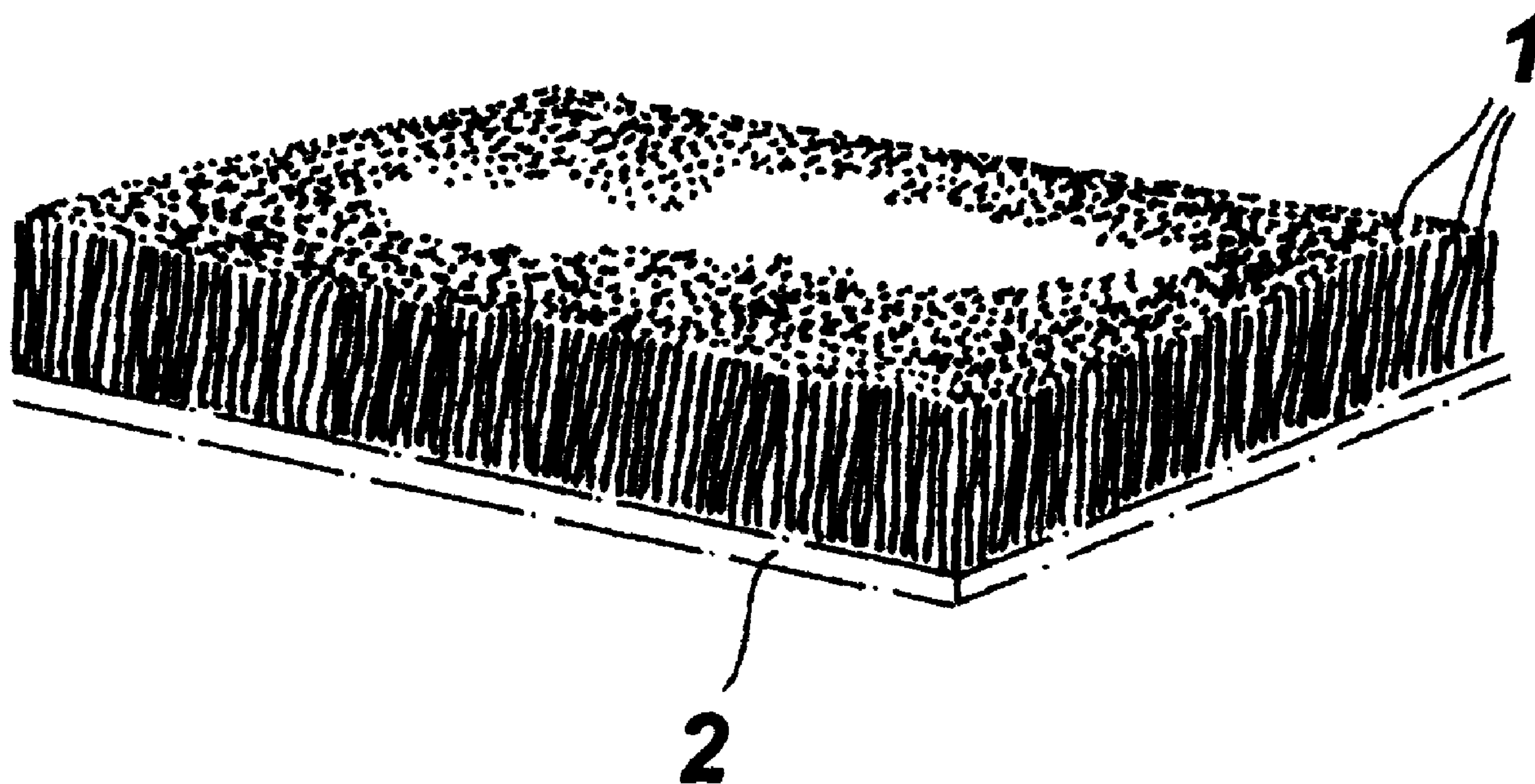




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(57) Abrégé/Abstract:

An artificial turf has a base layer, a multiplicity of blades fixed to and projecting upward from the base layer, and a mass of infill between the blades and on the base layer. The infill is formed of elongated plastic fibers each having a longitudinally extending inner part of a predetermined first plastic and a longitudinally extending outer part bonded to the inner part and of a predetermined second plastic different from the first plastic.

**ABSTRACT OF THE DISCLOSURE**

An artificial turf has a base layer, a multiplicity of blades fixed to and projecting upward from the base layer, and a mass of infill between the blades and on the base layer. The infill is formed of elongated plastic fibers each having a longitudinally extending inner part of a predetermined first plastic and a longitudinally extending outer part bonded to the inner part and of a predetermined second plastic different from the first plastic.

