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

(11) Publication number : **0 616 078 A1**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **93202281.7**

(22) Date of filing : **02.08.93**

(51) Int. Cl.[5] : **E01C 13/00**

(30) Priority : **13.02.93 GB 9302906**

(43) Date of publication of application :
21.09.94 Bulletin 94/38

(84) Designated Contracting States :
BE NL

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(54) **Improved surfaces for sporting and other activities.**

(57) An improved grass surface in which the grass is grown in a layer of material comprising sand, an organic growth supporting medium and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the growing material, and having an average fibre length from 5mm to 75mm and/or an improved sub-base for surfaces for sporting and/or other activities comprising the said material.

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FIELD OF THE INVENTION

The present invention relates to improved surfaces for sporting and other activities, and more particularly to surfaces suitable for equestrian usage, for ball games, such as football and golf, and other leisure activities.

BACKGROUND OF THE INVENTION

The natural surface for most equestrian events, particularly horse jumping, is grass. This is acceptable for large areas such as race courses where the usage is low and the grass therefore has time to recover between race meetings. Where the surface is used more extensively, for example, in training areas, grass, particularly in the autumn and winter period, becomes worn and muddy patches appear. These patches form dusty hard surfaces in dry conditions, and this may lead to an unacceptable incidence of leg injuries.

As an alternative to grass a number of artificial surfaces have been used. A first known surface comprises natural wood fibre and this when new provides a good surface. It is however a natural material and therefore deteriorates with age. Thus it has to be replaced and since it is fairly expensive the replacement cost is high. A second known surface comprises finely chopped PVC often from used electrical cable insulation material. This produces a good surface but if laid deeply the surface is rather loose and the cost of the material is very high. A third known surface comprises ashes from power stations. The ashes provide a surface which drains readily when newly laid in wet weather but in dry conditions the surface produces dust and becomes compacted becoming hard especially after prolonged use. An alternative surface is silica sand which provides a good surface in wet weather conditions but in dry weather conditions the sand provides an extremely difficult surface for both jumping and landing particularly for an equestrian practise ring. The principal problem of silica sand is that it lacks cohesion therefore providing a surface which is described as riding too deep and loose.

The natural surface for most ball games is also grass. The damage to the turf and soil structure which is caused by normal usage is intensive and the scale of damage can exceed the rate of such recovery. This is particularly pronounced in areas such as goal mouths and centre circles of football pitches and on golf tees where the turf can be totally destroyed and the soil severely compacted. In wet weather this means mud; in dry weather the surface is hard and bumpy.

As an alternative to grass a number of artificial surfaces have been used. A first known surface, commonly known as hard porous, comprises water bound grit/sand/clay mixtures of differing proportions, normally laid over a drainage layer of coarser material. This surface provides inadequate cushioning and is too abrasive. The surface material also becomes destructured and therefore loses permeability. In dry weather dust is a problem.

A second known surface comprises a synthetic material designed to imitate real turf. This may be laid on soil or on a drainage layer of sand or other material. This synthetic turf may or may not be infilled by a top dressing of sand. Such a surface is expensive to install and has insufficient resilience for falling players. Maintenance and repairs are difficult and costly.

A third known surface comprises a layer of fibres which are joined together in a loose pattern, laid in a bed of sand which in turn may be laid on a drainage layer of other material. Maintenance and repairs are difficult and costly. Play characteristics are poor.

A fourth known surface comprises a layer of sand or granular material bound by bitumastic or similar material. Such a surface has insufficient resilience, is too abrasive and is difficult and costly to repair and maintain.

It can be seen from the above that where the wear on a playing surface is severe, the tendency has been to move away from grass to synthetic surfaces of various kinds. However, for many reasons, both aesthetic and practical, it would still be preferable to employ a grass surface if its wearing properties could be improved.

In British patent No.2184765B there is described and claimed an all weather surface for equestrian events which has proved to be highly successful in practice. The surface comprises a layer of material, the material comprising a mixture of sand and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres throughout the sand, in which the fibres are in the range of 25 to 75 mm in length and are of uncrimped form. This is still, however, a wholly synthetic surface.

SUMMARY OF INVENTION

We have now discovered an improved all weather grass surface in which the root zone is stabilised with synthetic fibres, whilst maintaining a structure with good drainage and aeration, and an improved subbase for surfaces for sporting and for other activities.

