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(54) Method to reduce the coeficient of friction of the fibres for forming a field of artificial grass.

(57) The invention relates to a method for reducing the coefficient of friction of artificial grass by providing an agent reducing the coefficient of friction on the fribres, substantially produced from a polymer, said agent being based on a silicone elastomer, which is a dimethylpolysiloxane with terminating hydroxyl and/or amino groups. The invention also relates to a thus obtained artificial grassfield and to fibrous polymer material thus treated for the production of fields of artificial grass.

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Method to reduce the coefficient of friction of the fibres for forming a field of artificial grass.

The invention relates to a method of reducing the coefficient of friction of the fibres for forming a field of artificial grass by applying on the fibres an agent for reducing the coefficient of friction, which fibres are mainly produced from a polymer material, said agent being based on a silicone elastomer.

Such a method is known from EP-A-263,566, from which it is known to apply on the fibres for a field of artificial grass a film of silicone oil which, after curing under ambient circumstances, forms an elastomeric film around the fibres, and thus reducing the coefficient of friction of the fibrous material. As a result of the reduction of the coefficient of friction the risk of burn or grazes, caused when a player makes a sliding movement on the artificial grass, is reduced.

According to EP-A-259,940 some possibilities are known for reducing the coefficient of friction of the fibrous material of artificial grass. In example 4 of said patent application it is explained in more detail that a coating consisting of silicone oil and polytetrafluorethylene has been applied. Prior to the application of the agent the surface treatment agent was dissolved in water and the aqueous dispersion was sprayed on the fibrous material. After evaporation of the water 1-2% of the surface-treatment agent remained on the fibrous material. It appeared now that the silicone oil, mixed with polytetrafluorethylene does not provide the desired adherence to the fibrous material. When an elastomeric fibre is formed, based on a silicone compound which may form an elastomer, such as dimethylpolysiloxane, a better adherence is obtained than with a silicone oil, that does not form an elastomer, but the resistance of said coating against being rubbed off can be improved. Further reserach has been carried out to improve the fields of artificial grass, with the result that the adherence of the silicone elastomer to the polymer material from which the fibres of artificial grass are produced has been improved by using the method according to the invention, which is characterized in that one uses a dimethylpolysiloxane terminating with hydroxyl and/or amino groups.

Preferably the silicone elastomer is derived from a compound having formula 1 of the formula sheet, for which z is the same or different being an integer equal to or higher than 0 and y is an integer being equal to or higher than 1. It is preferred that z and y are lower than 20. This is a silicone compound such a dimethylpolysiloxane having terminating OH-groups and terminating N H_2-groups. By polymerisation thereof an elastomer is formed, which polymerisation rate is increasing at a higher temperature, but also will take place at ambient temperature.

Such dimethylpolysiloxane compounds are in general known from US patent 4,541,936. In this patent it has been disclosed that an aminofunctional methylsiloxane has been used to improve the properties of textile produced from yards or fibres so that the hand and moisture absorbability of the fibres is improved. However in this US patent no information has been disclosed in order to improve artificial grass fields. From EP-A-156,102 it is known to treat the fibres of mink-simulating piles with an agent to obtain a natural fur-like appearance and hand (draping property) by applying on the fibres an organopolysiloxane. In in this European patent application 156,102 no indication has been given concerning the improvement of an artificial grassfield. From German patent application 1,594,953 (1969) it is known to treat natural or sythetic fibres with polysiloxane which under the influence of a possibly present catalyst, cures. Especially fibres of cotton are treated in order to improve the hand, the properties of the fibres when one walks on the material and the properties in connection with the rejection of dirt. However no use of polysiloxane compounds has been indicated in connection with artificial grass.

Besides dimethylpolysiloxane having terminally hydroxyl groups and/or amino groups also other substances reducing, the coefficient of friction can be added. With said substance a synergetic action can be obtained. Further substances for reducing the coefficient of friction to be mentioned are especially fatty acid condensates obtained by reacting fatty acids having 12-22 carbon atoms with an alcohol, amine or alcohol amine. Furthermore quaternary ammonium compounds having formula 2 of the formula sheet may be used, in which R_1 is an alkyl group having 12-22 carbon atoms, R_2 and R_3 are the same or different alkyl groups having 1-22 carbon atoms and R_4 is an alkyl group having 1-4 carbon atoms and A is a salt forming ion. Furthermore it is also possible to use diquaternary ammonium compounds having formula 3 of the formula sheet, whereby R_1, R_2, R_3, R_4 and A have the same meaning as it is indicated above and in which x has a value of 2 or 3.