**ARTIFICIAL TURF**

**SPECIFICATION**

**FIELD OF THE INVENTION**

The present invention relates to artificial turf.

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**BACKGROUND OF THE INVENTION**

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Standard artificial turf, especially for sports fields and lawns, has a plurality of blades fixed on a base layer and a mass of infill on the base layer between the blades. In such artificial turf sand or rubber granules charged into the intermediate spaces between the blades as infill. This infill has the long-term disadvantage that it wears down in locations of heavy use and has to be renewed. Furthermore the damping properties of the infill are normally unsatisfactory, leading to so-called "turf toe" and other injuries when used for sports purposes, making artificial turf less popular for many sports, such as soccer.

## OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide an improved artificial turf.

Another object is the provision of such an improved  
5 artificial turf that overcomes the above-given disadvantages, in particular whose infill is improved over that of the prior art.

## SUMMARY OF THE INVENTION

An artificial turf has according to the invention a base layer, a multiplicity of blades fixed to and projecting  
10 upward from the base layer, and a mass of infill between the blades and on the base layer. The infill is formed of elongated plastic fibers each having a longitudinally extending inner part of a predetermined first plastic and a longitudinally extending  
outer part bonded to the inner part and of a predetermined second  
15 plastic different from the first plastic.

The base layer of the artificial turf in accordance with the invention forms as it were an flat generally two dimensional layer preferably formed as a fabric. It is recommended that this textile base layer consists of a plastic  
20 and advantageously of a polyolefin, especially polyethylene or polypropylene. It is in the scope of the invention that even the blades of the plastic turf in accordance with the invention are of plastic. According to a preferred embodiment of the invention

the blades are formed from plastic fibers or plastic filaments. According to recommended variant monofilaments of thermoplastic plastic form the blades of the artificial turf. The blades of the artificial turf are advantageously fixed on the base layer by  
5 tufting.

According to the invention the infill consists of multicomponent fibers applied to the base layer in the intermediate spaces between the blades. The artificial fibers or multicomponent fibers are knotted together. The outer plastic  
10 part and the inner plastic part of the multicomponent fibers preferably extend over the entire length or substantially over the entire length of the multicomponent fibers.

It is furthermore in the scope of the invention that a intermediate layer forms another part of the cross-section of the  
15 multicomponent fiber and that the intermediate layer in the multicomponent fiber is between the outer plastic part and the inner plastic part. Even the intermediate layer preferably extends over the entire length or substantially over the entire length of the multicomponent fibers. The intermediate layer is  
20 advantageously an adhesion promoter between the first and the inner plastic part, that is its outer surface is bonded to the inner surface of the outer layer and its inner surface is bonded to the outer surface of the inner or core layer. According to an especially preferred embodiment of the invention the three  
25 plastic parts are the only plastic components of the

multicomponent fibers and therefore the multicomponent fibers are three-component fibers.

It is also in the scope of the invention that the multicomponent fibers have a coaxial or core-sheath structure and that the outer plastic part forms the sheath and the inner plastic part forms the core of the multicomponent fibers. The outer plastic part advantageously forms the outer sheath of the multicomponent fibers and surrounds the core at least partially, preferably for the most part and most preferably completely.

According to a very recommended embodiment of the invention the outer plastic part is a polyolefin, preferably polyethylene and very preferably LLDPE (linear low-density polyethylene). Polyethylene and in particular LLDPE have especially proven themselves in the scope of the invention. Polyolefin, preferably polyethylene and very preferably LLDPE advantageously form the outer part of the multicomponent fibers in the core-sheath structure.

The inner plastic part is preferably a polyamide or a polyester. In particular, polybutylene terephthalate (PBT) can be used as polyester. However, according to a very preferred embodiment of the invention the inner plastic part is a polyamide. It is recommended that the inner plastic part is a polyamide from the group of Nylon 6, Nylon 6.6, Nylon 6.12, or Nylon 6.10. The use of Nylon 6 as the inner plastic part is especially preferred. The inner plastic part advantageously

forms the core part of the multicomponent fibers in the core-sheath structure.