According to one aspect of the present invention there is provided an improved grass surface in which the grass is grown in a layer of material comprising sand, an organic growth supporting medium and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the material, and having a fibre length from 5mm to 75mm.

In another aspect the invention provides a method of forming an improved grass surface, which comprises sowing grass seed in, or applying turf to, a lay-

er of material comprising sand, an organic growth supporting medium and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the material, and having a length from 5mm to 75mm.

In a further aspect, the invention provides a growing material for a grass surface, which comprises sand, an organic growth supporting medium and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the growing material, and having a fibre length from 5mm to 75mm.

In a still further aspect the invention provides a sub-base for a surface for sporting and/or other activities which comprises a layer of material comprising a mixture of sand, a particulate or fibrous organic material comprising vegetable matter and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the mixture and having a fibre length of from 5mm to 75mm.

DETAILED DESCRIPTION OF THE INVENTION

The components of the material of the present invention are sand, an organic medium which may be an organic growth supporting medium or a particulate or fibrous organic material comprising vegetable matter and elongate synthetic fibres.

Sand, suitable for use in the present invention, may be silica sand, or a sand bonded with a water activated clay. Sands bonded with an organic liquid activated clay, which are sometimes used for equestrian surfaces, are in general not suitable for use in the present invention.

Silica sand is a sand which is relatively clean, is clay free, and is a well graded sand produced by a wet classification method. Sand bonded with water activated clay is a sand in which the sand particles are coated with a water activated clay which imparts a degree of cohesive strength to the sand, the extent of the cohesive strength being dependent on the relative amounts of clay and water.

Preferably the sand particles have an average diameter in the range of from 100 to 1000 microns.

The organic growth supporting medium may be any suitable particulate or fibrous material which can be penetrated by grass roots, but is preferably soil, peat, or a mixture thereof.

Where soil is used, this is preferably good quality top soil (screened and/or sterilised) from an approved source. Top soil provides a base source of nutrients for the grass and provides moisture retention characteristics.

The peat is preferably from an approved source and provides an organic content which acts to retain moisture and provide a source of root promoting bacterial activity in the root zone.

The organic growth supporting medium is preferably supplemented with a soil conditioner such as a seaweed based soil conditioner, for example, Alginure soil improver, which contains an organic colloid capable of aggregating soil and intensifying microbial life as well as providing a supply of trace elements.

Where the organic medium is a particulate or fibrous organic material comprising vegetable matter, it may also be, but need not necessarily be, growth supporting. The particulate or fibrous organic material can for example be soil, humus, peat or other similar materials derived from the partial decomposition of vegetable matter.

The elongate synthetic fibres preferably comprise fibres of a synthetic polymeric material having good resistance to environmental conditions. Fibres of polyolefins such as polyethylene, polypropylene, polybutene or co-polymers thereof are suitable, together with polyamides such as nylon, halogenated polymers such as PVC, and other similar materials.

The fibres can have a fibre length of from 5 to 75mm, preferably from 10 to 75mm, most preferably from 20 to 40mm. The average diameter of the fibres is preferably from 50 to 150 denier, for example about 65 denier.

The fibres are preferably polypropylene fibres commonly referred to as staple fibre.

Preferably the layer of growing material or the sub-base is from 25 to 150mm thick, most preferably from 50 to 150mm thick.

It is highly advisable to add to the layer of growing material a fertiliser at least prior to seeding or planting and at regular intervals thereafter. An inorganic fertiliser comprising a balanced supply of nitrogen, phosphorus and potassium (N, P and K) may be added to the root zone, and for example a typical pre-seeding fertiliser (5, 7.5, 5) may be added to the growing material at the mixing stage or sprayed or sprinkled onto the surface of the layer of growing material in situ. The fertiliser should be chosen to provide a balanced supply of the main nutrients required for healthy turf growth.

The ratio of the components of the material will depend to some extent on the nature of the components chosen. Where silica sand is used, this preferably comprises from 50 to 95% by volume most preferably from 60 to 85% by volume of the total composition. Where sand bonded with water activated clay is used, this preferably comprises from 50 to 95 percent by volume of the total composition.

