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(54) **Method of providing a substructure construction for an artificial grassfield and an artificial grassfield having such a substructure construction.**

(57) A method of providing a substructure construction for an artificial grassfield by providing a foundation on a layer of sand which is present or has been provided, said foundation for the larger part consisting of natural round sand or river sand to which a material of organic origin is added in an amount of more than 1 weight %, calculated on the quantity of sand, whereby 60-70 weight % of river sand is distributed evenly among a quantity of 40-30 weight % of rubber particles.

EP 0 260 769 A1

Method of providing a substructure construction for an artificial grassfield and an artificial grassfield having such a substructure construction.

The invention relates to a method for providing a substructure construction for an artificial grassfield by providing a foundation on a layer of sand which is present or has been provided, said foundation for the larger part consisting of natural round sand or river sand to which a material of organic origin is added in an amount of more than 1 weight % on basis of the sand. The invention furthermore relates to an artificial grassfield, having such a substructure construction, which can be used for practising various sports, especially soccer.

In the past decade the interest in artificial grass has constantly increased as it is possible on these fields to practise sport in practically all weather conditions without having to be afraid that the field will have to be rejected and because a field of artificial grass can be used much more intensively than a field of natural grass. A field of artificial grass strewn in with sand can be used for about 2000 hours per year without any problems, whereas a field of natural grass can be played on for an average of 250-300 hours per year. Also the cost of maintenance is considerably lower for an artificial grassfield as it amounts to approximately Dfl. 3000,-per field per year, whereas for a field of natural grass the average cost is Dfl. 20,000.-per field per year.

Because of these advantages more and more fields of artificial grass are being laid, which are used especially for playing hockey. Such fields of artificial grass are also known in the patent literature, especially since the publication of the US patent 3,995,079, published in 1976. At that time a great deal of attention was paid to the provision of a filling material between the fibres forming the artificial grass, so that on the one hand the fields of artificial grass could be laid down cheaper because less fibre material was required and on the other hand the field got properties which were better comparable with those of a natural field. For playing hockey on a field of artificial grass it is especially important that the field is flat and furthermore the damping or softness is important. For a soccer field, on the other hand, the damping is the most important factor because with soccer the players make more movements such as jumping and making slidings than with hockey. It has been tried to vary the damping of artificial grass by partly substituting the layer of sand which was strewn between the fibres for an other material such as rubber particles being connected together by means of a binding agent, as described in the US patent specification 4,396,653. On said rubber grains connected together by a binding agent there

was strewn a layer of sand. In practice, however, such a construction proved to be unsatisfactory because the layers strewn in were of a too resilient nature. Furthermore an artificial grassfield is described in the US patent 4,497,853 in which an understructure construction is applied having a layer of coir fibres, protected by a layer impervious to water. Said construction is costly because it is built up from an substructure construction comprising at least three layers and moreover the artificial grassfield thus obtained does not have the desired damping.

An improved substructure construction for an artificial grassfield which can especially be used for soccer because a better damping is obtained, is known from the European patent specification 0,136,747. The substructure construction described therein is composed of unbroken sand which is mixed with at least 1 per cent by weight of a fibrous material, for which purpose polypropylene fibres, Nylon fibres or glass fibres have been mentioned. From further measurements and observations it has become apparent that the optimum result which can be obtained with a substructure construction for an artificial grassfield with regard to the flatness and the damping power can be improved by a substructure construction according to the invention. Said substructure construction can be laid according to a method as mentioned in the preamble and it is characterized in that 60-70 per cent by weight of river sand is distributed evenly among a quantity of 40-30 per cent by weight of rubber particles. It might be that in the non-prepublished European patent application 204,381 (publication date December 10, 1986) it has been indicated that a substructure construction for an artificial grassfield can be obtained from a mixture of sand and cuttings or fibres of an elastomeric material, but these cuttings or fibres have a length of 10-40 mm and a thickness of 1-4 mm. This means that one used small sheets having a thickness being about 10% of the length. Contrary to this the crumbles or fragments as used according to the present invention have such a size that the length and thickness are comparable. By doing so a skeleton of rubber has been obtained in which sand fills up the gaps between the rubber particles. The elasticity of the skeleton of the rubber particles is decreased and can be controlled by the sand as filled in between the particles of rubber. In the construction according to the invention one only uses round sand or river sand, while according to the non-prepublished European patent application 204,381 preferably hydraulic slag sand is added.

The use of resilient particles as such in a ground layer has been described in the British patent application 2,132,903 but there the particles of the resilient material, such as grains of synthetic rubber, plastic materials, cork and the like are provided in a fibrous structure of e.g. polyamide fibres. This construction is costly because of the use of the polyamide fibres and it has a considerably looser structure than the layer consisting of the matrix of rubber particles, whereby the hollow spaces are filled with sand as applied according to the present patent application. Besides, tests have shown that the damping value for a soccer field having a substructure according to the invention is better than with the ground layer as described in said British patent application.

With the construction according to the invention it appeared to be possible that the substructure construction is up to the high standards required for an artificial grassfield for playing soccer. The main consideration thereby is the playing comfort and the damping of the total construction. The damping power of the total construction is mainly determined by the construction of the substructure. Said damping power is especially important when the sportsman comes down after a jump, whereby the sportsman should have the same feeling as on a natural field. When the damping power is too small the playing surface is relatively hard and the chance of getting injured is too great. Therefore it is very difficult to construct a substructure construction for a field of artificial grass whereby the final result is that the sportsman experiences the artificial grass as much as possible the same as a field of natural grass. This has only appeared to be possible with the construction according to the present invention and not with the application of the comparatively elastic intermediate layer with bound rubber granulates in the synthetic fibres. Besides there is no natural build-up of the layers with known constructions as described in the British patent application 2,132,903 and the US patents 4,396,653 and 4,497,853, as a result of which the differences in properties between the various layers composing the construction are too great, which the sportsman, when making sudden movements, experiences as unpleasant.

