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(54) **Plastics granule to be used as infill for synthetic turfs**

(57) A plastics granule (10) to be used as infill for synthetic turfs, constituted by a central core (11) from which a plurality of appendages (12) protrude monolithically, the appendages being adapted to be arranged, once a necessary quantity of granules (10) has been spread on a synthetic turf, substantially within the interspaces formed between the appendages (12) of adjacent granules (10).

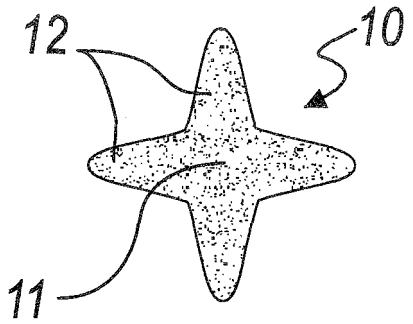

Fig. 1

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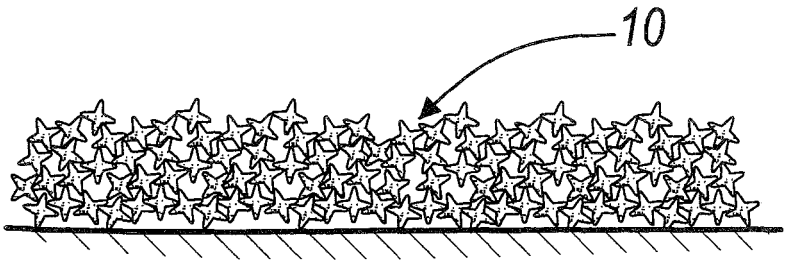

Fig. 2

Description

[0001] The present invention relates to a plastics granule to be used as infill for synthetic turfs.

[0002] As it is known, playing fields made of artificial grass have become increasingly widespread in recent years.

[0003] The reasons for this growth include the lower maintenance of the field with respect to natural-grass fields, the greater uniformity of the surface, and the possibility to use the field also in winter periods and indoors.

[0004] Artificial grass surfaces are usually formed by layers of heavy materials (sand, mineral fillers) on textile substrates tufted with polyolefin fibers capable of imitating natural grass.

[0005] These heavy materials are designed to support the tufted fibers laterally.

[0006] However, it has been noted that the use of these heavy materials is not ideal for imitating natural turf.

[0007] These heavy materials in fact give the synthetic surface a low elastic response, which in the long term is traumatizing for the athletes who run on it.

[0008] Moreover, such heavy materials are highly abrasive in case of falls onto the synthetic turf, causing unpleasant skin injuries to the athlete.

[0009] In order to overcome these problems, alternative filler materials in granular form have been studied, and the predominant orientation is toward the use of polymeric materials.

[0010] It has been understood that physical factors such as the apparent density and physical shape of the granule, in addition to the chemical composition of the material, also contribute to achieving the elasticity characteristics sought for the artificial turf.

[0011] These two factors, apparent density and physical shape, are substantially linked to each other, since apparent density is influenced by the physical shape of the granule.

[0012] Apparent density, in combination with the elastic properties of the material, contributes to define the elastic response of the turf.

[0013] The value of this elastic response is a fundamental factor for approval of the turf by sports federations.

[0014] The chemical composition of the material is an important factor in the production of such granules.

[0015] Solutions are in fact known which have irregularly shaped granules constituted by a polymeric material with the addition of inorganic fillers.

[0016] Due to their irregular shape and chemical composition, such granules, owing to the abrasive mechanical action caused by the treading of athletes, form fine dust, which spreads into the surrounding environment, with obvious environmental damage and physiological damage for the athletes who inhale it.

[0017] It has thus been understood from these experiences that the granules must have a certain resistance to abrasion.

[0018] Two great groups of materials are currently used to provide such granules: cross-linked materials (e.g., vulcanized rubber) and thermoplastic materials (e.g., PVC, SBS copolymers, SEBS, SEPS, elastomerized polyolefins, thermoplastic polyurethanes).

[0019] Cross-linked materials are preferred due to their low cost, but because of their particularity they have the drawback of being substantially impossible to recycle and the drawback of low flexibility in formulation, since they are subjected to the constraints imposed by the cross-linking process.