For the organic growth supporting medium, where top soil is used, this preferably comprises from 5 to 50% by volume most preferably from 5 to 20% by volume of the total growing material composition, and where peat is used this preferably comprises from 5 to 25% by volume most preferably from 5 to 15% by volume of the composition.

For the particulate or fibrous organic material component of the sub-base, where top soil is used,

this preferably comprises from 5 to 50% by volume most preferably from 5 to 20% by volume of the total material composition, and where peat is used this preferably comprises from 5 to 25% by volume most preferably from 5 to 15% by volume of the composition.

Where a seaweed based soil conditioner is used this is preferably applied in an amount of from 50 to 100g/m^2, preferably about 75g/m^2.

The fertiliser is preferably added in an amount of from 10 to 50kg/20 tonnes of total composition by weight, for example about 25kg/20 tonnes of total composition by weight, or applied to the layer in situ at a rate of from 50 to 100g/m^2, preferably about 75g/^{2}.

The percentage of synthetic fibres in the total material composition is preferably in the range of 0.1 to 0.9% by weight, most preferably from 0.25 to 0.5% by weight, for example about 0.4% by weight. In general the percentage of fibres is at the higher end of the range when silica sand is used, and the lower end of the range when sand bonded with water activated clay is used.

The fibres may be coloured to conform to the colour of the growing material and thereby be substantially invisible in use.

The components of the growing material may be mixed in any order, or simultaneously, to give a substantially homogeneous mixture. It is important to distribute the fibres evenly and randomly throughout the mixture, and it has been found in practice that it is preferable to pre-mix the sand and the fibres together to obtain an even random dispersion.

In the preparation of an all weather grass surface according to the invention, turf and top soil are removed to the required depth and replaced with a layer of the growing material. A greater depth of turf and top soil may be removed particularly if the drainage characteristics are poor and the lower layer may be replaced with a drainage base comprising clean crushed rock or gravel of appropriate size laid to an appropriate thickness in accordance with normal drainage engineering design rules.

The growing material is prepared by taking a quantity (usually several tonnes) of sand which is in a fairly moist condition and mixing into the sand a quantity of polypropylene fibres of the desired length. The sand is preferably selected to have an average particle size of from 100 to 1000 microns with particles of rounded to sub-angular shape and is mixed with the fibres for example in a high intensity mixer of the contra rotating type which mixes the fibres homogeneously in a randomly orientated distribution throughout the sand.

The random distribution of fibres stabilises the sand imparting resistance to particle movement under load from horses hooves etc, thus minimising spreading and hoof penetration such that a sure footing is obtained. The fibre length is required to be long enough such that a "crosslinking" effect is produced thereby preventing the sand from moving under the pressure of the horses hooves, players feet, or other users such as wheeled vehicles or implements.

Thus the particle size of the sand and the diameter and length of the fibres require to be carefully selected within the preferred ranges to suit the intended use.

Relatively straight fibres need to be used since crimped fibres are not readily mixed to produce a substantially "homogeneous" mixture. The length of the fibres is of particular importance since this provides, in the homogenous mixture, the crosslinking which is necessary to prevent the mixture from spreading under the shock loading produced by horses hooves, players feet, or other users as aforesaid.

Following mixing of the sand and the fibres, this mixture is further mixed with the organic growth supporting medium and any soil conditioner and/or fertiliser as appropriate. Following mixing the growth material is delivered to the prepared site and laid out to the required depth to give the desired surface characteristic. The characteristic of the surface can be altered by the choice of sand particle size and the percentage of the individual components mixed therewith.

Grass seed is then applied to the layer of growing material at a rate depending on local conditions, but usually within the range of 25 to 35 g/m^2. In the alternative, the layer of growing material may be turfed using turf which has been grown on the same type of sand as used for the growing material. For this application so-called washed turf is preferred.

It is found that using the method of the invention, an all weather grass surface can be prepared which is free-draining, such that even after prolonged periods of heavy rain water will not stand on the surface. The surface remains relatively dry and mud free, to provide a firm footing for sporting activities. In addition, it is found that the surface resists compaction, and the root zone retains a good structure even when subjected to heavy wear under wet conditions. This improves aeration giving the grass ideal growing conditions, and allows healthy and vigorous root development. The result is a thicker, more dense cover of grass.