It is in the scope of the invention that the intermediate layer in the core-sheath structure of the multicomponent fibers is between the sheath and the core and that the intermediate layer surrounds the core at least partially, preferably completely or substantially completely. The intermediate layer forms as it were an intermediate tube of the core-sheath structure whereas the outer plastic part preferably forms an outer tube. It is furthermore in the scope of the invention that the intermediate layer is a plastic that acts as an adhesion promoter between the first and the inner plastic part. Plastics that can act as adhesion promoter, especially between a polyolefin and a polyamide, are basically known in the art. According to a recommended variant of the invention the intermediate layer is a polyamide/polyolefin copolymer, preferably a polyamide/polyethylene copolymer. According to another preferred variant a polyolefin modified with a maleic acid derivative, preferably with maleic acid anhydride, is used as the intermediate layer. The modified polyolefin is preferably modified polyethylene or polypropylene.

The multicomponent fibers preferably comprise 5 to 50%, preferably 10 to 45%, and very preferably 10 to 40% of the outer plastic part as regards their cross-sectional area. The previous and subsequent data refer to the percentage of the cross-sectional area that the particular part occupies as concerns the

overall cross-sectional area of a multicomponent fiber. It is recommended that the multicomponent fibers comprise 3 to 20%, preferably 5 to 20%, and most preferably 5 to 15% of the intermediate layer as regards their cross-sectional area.

5 According to a preferred embodiment of the invention the multicomponent fibers comprise 30 to 93%, preferably 30 to 85% and most preferably 35 to 80% of the inner plastic part as regards their cross-sectional area. As describe above, the outer plastic part forms the sheath or outer sheath of the  
10 multicomponent fiber and the inner plastic part forms the core of the multicomponent fiber in the coaxial or core-sheath structure. The intermediate layer is preferably arranged between the outer plastic part (sheath or outer tube) and the inner plastic part (core) and advantageously acts as adhesion promoter between the  
15 first and the inner plastic part. According to a very preferred embodiment of the invention the inner plastic part or the core part is the main constituent of the multicomponent fibers. The inner plastic part advantageously occupies more than 40%, preferably more than 45% of the cross-sectional area of the  
20 respective multicomponent fiber.

A quite especially preferred embodiment of the invention is characterized in that the multicomponent fibers are made into a textured yarn and the yarn is used as the infill on the base layer between the blades. It is in the scope of the  
25 invention that the multicomponent fibers are textured in a texturing machine. The textured fibers are permanently curled

multicomponent fibers that are quite especially suited as infill for the artificial turf.

Furthermore according to the invention the multicomponent fibers in accordance with the invention are spun from a spinning nozzle or spinneret. The individual plastic parts are supplied to the spinning nozzle in a customary manner from extruders. After spinning, the multicomponent fibers are cooled, preferably in a water bath. The multicomponent fibers can subsequently be stretched. The conversion of the fibers to textured yarn takes place according to a preferred embodiment.

According to an especially recommended embodiment of the invention even the blades of the artificial turf are formed from multicomponent fibers or multicomponent elements that are preferably formed in a coaxial or core-sheath structure. An outer plastic part forms a part of the cross section of a blade and extends at least substantially over the length of the blade. A inner plastic part forms another part of the cross section of a blade and also extends at least substantially over the length of the blade. The outer plastic part preferably forms a tube surrounding the inner plastic part as core of the multicomponent fiber in such a core-sheath structure. An intermediate layer is also advantageously provided here that forms a part of the cross section of a blade and extends at least substantially over the length of the blade. It is recommended that the intermediate layer in the multicomponent fiber is arranged between the outer plastic part and the inner plastic part, preferably between the

sheath (outer plastic part or tube) and the core (inner plastic part) of the multicomponent fiber in the core-sheath structure. The intermediate layer preferably acts as adhesion promoter between the first and the inner plastic part. According to the invention the features and embodiments cited above regarding the outer plastic part, the inner plastic part and the intermediate layer in conjunction with the infill also apply to their full extent to the plastic parts of the blades and to the blades. Thus, the multicomponent fibers for the blades also preferably have a sheath part of polyolefin, preferably of polyethylene and very preferably of LLDPE. Furthermore, it is recommended that the multicomponent fibers for the blades have a core of polyamide, preferably of Nylon 6. The intermediate layer is preferably arranged as it were as an intermediate tube in these multicomponent fibers for the blades and surrounds the core at least partially, preferably completely.