[0020] Generally, the granules derived from these cross-linked materials are obtained by milling (for example recycled tires) and particle size selection.

[0021] Due to their chemical and physical characteristics, even with an irregular shape, the granules produced with cross-linked materials do not form dust.

[0022] Thermoplastic materials have higher costs than cross-linked materials, but are entirely recyclable and allow considerable flexibility in formulation, so as to be able to select chemical and physical characteristics that are suitable for the application.

[0023] However, the thermoplastic granules used, due to the extrusion processes by means of which they are provided, lead to a regular form factor; the typical shape of these granules is in fact cylindrical or spheroidal.

[0024] A regular cylindrical or spheroidal form factor leads to high apparent densities and at the same time causes the turf that contains such granules to be slippery, since the granules tend to flow over each other.

[0025] The aim of the present invention is to provide a plastics granule to be used as infill for synthetic turfs which solves the drawbacks observed in the use of known types of granule.

[0026] Within this aim, an object of the present invention is to provide a plastics granule to be used as infill for synthetic turfs which allows to avoid slipping phenomena due to the shape of the granules.

[0027] Another object of the present invention is to provide a plastics granule to be used as infill for synthetic turfs which leads to an increase in the elasticity of the turf with respect to the elasticity provided by known types of granule.

[0028] Another object of the present invention is to provide a plastics granule adapted to be used as infill for synthetic turfs which has lower specific gravities than known granules.

[0029] Another object of the present invention is to provide a plastics granule to be used as infill for synthetic turfs which can be recycled.

[0030] A further object of the present invention is to provide a plastics granule to be used as infill for synthetic turfs which is cheap and simple.

[0031] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a plastics granule to be used as infill for synthetic turfs, characterized in that it is constituted by a central core from

which a plurality of appendages protrudes monolithically, said appendages being adapted to be arranged, once a necessary quantity of said granules has been spread on a synthetic turf, substantially within the interspaces formed between the appendages of adjacent granules.

[0032] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a transverse sectional view of a granule according to the invention;
Figure 2 is a schematic view of a surface distribution of granules according to the invention;
Figure 3 is a transverse sectional view of a second embodiment of a granule according to the invention with respect to the embodiment of Figure 1;
Figure 4 is a transverse sectional view of a third embodiment of a granule according to the invention with respect to the embodiment of Figure 1;
Figure 5 is a transverse sectional view of a fourth embodiment of a granule according to the invention with respect to the embodiment of Figure 1;
Figure 6 is a transverse sectional view of a fifth embodiment of a granule according to the invention with respect to the embodiment of Figure 1.

[0033] With reference to Figures 1 and 2, a plastics granule to be used as infill for synthetic turfs according to the invention is generally designated by the reference numeral 10.

[0034] The granule 10 is constituted by a central core 11, from which a plurality of appendages 12 protrude monolithically.

[0035] The appendages 12 are adapted to be arranged, once a necessary amount of the granules 10 has been distributed on a synthetic turf, substantially within interspaces 13 formed between the appendages of adjacent granules, as shown schematically in Figure 2.

[0036] The purpose of the appendages 12 is to increase the surface of contact among adjacent granules so as to increase the friction effect among said granules and provide hindrances to the rolling of said granules over each other, consequently reducing the overall slipperiness of the turf with the deposited granules.

[0037] According to what has been described, it is evident that the shape and number of the appendages may vary according to the particular requirements and needs.

[0038] For example, Figures 3 and 4 illustrate two further embodiments of the granule of Figure 1, now designated by the reference numerals 100 and 200: in the first case, the appendages 12 are four, whereas in the two subsequent examples, the appendages, now designated by the reference numerals 112 and 212, are respectively six and eight.

[0039] The shape of the appendages also may be the most disparate.

[0040] For example, in Figures 1, 3 and 4, the appendages 12, 112 and 212 taper from the central core 11, 111 and 211 toward the free end.

[0041] Figure 5 instead illustrates a fourth embodiment 300, in which four appendages 312 protrude from the central core 311 and taper from the free end toward the central core 311, for example because the free ends are cambered.