Further substances reducing the coefficient of friction which may be used are waxes, such as vegetable and animal waxes, paraffin wax or polyalkylene wax having a melting point higher than 35 °C.

The dimethylpolysiloxane is preferably applied in a quantity of 5-35 g/m^2 of artificial grass.

The reduction of the coefficient of friction by

using a silicone elastomer as indicated above according to the invention can be shown by measurement with the Leroux apparatus.

A further advantage for the turf of artificial grass thus obtained, besides the reduction of the coefficient of friction, is that the elasticity of the entire material of artificial grass is improved. Said improvement of the elasticity manifests itself in a higher recuperative power, which appears from the fact that after having used the field of artificial grass it is less "flat". This has been demonstrated with the so-called "wheelchair test". The data from this experiment show that the field of artificial grass whose fibrous material had a coating on the basis of the silicone elastomer, based on dimethylpolysiloxane with terminating hydroxyl and/or amino groups according to the invention the grass was less flattened. This artificial grass will undergo less agening when a coating according to the invention is applied. A limited life of the artificial grass manifests itself by splitting and/or pulverizing of the ends of the fibres. Said agening is effected faster by means of the "tread test". It appears thereby that the other parts of artificial grass having no coating or having a coating on the basis of silicone oil are split faster in several filaments in the longitudinal direction than when the silicone elastomer according to the invention has been applied. From these experiments it appears that fields of artificial grass can be improved by providing the fibrous material with a coating consisting of a silicone elastomer according to the invention. It also is possible to re-treat the existing fields of artificial grass with a silicone elastomer according to the invention.

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

Example.

An emulsion was prepared by mixing 120 g of dihydroxydimethylpolysiloxane having formula 1 for which z and y = 1 of the formula sheet, 120 g of fatty acid condensate on the basis of a C_{15}-fatty acid and alcohol amine and 710 g of water. To this solution one added 50 g of emulsifying agent on the basis of a C_{17}-alcohol.

A quantity of 350 g of this emulsion was diluted with water to 1 litre.

This product was sprayed on a fibrous material of which an artificial grass was made, in a quantity of 200 cm^3 per m^3. The fibrous material or the artificial grass made of said fibrous material was heated to 130 °C for 10 minutes. Thus a well-adhering elastomeric film was formed around the artificial grass material.

Such an elastomeric film may be provided on various materials of which artificial grass fibres are made, such as fibres which can be frizzed or without frizzing made of polypropene, fibres made by co-extruding various polymers, fibres made of block copolymers of various polymers or made of polyamine.

Claims

1. Method of reducing the coefficient of friction of artificial grass by providing an agent reducing the coefficient of friction on the fibres, substantially produced from a polymer, said agent being based on a silicone elastomer, characterized in that the silicone elastomer is dimethylpolysiloxane with terminating hydroxyl and/or amino groups.

2. Method according to claim 1, characterized in that the silicone elastomer to be used is derived from a compound having formula 1 as given on the formula sheet in which z can be the same or different integers 0 and y is an integer 1.

3. Method according to claims 1-2, characterized in that the elastomer is provided in a quantity of 5-35 g/m^2 of artificial grass.

4. Method according to claims 1-3, characterized in that also other agents reducing the coefficient of friction are applied on the fibres.

5. Method according to claim 4, characterized in that other substances reducing the coefficient of friction are fatty acid condensates formed on basis of C_{12} - C_{22} -fatty acids and alcohol amines.

6. Method according to claim 4, characterized in that quaternary ammonium compounds having a formula corresponding with formula 2 of the formula sheet are added as other substances reducing the coefficient of friction, whereby R_1 is an alkyl group having 1-22 carbon atoms, R_2 and R_3 are similar or different alkyl groups having 1-22 carbon atoms, R_4 is an alkyl group having 1-4 carbon atoms, and A is a salt forming anion.

