(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 281 814 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.02.2003 Bulletin 2003/06

(51) Int Cl.[7]: **E02D 17/20**

(21) Application number: **02015901.8**

(22) Date of filing: **17.07.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **30.07.2001 IT BO20010494**

(71) Applicant: **OFFICINE MACCAFERRI S.p.A.**
40123 Bologna (IT)

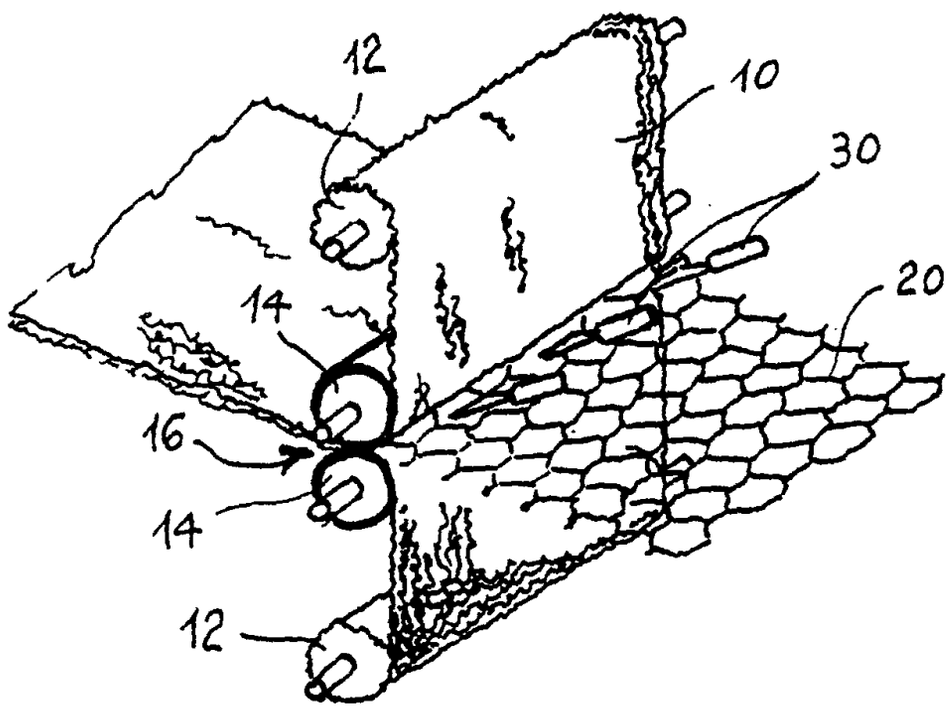
(72) Inventor: **Ferraiolo, Francesco**
40050 Ca' de' Fabbri, (Bologna) (IT)

(74) Representative: **Provvisionato, Paolo**
Provvisionato & Co S.r.l.,
Piazza di Porta Mascarella, 7
40126 Bologna (IT)

(54) A soil-covering structure comprising layers of geocomposite enclosing a reinforcing element, and a method for the production of that structure

(57) A soil-covering structure comprises layers (10) of geocomposite which enclose a reinforcing element (20) and which are engaged with the latter at predetermined positions only.

FIG.1



EP 1 281 814 A2

Description

[0001] The present invention relates to the field of soil-covering structures, and in particular to a covering structure comprising layers of geocomposite enclosing a reinforcing element. The present invention relates also to a method which is particularly suitable for the production of that structure.

[0002] It is known to produce reinforcing structures by mixing one or more filaments of geosynthetic material in the semiliquid state with a reinforcing element, for example a wire mesh, or a prefabricated layer of material having a high mechanical strength.

[0003] Italian patent IT 1257665 illustrates a method and an installation for manufacturing filters constituted by tangled threads in which a reinforcing netting is embedded. One of the main disadvantages of that method resides in the complexity and the number of devices necessary to manufacture the product. In addition to the rollers which support and maintain under tension the flexible netting constituting the reinforcing means, the installation also comprises an extrusion head provided with a plurality of nozzles which discharge a stream of geosynthetic heat-fusible material which is combined with the flexible netting in a cooling tank. The method for the manufacture of those filters also comprises some set-up stages, including the selection of the spacing between the nozzles of the extrusion head, the distance between the surface of the cooling liquid and the above-mentioned nozzles, the position of the bearing roller relative to the position of the nozzles, and the ratio of the thread-delivery rate to the surface speed of the bearing roller.