[0042] The direction of longitudinal extension also may be different according to requirements. In the examples described so far, the direction of longitudinal extension from the core is substantially rectilinear, but it can also be for example curved, as shown in the embodiment 400 of Figure 6; in this case, the appendages 412 protrude from the central core 411 with a curved orientation.

[0043] It should be noted that the apparent density of a granule thus shaped is lower, since with respect to a cylindrical or spherical shape the packing of the granules is lower.

[0044] The elastic response is consequently increased, also reducing the specific gravities of said granules.

[0045] Advantageously, the granules according to the invention are preferably made of elastomerized thermoplastic polyurethane, as disclosed and claimed in EPA-05109055.3, filed in the name of this same Applicant on 30 September 2005.

[0046] In particular, the elastomerized thermoplastic polyurethane that forms the granules is ester- and/or ether-based.

[0047] Advantageously, the thermoplastic polyurethane that forms the granule can be of the expanded type.

[0048] In its preferred formulation, each granule comprises the following materials:

- ester- and/or ether-based polyurethane in an amount between 10 and 70% by weight of the compound,
- styrene-based compatibilized elastomerizing derivatives, in an amount between 5 and 20% by weight of the compound,
- mineral fillers in an amount between 10 and 60% by weight of the compound,
- process oil in an amount between 2 and 10% by weight of the compound,
- exothermic and/or endothermic physical and/or chemical expanding agents, in amounts between 0.2 and 4% by weight of the compound,
- thermal stabilization additives,
- oxidative stabilization additives,
- colors.

[0049] The apparent density of the granule is comprised between 0.40 g/ml and 0.80 g/ml.

[0050] The use of thermoplastic material to provide the

granule according to the invention allows to manufacture the granule conveniently by extrusion and cutting.

[0051] In practice it has been found that the invention thus described solves the drawbacks noted by the use of known types of granule as infill for synthetic turfs.

[0052] In particular, the present invention provides a plastics granule to be used as infill for synthetic turfs which has such a shape as to avoid the slipping of the granules over each other when treaded upon, with evident problems of stability also for the athletes who use the synthetic turf.

[0053] This has been achieved by giving the granule a shape which has appendages which are arranged between appendages of adjacent granules, increasing as a whole the aggregation power of the mass of said granules.

[0054] Advantageously, the granules are made of thermoplastic material, which allows easy shaping of the granule by extrusion, at the same time achieving the goal of recyclability of the granules.

[0055] The apparent density is also lower, with respect to known granules, owing to the greater space occupation of said granules and owing to the material used; in this manner, the elastic response of the turf has also been increased.

[0056] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0057] In practice, the materials employed, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

[0058] The disclosures in Italian Patent Application No. PD2005A000213 from which this application claims priority are incorporated herein by reference.

[0059] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A plastics granule to be used as infill for synthetic turfs, **characterized in that** it is constituted by a central core (11, 111, 211, 311, 411) from which a plurality of appendages (12, 112, 212, 312, 412) protrude monolithically, said appendages being adapted to be arranged, once a necessary quantity of said granules (10, 100, 200, 300, 400) has been spread on a synthetic turf, substantially within the interspaces (13) formed between the appendages (12, 112, 212, 312, 412) of adjacent granules (10, 100, 200, 300, 400).

2. The granule according to claim 1, **characterized in that** said appendages (12, 112, 212, 412) taper from the central core (11, 111, 211, 411) toward the free end.

3. The granule according to claim 1, **characterized in that** said appendages (312) taper from the free end toward the central core (311).

4. The granule according to one of the preceding claims, **characterized in that** the direction of longitudinal extension of said appendages (12, 112, 212, 312) from the central core (11, 111, 211, 311) is substantially rectilinear.

5. The granule according to one of the preceding claims, **characterized in that** the direction of longitudinal extension of said appendages (412) from the central core (411) is substantially curved.

6. The granule according to one of the preceding claims, **characterized in that** it is made of elastomerized thermoplastic polyurethane and has an apparent density comprised between 0.40 g/ml and 0.80 g/ml.

7. The granule according to claim 6, **characterized in that** said elastomerized thermoplastic polyurethane is ester- and/or ether-based.

