

PATENT SPECIFICATION

(11)

1294 680

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NO DRAWINGS

- (21) Application No. 63150/69 (22) Filed 29 Dec. 1969
 (31) Convention Application No. 50894 (32) Filed 31 Dec. 1968 in
 (33) France (FR)
 (45) Complete Specification published 1 Nov. 1972
 (51) International Classification E01C 3/06 D01D 5/00 D04H 3/10//
 E01C 9/08 D04H 3/16 3/03



(52) Index at acceptance

E1G 53E 60C1 60E1 60F 60N 60P 60T 61 62
 B5B 35Y 360 363 409
 D1R 3B1 3C2C 3C2Y 3C5A 3D1B2 3D2A 3D3C 3D3E
 3D3F

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(54) PROCESS FOR STABILISING SOILS

(71) We, SOCIETE RHODIACETA, a French Body Corporate of 21 Rue Jean-Goujon, Paris 8e, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the stabilisation of soils.

For the construction of buildings and land communication routes, especially road and railway communication routes, it is important for the base soil to be perfectly stable. For this reason a separating layer, generally called an anti-contaminant layer, is often spread over the cleared soil, optionally after it has been compacted but before the layers subsequently called "preparation layers" (foundation layer, base layer and the like) which are of a different material to that of the soil, are formed. This anti-contaminant layer, which is water-permeable, is intended to prevent the base soil being converted into mud which under the pressure exerted by the weight of a building or the passage of heavy vehicles (trains, lorries, or earthworking machinery), rises up through the preparation layers, with the result that these no longer react uniformly to the pressure exerted and subsidence occurs.

However, this anti-contaminant layer, which usually consists of so-called "drain sand", of gravel, or of an unsorted mixture of sand and gravel must, in order to be effective, be made sufficiently thick, especially if it rests on clay, sandy or marshy soils. Thus this expensive and in certain cases rather unreliable solution has important drawbacks.

The present invention provides a process for the preparation of a land surface, for example for the construction thereon of buildings or land communication routes, which comprises clearing the soil, depositing

on the cleared soil as an anti-contaminant layer a water permeable needle-punched non-woven fabric formed from synthetic organic continuous filaments, and laying down over the anti-contaminant layer one or more conventional preparation layers.

In itself, a non-woven web or fabric formed of continuous filaments arranged at random across the web is a known product. Such products are sometimes described by the general expression "spunbonded" and this expression will for simplicity be adapted hereinafter. The manufacture of these articles, which has frequently been described consists in principle in extruding a molten or dissolved organic polymer through a spinneret pierced with holes, orienting the extruded filaments by stretching the bundle by means of one or more jets of fluid (compressed air), and finally receiving the bundle in a predetermined manner on a moving belt whose speed and direction of travel are regulated so as to form an essentially regular non-woven web of the desired thickness. In practice, at this stage of the process of manufacture, the material is brought to the desired thickness, e.g. by calendering, preferably hot, so that the elementary filaments are bonded to one another at least at the surface, thereby considerably increasing the cohesion of the web. In general, a gently calendering suffices. The "spunbonded" web is then needle-punched, essentially to enmesh the continuous filaments and impart cohesion to the base layer.

For the present purpose there is preferably used a spunbonded web of oriented filaments of a polyester, especially polyethylene terephthalate, or a polyolefine, especially isotactic polypropylene, though other organic filaments (of for example a polyamide, polyvinyl chloride or polyvinylidene chloride or their derivatives, a cellulose acetate, poly acrylo-

[Price 25p]

SPECIFICATION AMENDED - SEE ATTACHED SLIP

nitrile, vinyl alcohol or the like) can also be used.

The webs can optionally contain a filler, an adjuvant or a textile reinforcement, consisting for example of a web of filaments or of parallel coarse fibres, or wide-mesh woven fabric.

The optimum weight of spunbonded webs employed depends on the nature of the base soil and of the preparation layers, as well as on the pressure which the soil will have to undergo. By way of example, a weight of 250 to 325 g/m² will be adequate for moderate or heavy duty roadways.

The spunbonded material can be placed in position very simply by unrolling on the soil. Optionally, a second fabric of the same or a similar kind and/or a conventional anti-contaminant layer can be laid down over it. Thereafter, the preparation layers and, where appropriate, the coating layers are formed in the ordinary manner.