[0004] German patent application DE 2225043 illustrates a reinforcing structure which is substantially similar to that of the above-mentioned Italian patent but which comprises a double layer of geocomposite material, between which layers a knitted fabric is introduced and embedded. Although the resulting product still has optimum characteristics of mechanical strength, the method for the production thereof is even more complex and expensive.

[0005] The principal object of the present invention is to overcome the disadvantages of the products of the known type by producing a soil-covering structure which is economical and which exhibits a high degree of strength over time even after prolonged use.

[0006] Another object of the present invention is to provide a method for the manufacture of the above-mentioned covering structure which is simple and reliable and which enables production times and costs to be reduced.

[0007] In order to achieve the objects indicated above, the invention relates to a soil-covering structure comprising layers of geocomposite enclosing a reinforcing element, and to a method for the manufacture thereof, as defined in the claims which follow.

[0008] In one embodiment of the present invention, a soil-covering structure comprises a double layer of geocomposite, for example, but in non-limiting manner, a geomat which is generally composed of synthetic polymers. Enclosed inside the double layer of geocomposite is a metal structure, for example, but in non-limiting manner, a wire mesh, or a geogrid, in order to confer the necessary mechanical strength on the complete structure. During the manufacturing process, some predetermined portions of the layers of geosynthetic material are welded to the meshes of the reinforcing structure in such a manner as to improve sealing between the two layers of geosynthetic material and the reinforcing element.

[0009] One of the main advantages of this invention consists in the ready availability and easy handling of layers of geocomposite which have already been formed, and in the simplification of the production installation, for example, as a result of the elimination of the spinning and cooling devices of the systems of the known type.

[0010] Another advantage of the present invention is constituted by the fact that, during the manufacturing stage, both the layers of geocomposite and the reinforcing element which constitute the complete covering structure can be easily replaced without having to make substantial changes to the production installation and without having to carry out complex calibration and installation procedures for the system.

[0011] A further advantage of the present invention is provided by the greater compactness and strength of the "sandwich" system of the present invention which is composed of the layers of geosynthetic material and of the reinforcing structure which, as a result of the welding operation, is capable of withstanding even very high temperatures.

[0012] Other characteristics and advantages will emerge from the following detailed description of an embodiment of the invention with reference to the appended drawings which are given purely by way of non-limiting example and in which:

- Figure 1 is a perspective view of some elements of an installation for the production of a covering structure according to the present invention; and
- Figure 2 is a side view of a detail of Figure 1.

[0013] Referring now to the appended drawings, a soil-covering structure comprises at least two layers of heat-sensitive geosynthetic material, for example, but in non-limiting manner, two geomats 10 composed of synthetic polymers of the type generally available on the market under the name AK20-NOBEL, or COLBOND®, and one or more netting elements, for example, but not necessarily, a wire netting 20 of the type having hexagonal meshes. The wire netting 20 is enclosed inside the two geomats 10, and portions of the fibres of the geomats 10 are secured to predetermined regions of the meshes of the wire netting 20, for example, but in non-limiting manner, by welding, hot-fixing, or other similar

methods.

[0014] An installation for the production of a soil-covering structure according to the present invention comprises at least one pair of support means, for example, but in non-limiting manner, two rotatable cylindrical bodies 12 onto each of which a layer of geomat 10 is wound. The winding cylinders 12 are arranged opposite one another and a pair of drive and compression means, for example, but in non-limiting manner, a further pair of cylindrical elements 14, is arranged between them. The compression cylinders 14 are arranged at a short distance from one another, thus defining a path 16 which is of a height sufficient for the passage of at least two layers of geomat 10 and a wire netting 20.

[0015] In use, a panel of wire netting 20 of known type and two layers of geomat 10 are brought simultaneously to the vicinity of the inlet of the path 16 in the same predetermined direction, in such a manner that the wire netting 20 is located between the two layers of geomat 10.

[0016] In the vicinity of the path 16, one or more heating members, for example, but in non-limiting manner, heating torches 30, are arranged in predetermined positions upstream of the compression cylinders 14 in such a manner as to heat some of the contact regions between the geomats 10 and the meshes of the wire netting 20. In that situation, the fibres of the geomats 10 pass into a semi-fluid state and engage on the meshes of the wire netting 20.

[0017] The winding cylinders 12 and the compression cylinders 14 are then operated by motor means (not illustrated) and set in synchronous rotation with one another in such a manner as to permit the passage of the layers of geocomposite 10 enclosing the wire netting 20 along the above-mentioned path 16. The action of the compression cylinders 14 helps to complete the stage of engagement of the fibres of the geomats 10 with the meshes of the wire netting 20, so that a compact, reinforced, ready-for-use covering structure is discharged downstream of the cylinders 14, in the vicinity of the outlet of the path 16.