8. The granule according to claim 6 or 7, **characterized in that** said thermoplastic polyurethane is expanded.

9. The granule according to one or more of the preceding claims, **characterized in that** it comprises the following materials:

   - ester- and/or ether-based polyurethane according to the preceding claims, in an amount between 10 and 70% by weight of the compound,
   - styrene-based compatibilized elastomerizing derivatives, in an amount between 5 and 20% by weight of the compound,
   - mineral fillers in an amount between 10 and 60% by weight of the compound.

10. The granule according to claim 9, **characterized in that** it also comprises one or more of the following components:

    - process oil in an amount between 2 and 10% by weight of the compound,
    - exothermic and/or endothermic physical and/or chemical expanding agents, in amounts between 0.2% and 4% by weight of the compound,
    - thermal stabilization additives,

- oxidative stabilization additives,
- colors.

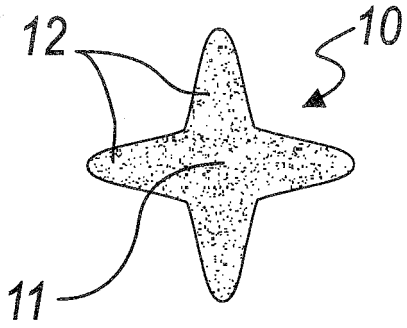

Fig. 1

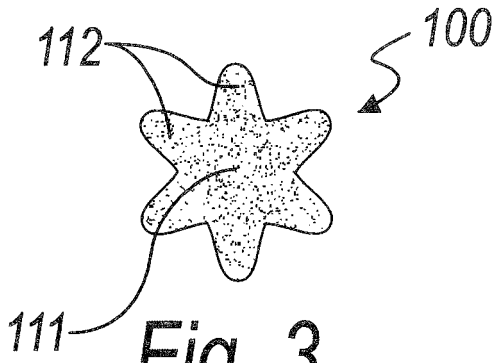

Fig. 3

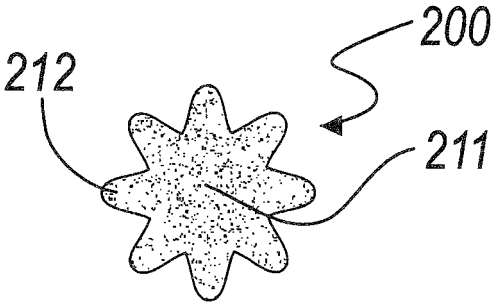

Fig. 4

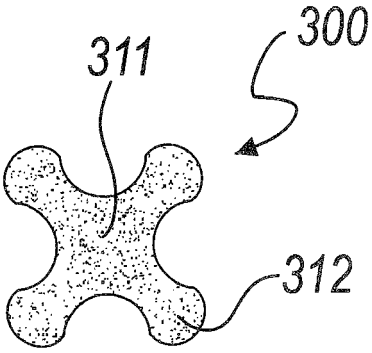

Fig. 5

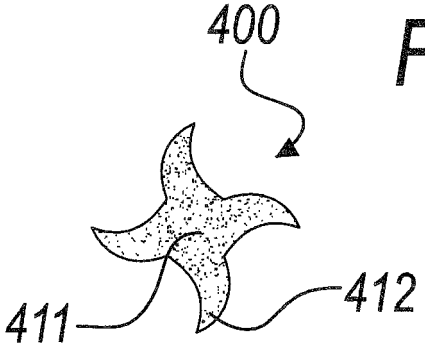

Fig. 6

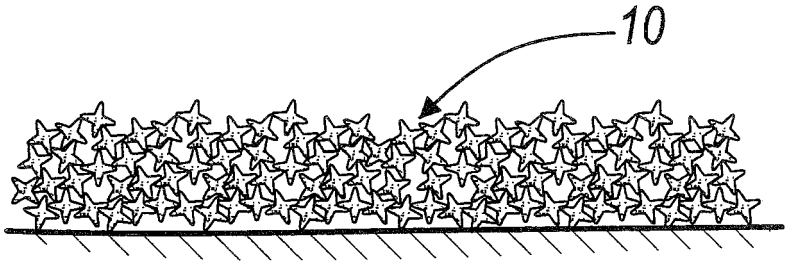

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT PD20050213 A **[0058]**