement according to claim 1, wherein the fusion welding is selected from among ultrasonic welding, hot melt welding, hot wedge welding, and hot air welding.

[4] The cellular reinforcement according to claim 1, wherein widthwise ends of the transverse reinforcement cords and the longitudinal reinforcement cords are formed to be sharp.
[Fig. 9]