Compared to the previously used anti-contaminant layers, the spunbonded material makes it possible, with greatly reduced volume and weight, (1) better to separate the base soil from the preparation layers, (2) more effectively to prevent the rise of mud and (3) better to distribute the load exerted at a point over a broader surface of the base soil. The use of this material thus considerably improves the stability even of soils which are by nature rather unstable, such as clay, sandy or marshy soils.

The spunbonded material is consequently particularly suitable firstly for stabilising roadways such as ordinary roads, motorways, racing tracks, unmade roads, tracks for the passage of heavy machinery in yards, and metalled roads, and secondly for stabilising building land and areas which have been cleared and are to be used for the bulk storage of large amounts of building materials, coal and the like.

The example which follows illustrates the invention.

Example

Polyethylene terephthalate granules dried to a residual moisture content of less than 0.01% and having an intrinsic viscosity of 0.65 (determined at 25°C on a 0.5% solution in *o*-chlorophenol) are fused in a single-screw extruder. The fused mass is passed by means of a pump through a spinneret heated to 290°C and pierced with 50 holes of diameter 0.6 mm. The flow of extruded material is regulated to 3.0 g/minute/hole. The bundle of filaments formed is collected continuously in a stretching nozzle situated 175 cm from the spinneret, so that while travelling from the spinneret to the nozzle the bundle cools. The stretching nozzle is supplied with air compressed to 6 kg/cm² gauge.

After the stretching, the filaments have the following properties:

Average gauge, 10 dtex (9 den);
Elongation, 130%;
Tenacity, 3.2 g/den.

The bundle of oriented filaments is laid down by means of an oscillating deflector onto an endless moving belt to form a non-woven web which consists of continuous filaments arranged at random and in a non-parallel manner and which weighs about 280 g/m². This web is continuously calendered by passing it between two rollers heated to 120°C, the spacing of which is adjusted to 8 mm.

Thereafter the spunbonded web is passed into a needle-punching loom equipped with needles with nine hooks, and so regulated as to give a piercing density of 80 strokes/cm² and a thickness of about 3 mm; the resulting web weighs about 300 g/m².

A sample of this web, 20 metres long and 5 metres wide, was unrolled on a curved access ramp of clay soil sloping at about 5°, 80 tons of unsorted sand-gravel mixture of density about 1600 kg/m³ were spread above the web. After lorries and bulldozers of average weight 20 tons had passed, at the rate of 800 tons/day, for 15 days (during which it rained for the equivalent of 5 days, of which 3 were consecutive days), the profile of the ramp was only very slightly changed and all travel had taken place normally.

During the same time, on a ramp similar to the first to which only the 80 tons of the sand-gravel mixture but no non-woven web has been applied, the lorries and bulldozers become stuck in the mud after one day's rain and it was necessary to add further sand-gravel mixture. After 15 days, to fill up the ruts which had appeared either merely because of the lorries and bulldozers passing or because of the combined action of their passing and of the rain, it was necessary to add 170 tons of the mixture over a surface equal to that of the web, that is to say 100 m², representing a total application of 250 tons against a previous 80 tons.

WHAT WE CLAIM IS:—

1. A process for the preparation of a land surface, for example for the construction thereon of buildings or land communication routes, which comprises clearing the soil, depositing on the cleared soil as an anti-contaminant layer a water-permeable needle-punched non-woven fabric formed from synthetic organic continuous filaments, and laying down over the anti-contaminant layer one or more conventional preparation layers.

2. A method according to claim 1, where-

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The webs can optionally contain a filler, an adjuvant or a textile reinforcement, consisting for example of a web of filaments or of parallel coarse fibres, or wide-mesh woven fabric.

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The spunbonded material can be placed in position very simply by unrolling on the soil. Optionally, a second fabric of the same or a similar kind and/or a conventional anti-contaminant layer can be laid down over it. Thereafter, the preparation layers and, where appropriate, the coating layers are formed in the ordinary manner.

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2. A method according to claim 1, where-



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in the non-woven fabric is made of filaments
of a polyester or a polyolefine.

3. A method for the preparation of a land
surface according to claim 1 substantially as
5 hereinbefore described.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1972.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from
which copies may be obtained.

SPECIFICATION NO 1294680

By a direction given under Section 17 (1) of the Patents Act 1949 this application
proceeded in the name of RHONE-POULENC-TEXTILE, a French Body Corporate of
21, Rue Jean-Goujon, Paris 8e, France.

THE PATENT OFFICE

R 15353/15