According to a preferred embodiment with the method according to the invention the rubber particles may originate from mechanically ground car tyres, the larger part of the rubber particles having a screen size of 6-11 mm and being free of textile and steel. On filling the rubber matrix with sand, up to 10 per cent by weight of water is added during the mixing of sand and rubber particles in order to aid the filling of the open spaces among the rubber particles. The mixture of rubber and sand is provided on the foundation to a height of 4-20 cm,

preferably to a height of about 7 cm. When the grains have just a bit freedom of movement the foundation can absorb comparatively little energy and the ground layer is experienced as being "hard". On the other hand high damping power corresponds with a high absorption of energy. In order to absorb the energy to a sufficient degree under high loads using a foundation according to the invention, the layer has a thickness of at least 6 cm.

In order to avoid separation of the layer comprising rubber and sand it is preferred to use rubber and sand grains having about the same weight, which implies that because of the lower specific weight of rubber the rubber particles are bigger than the sand grains. Thus the rubber grains form the damping skeleton of the foundation whereby displacements or deformations are as much as possible inhibited by the sand filling.

The invention will be further explained with reference to the following example.

Example

The terrain where an artificial grassfield is to be laid down is dug away up to the frost limit. On the bottom groundlayer there is possibly laid a drainage system consisting of pipes for discharging any excess of water. Then a sand bed is provided to a height of about 12 cm under the edge, said sand being chosen from moderately coarse sand being previous to water and having a particle size of 180 μ m -300 μ m. On this the foundation layer was provided, said layer consisting of a mixture of 67 weight % of river sand and 33 weight % of rubber particles, said rubber particles having been obtained from mechanically ground car tyres. The rubber particles had a screen size of 7-11 mm and the sand consisted of natural round sand or river sand whose particle sizes were between 0.2 and 2 mm, 80% being larger than 0.5 mm. The mixture of rubber and sand was obtained by adding sand to the rubber in an intensive mixer, so that the open spaces between the rubber particles were filled with sand. The layer of rubber and sand thus provided on the sand bed formed a rubber skeleton whose open spaces were filled with sand particles, so that the freedom of movement of the rubber particles was strongly restricted by the sand. On this bed of rubber and sand a film of porous material was then provided and finally the artificial grass. With this construction an artificial grassfield has been obtained suitable for playing soccer.

Claims

1. A method of providing a substructure construction for an artificial grassfield by providing a foundation on a layer of sand which is present or has been provided, said foundation for the larger part consisting of natural round sand or river sand to which a material of organic origin is added in an amount of more than 1 weight %, calculated on the quantity of sand, characterized in that 60-70 weight % of river sand is distributed evenly among a quantity of 40-30 weight % of rubber particles.

2. The method according to claim 1, characterized in that the rubber particles originate from mechanically ground car tyres, the larger part of the particles having a screen size of 6-11 mm and being free of textile and of steel, the main part of the particles has a thickness being more than half the length of the particles.

3. The method according to claims 1-2, characterized in that the filling of the rubber matrix by sand particles is stimulated by adding up to 10 weight % of water during the mixing of sand and rubber particles.

4. The method according to claims 1-3, characterized in that the mixture of rubber and sand is provided on the foundation to a height of 4-20 cm.

5. The method according to claims 1-4, characterized in that the rubber particles and sand grains have substantially the same weight.

6. A field of artificial grass consisting of a substructure construction and an upper layer with synthetic fibres, characterized in that the substructure construction is applied as described in claims 1-5.



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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.4)																
1 D,A	EP-A-0 136 747 (HEYMANS) * Whole document * ---	1,6	E 01 C 13/00																
1 A	DE-A-3 313 329 (BALSAM SPORTSTÄTTENBAU GmbH) * Whole document * ---	1,6																	
1 A	FR-A-1 549 667 (INTERNATIONALER GLAS TRUST REG.) * Page 2, right-hand column, line 49 - page 3, left-hand column, line 5; abstract 2B * ---	1,2																	
1 P,D X	EP-A-0 204 381 (HBG) * Whole document * -----	1,4,6																	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)																
			E 01 C																
The present search report has been drawn up for all claims																			
Place of search THE HAGUE		Date of completion of the search 13-11-1987	Examiner DIJKSTRA G.																
<table border="0"><tr><td>CATEGORY OF CITED DOCUMENTS</td><td>T : theory or principle underlying the invention</td></tr><tr><td>X : particularly relevant if taken alone</td><td>E : earlier patent document, but published on, or</td></tr><tr><td>Y : particularly relevant if combined with another</td><td>after the filing date</td></tr><tr><td>document of the same category</td><td>D : document cited in the application</td></tr><tr><td>A : technological background</td><td>L : document cited for other reasons</td></tr><tr><td>O : non-written disclosure</td><td>.....</td></tr><tr><td>P : intermediate document</td><td>& : member of the same patent family, corresponding</td></tr><tr><td></td><td>document</td></tr></table>				CATEGORY OF CITED DOCUMENTS	T : theory or principle underlying the invention	X : particularly relevant if taken alone	E : earlier patent document, but published on, or	Y : particularly relevant if combined with another	after the filing date	document of the same category	D : document cited in the application	A : technological background	L : document cited for other reasons	O : non-written disclosure		P : intermediate document	& : member of the same patent family, corresponding		document
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