[0018] As illustrated in Figure 2, in order to promote the engagement of the fibres of the geomats 10 with the wire netting 20, and in order to reduce the heating times, the heating members 30 can be arranged in several groups, each in predetermined positions in the vicinity of each of the compression cylinders 14.

[0019] According to a further characteristic of the present invention, cooling elements (not illustrated), for example, but in non-limiting manner, a cooling plate, or a stream of cold air, or a vessel containing cooling liquid, are arranged downstream of the compression cylinders 14 in order to assist the rapid cooling of the fibres of the geomats 10 and to accelerate their connection to the meshes of the wire netting 20.

[0020] Once it has left the compression cylinders 14, the covering structure can be wound onto other cylindrical elements in order to be stored, or can be shaped directly in accordance with production requirements.

[0021] Naturally, the principle of the invention remaining the same, the forms of embodiment and details of construction may be varied widely with respect to those described without thereby departing from the scope of the present invention.

Claims

1. A soil-covering structure comprising layers of geocomposite enclosing a reinforcing element, **characterised in that** the layers of geocomposite are engaged with the reinforcing element only at predetermined portions.

2. A soil-covering structure according to claim 1, **characterised in that** the reinforcing element comprises wire netting.

3. A soil-covering structure according to claim 2, **characterised in that** the layers of geocomposite comprise a geomat.

4. A method for the production of a soil-covering structure according to any one of the preceding claims, comprising the stages of:

   - providing two or more layers of geocomposite material;
   - providing one or more reinforcing elements;

   characterised in that it also comprises the following stages:

   - superposing the two or more layers of geocomposite material on the one or more reinforcing elements; and
   - heating one or more predetermined portions of the geocomposite material in order to permit the engagement of the one or more predetermined portions with the reinforcing element.

5. A method according to claim 4, **characterised in that** it also comprises the stages of:

   - providing two or more support elements;
   - loading layers of geocomposite material onto the two or more support elements;
   - providing at least two compression elements arranged at a short distance from one another in such a manner as to define a path;
   - bringing to the vicinity of the inlet of the path a reinforcing element contained between the two or more layers of geocomposite material;
   - heating one or more predetermined portions of the geocomposite material in order to permit the engagement of the one or more predetermined portions with the reinforcing element;

and

- passing the two layers of geocomposite material enclosing the reinforcing element between the two compression elements.

6. An installation for the production of a soil-covering structure according to any one of claims 1 to 3, **characterised in that** it comprises an inlet region for two or more layers of geocomposite material and one or more reinforcing means, support means for layers of geocomposite and compression means being arranged in the vicinity of the inlet region, and heating means being arranged in such a manner that they are distributed in predetermined positions in the vicinity of the compression means.

7. An installation according to claim 6, **characterised in that** the support means comprise one or more cylindrical support elements, the compression means comprising two or more cylindrical compression elements arranged at a short distance from one another, and the heating means comprising heating torches.

FIG.1

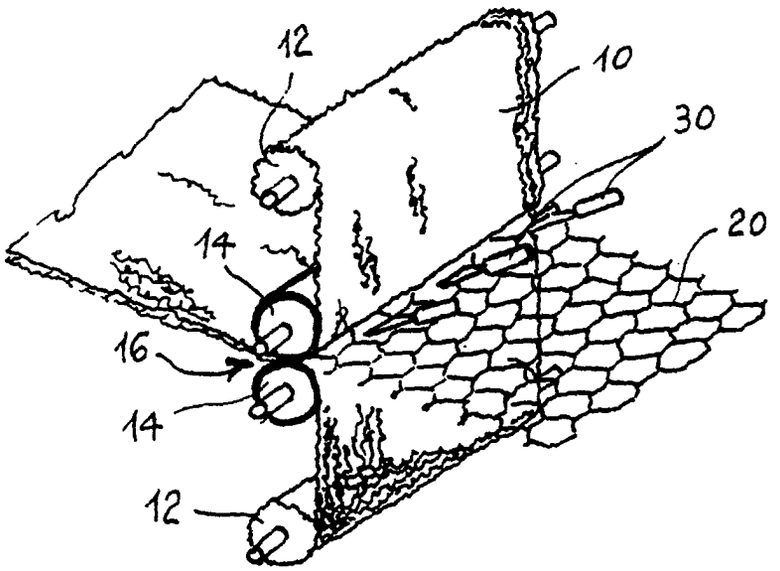


FIG.2