It is found that the preferred grass surfaces of the invention have greatly improved sheer resistance and stability. The synthetic fibres act like a mass of relatively indestructible roots, and provide a rot proof structure to the root zone. It is believed that the distributed fibres, rather than the grass roots, take the strain from shocks and pressure to the system, and prevent the surface from breaking up. Grass regeneration after winter conditions is very quick because the roots have remained intact. For the same reason, recovery from any shallow divotting is very speedy.

The new all weather grass surface is particularly suitable for sporting areas having high usage, for ex-

ample equestrian training areas, the goal mouths and the centre circle of a football pitch, and golf tees.

In the preparation of a sub-base for a surface for sporting and other activities the same procedures are adopted as set out above. The mixture of sand, particulate or fibrous organic material comprising vegetable matter and elongate synthetic fibres is laid out on a prepared site to the required depth as previously described. A so-called "paving" may then be laid on the thus formed sub-base, which, in the case of for example a tennis court or a footpath, can be a clay paving. Other suitable paving materials may of course also be used.

The reader's attention is directed to all papers and documents which are filed concurrently with this specification and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps or any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

Claims

1. An improved grass surface in which the grass is grown in a layer of material comprising sand, an organic growth supporting medium and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the material, having a fibre length from 5mm to 75mm.

2. An all weather surface as claimed in claim 1, in which the sand is silica sand in which the sand particles have an average diameter in the range of from 100 to 1000 microns and/or in which the organic growth supporting medium is soil, peat, or a mixture thereof, preferably comprising a soil conditioner, preferably a seaweed based soil conditioner.

3. A surface according to Claim 1 or 2, in which the elongate synthetic fibres have a fibre length from 20 to 40mm and/or average diameter from 50 to 150 denier.

. A surface according to any of the preceding claims, in which the layer of material is from 50 to 150mm thick and/or in which the material (a) comprises from 50 to 95% of silica sand by volume of the total material, or (b) comprises from 50 to 95% of sand bonded with water activated clay, by volume of the total material.

5. A surface according to any of the preceding claims, in which the organic growth supporting medium comprises soil which is present in an amount of from 5 to 50% by volume based on the total volume of the growing material and/or comprises peat which is present in an amount of from 5 to 25% by volume based on the total volume of the growing material.

6. A surface according to any of the preceding claims, in which there is present a seaweed based soil conditioner in an amount of from 50 to 100g/m^2, based upon the area of the growing material layer, and/or an inorganic fertiliser in an amount of from 10 to 50kg/20 tonnes of total growing material by weight.

7. A surface according to any of the preceding claims, in which the percentage of synthetic fibres in the material is in the range of from 0.1 to 0.9% by weight based on the total weight of the material.

8. A method of forming an all weather grass surface, which comprises sowing grass seed in, or applying turf to, a layer of growing material comprising sand, an organic growth supporting medium and elongate synthetic fibres, the fibres having a length from 5mm to 75mm and being randomly dispersed as separate individual fibres in the growing material, preferably by being pre-mixed with the sandin a high intensity mixer.

9. A growing material for a grass surface, which material comprises sand, an organic growth supporting medium and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the growing material, and having a fibre length from 5mm to 75mm.

10. A sub-base for a surface for sporting and/or other activities which comprises a layer of material comprising a mixture of sand, a particulate or fibrous organic material comprising vegetable matter and elongate synthetic fibres, the fibres being randomly dispersed as separate individual fibres in the mixture and having a fibre length of from 5mm to 75mm.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2281

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.5)
D,Y	GB-A-2 184 765 (THE MANSFIELD STANDARD SAND CO.)	1	E01C13/00
A	* the whole document *	2-4,7-10	
Y	GB-A-2 245 132 (SOLON)	1	
A	* the whole document *	2,5,8-10	
A	US-A-5 064 308 (ALMOND) * column 5, line 13 - line 34; figure 3 *	1,2,5	
A	DE-A-18 12 745 (AMERICAN FOREST) * claims 1,2 *	2	
A	WO-A-92 13138 (BOWERS) * page 6, line 11 - page 13, line 9; figures *	1,10	
A	EP-A-0 322 090 (THE ROYAL HONG KONG JOCKEY CLUB) * the whole document *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

E01C
A01G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 May 1994	Dijkstra, G

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
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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
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