The invention is based on the recognition that the infill in accordance with the invention in the form of multicomponent fibers meets all requirements and has excellent damping properties. The disadvantageous loss of material that occurs at least in the long term and at least in areas in the case of the known infills practically does not take place at all with the infill in accordance with the invention but rather the infill in accordance with the invention remains permanently in place even after considerable and prolonged mechanical stress. Furthermore, it should be emphasized that the infill in

5 accordance with the invention is distinguished by excellent  
compatibility with the skin. If players fall and slide on the  
artificial turf, this does not result in any appreciable injuries to  
or burns on the skin. The design of the multicomponent filaments in  
core-sheath structure effectively contributes to this. The artificial  
10 turf in accordance with the invention is also excellently suited for  
lawns, pool surrounds, and the like.

In accordance with another embodiment of the present invention,  
there is provided an artificial turf comprising: a base layer; a  
plurality of tufts secured to the base layer; and a damping material  
15 arranged on the base layer and between the tufts; wherein the damping  
material comprises plastic fibers which are designed as multicomponent  
fibers, a first plastic component forming a portion of a cross section  
of a multicomponent fiber and a second plastic component forming  
another portion of the cross section of the multicomponent fiber.

20

#### BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features, and advantages will become  
more readily apparent from the following description, reference being  
25 made to the accompanying drawings in which:

FIG. 1 is a perspective view of a piece of artificial turf  
according to the invention;

FIG. 2 is a large-scale vertical section through the inventive  
artificial turf; and

30 FIG. 3 is a longitudinal section through the multicomponent fiber  
used as infill in the inventive artificial turf.

## SPECIFIC DESCRIPTION

As seen in FIG. 1, artificial turf in accordance with the invention consists of a plurality of blades 1 fixed on a base layer 2. The blades 1 are formed by multicomponent monofilament fibers and are advantageously fixed on the base layer 2 by tufting.

FIG. 2 shows the artificial turf in greater detail. Here, the blades 1 are shown projecting through the base layer 2 and joined together underneath it, with their free ends projecting upward from it. The base layer 2 is in particular a woven, knitted, or felted fabric or plastic textile consisting preferably of a polyolefin, preferably polypropylene or polyethylene. A layer 3 of infill in accordance with the invention is formed of multicomponent fibers 7 situated between the blades 1 on the base layer 2. The multicomponent fibers 7 are preferably sections of textured yarn.

FIG. 3 shows a cross section through a single multicomponent fiber 7 in accordance with the invention for the infill 3, a longitudinal axis A of the fiber 7 being perpendicular to the plane of view of FIG. 3. The multicomponent fibers 7 are constructed here in a core-sheath structure. More particularly, an over tube or sheath 4 preferably consists here and in the illustrated embodiment of polyethylene, preferably of LLDPE (linear low-density polyethylene). Its core 5 preferably consists here and in the illustrated embodiment of polyamide,

very preferably of Nylon 6. An intermediate layer is provided between the sheath 4 and the core 5, which intermediate layer consists of a copolymer of polyamide and polyethylene or of polyethylene or polypropylene modified with maleic acid anhydride. The intermediate layer forms an inner tube or sheath 6 that completely surrounds core 5 and acts as adhesion promoter between the sheath 4 and the core 5. Thus the sheath 4 forms a flattened tube whose inner surface is bonded to the outer surface of the intermediate layer 6 that is also formed as a flattened tube and whose inner surface is bonded to the outer surface of the core 5 that itself is formed as a flattened body having two arcuate and outwardly convex outer surfaces meeting at sharp edges, with as illustrated a plurality of longitudinally extending cushion voids 8. The core 5 and the outer layer 4 preferably form the main constituent of the multicomponent fiber here and in the illustrated embodiment.

The embodiments of the present invention for which an exclusive property or privilege is claimed are defined as follows:

1. An artificial turf comprising:

a base layer;

a plurality of tufts secured to the base layer; and

a damping material arranged on the base layer and between the tufts;

wherein the damping material comprises plastic fibers which are designed as multicomponent fibers, a first plastic component forming a portion of a cross section of a multicomponent fiber and a second plastic component forming another portion of the cross section of the multicomponent fiber.

2. The artificial turf according to claim 1, further comprising a third plastic component forming a further portion of the cross section of the multicomponent fiber, the third plastic component is arranged between the first plastic component and the second plastic component.

3. The artificial turf according to claim 1 or 2, wherein the multicomponent fibers have a core-sheath structure, the first plastic component forming the sheath and the second plastic component forming the core.

4. The artificial turf according to any one of claims 1 to 3, wherein the first plastic component is a polyolefin.

5. The artificial turf according to claim 4, wherein the first plastic component is polyethylene.

6. The artificial turf according to claim 5, wherein the first plastic component is a linear low-density polyethylene.

7. The artificial turf according to any one of claims 1 to 6, wherein the second plastic component is a polyamide or a polyester.