7. Method according to claim 4, characterized in that diquaternary ammonium compounds having formula 3 of the formula sheet are used as other substances reducing the coefficient of friction, whereby R_1, R_2, R_3, R_4 and A have the same meaning as is indicated in claim 6 and whereby x has the meaning of 2 or 3.

8. Method according to claim 4, characterized in that other substances reducing the coefficient of friction are waxes, especially vegetable or animal waxes; parraffin wax or waxes having a melting point higher than 35 °C.

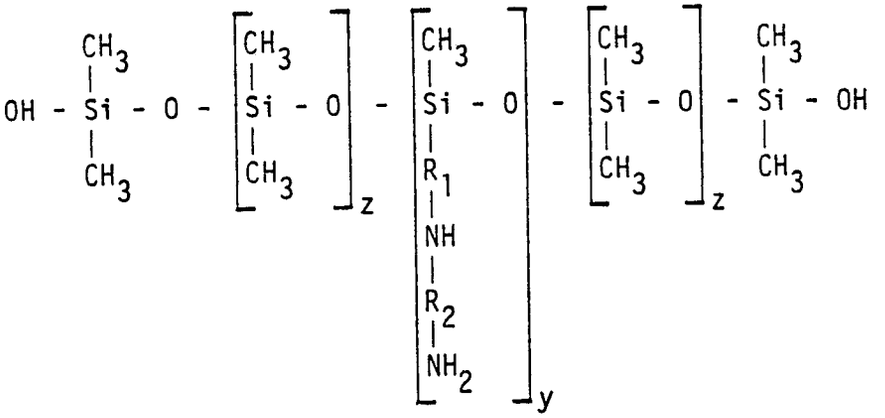
9. Field of artificial grass treated with an agent reducing the coefficient of friction according to claims 1-8.

10. Field of artificial grass treated with an agent reducing the coefficient of friction according to

claims 1-8 in which field one used a fiber material being frizzed.

11. Fibrous polymeric material treated with an agent reducing the coefficient of friction, obviously intended for being used in the production of field of artificial grass.

FORMULA SHEET



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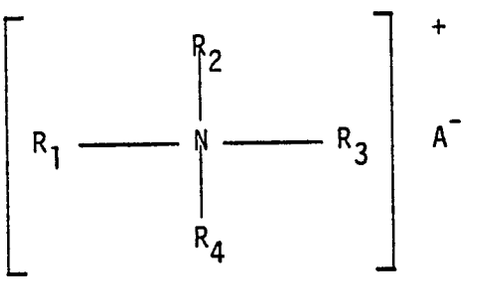

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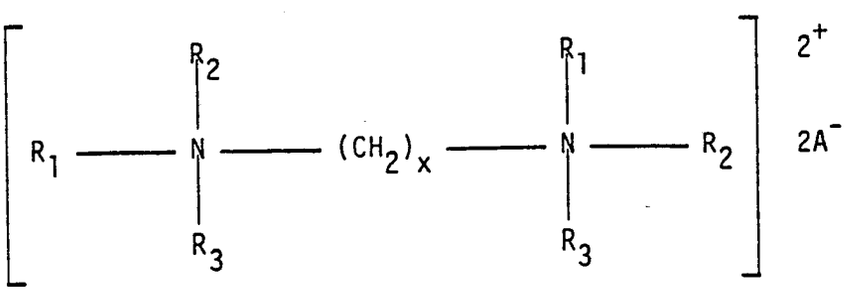

3.

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EUROPEAN SEARCH REPORT

Application Number

EP 90 20 0233

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)
X	EP-A-0 156 102 (KANEGAFUCHI K.K.K.) * Claims; page 3, line 7 - page 6, line 13 *	1	D 06 M 15/643 E 01 C 13/00
X	DE-A-1 594 953 (CHEMISCHE FABRIK ROTTA) * Claims; page 1, line 10 - page 2, line 27; example 5 *	1	
A	BE-A- 886 036 (TORAY SILICONE) * Claims *	1,2	
A	US-A-4 541 936 (TORAY SILICONE) * Claims; column 3, line 67 - column 4, line 9 *	1,2,4,6,8	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D 06 M
E 01 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09-03-1990	HELLEMANS W.J.R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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