8. The artificial turf according to claim 7, wherein the second plastic component is a polyamide selected from the group consisting of polyamide 6, polyamide 6.6, polyamide 6.12 and polyamide 6.10.

9. The artificial turf according to any one of claims 3 to 8, wherein the third plastic component in the core-sheath structure of the multicomponent fiber is arranged between the sheath and the core, and the third plastic component at least partially surrounds the core.

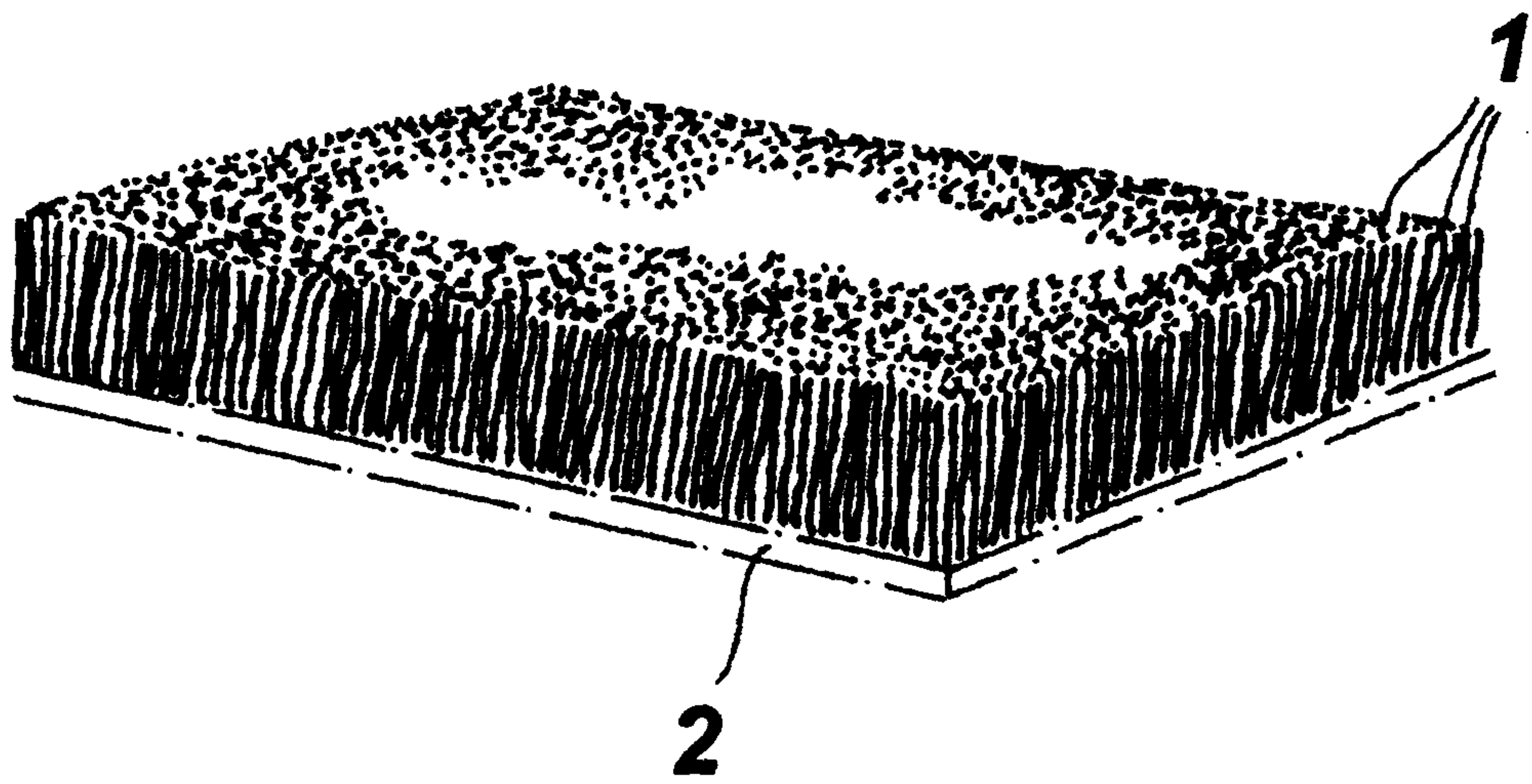
10. The artificial turf according to claim 9, wherein the third plastic component completely surrounds the core.

11. The artificial turf according to any one of claims 1 to 10, wherein the third plastic component is a plastic component selected from the group consisting of copolymer polyamide/polyolefin and polyolefin modified with maleic acid derivative.

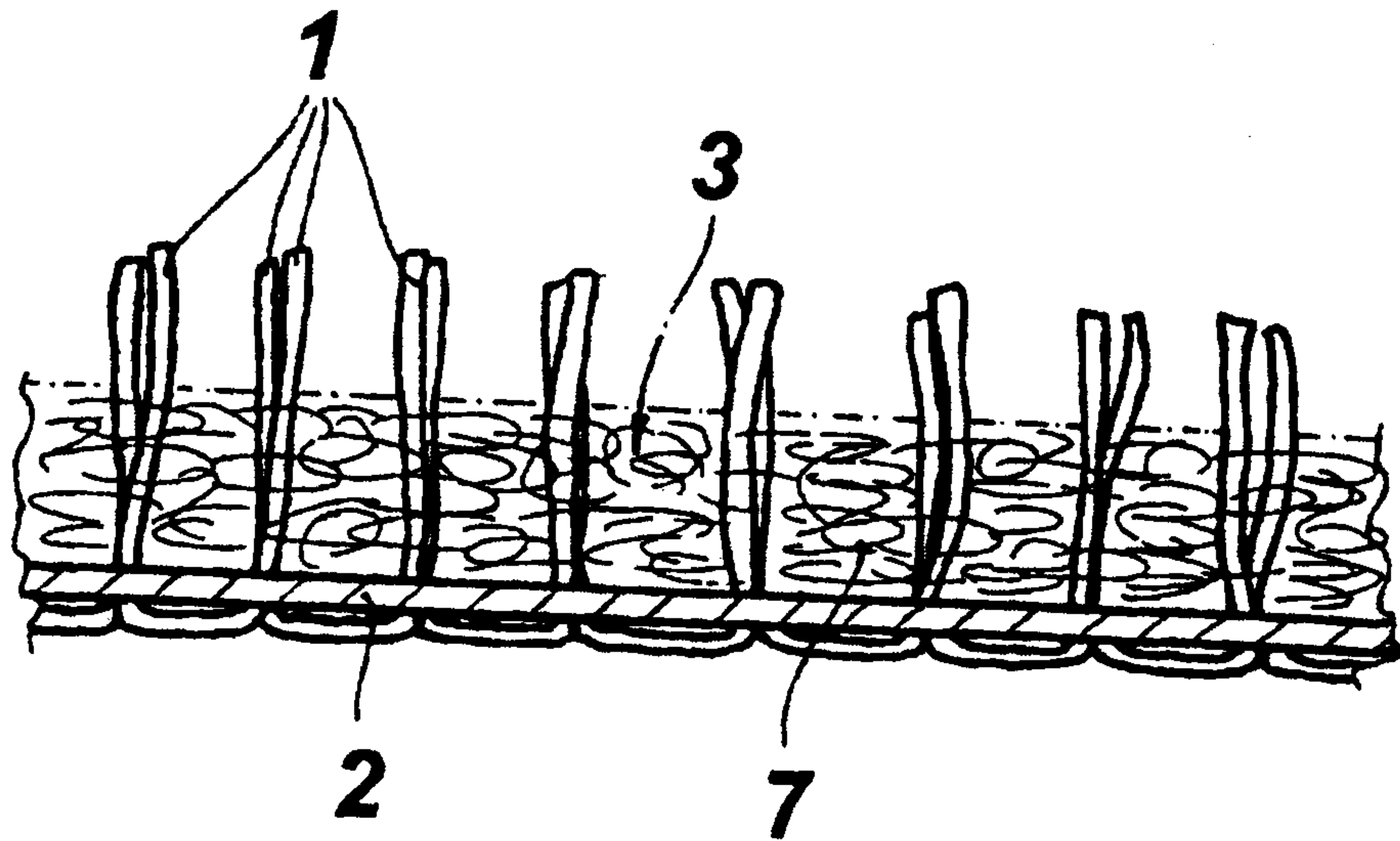
12. The artificial turf according to any one of claims 1 to 11, wherein the multicomponent fibers are processed to form textured yarn and are arranged as the damping material in the form of textured yarn between the tufts on the base layer.

13. The artificial turf according to any one of claims 1 to 12, wherein the tufts are formed from the multicomponent fibers.

**Fig. 1**



**Fig. 2**



**Fig. 3**

