The artificial turf infill includes composite infill components. The infill components include a water absorbent yarn. The water absorbent yarn is covered with a jacket. The jacket is formed from an elastomeric compound. The jacket includes at least one opening. The at least one opening exposes the water absorbent yarn.
COMPOSITE ARTIFICIAL TURF INFILL

FIELD OF THE INVENTION

[0001] The invention relates to artificial turf, in particular to artificial turfs with infill and also infill for artificial turf.

BACKGROUND AND RELATED ART

[0002] Artificial turf or artificial grass is surface that is made up of fibers which is used to replace grass. The structure of the artificial turf is designed such that the artificial turf has an appearance which resembles grass. Typically artificial turf is used as a surface for sports such as soccer, American football, rugby, tennis, golf, for playing fields, or exercise fields. Furthermore artificial turf is frequently used for landscaping applications.

[0003] Artificial turf may be manufactured using techniques for manufacturing carpets. For example artificial turf fibers which have the appearance of grass blades may be tufted or attached to a backing. Often times artificial turf infill is placed between the artificial turf fibers. Artificial turf infill is a granular material that covers the bottom portion of the artificial turf fibers. The use of artificial turf infill may have a number of advantages. For example, artificial turf infill may help the artificial turf fibers stand up straight. Artificial turf infill may also absorb impact from walking or running and provide an experience similar to being on real turf. The artificial turf infill may also help to keep the artificial turf carpet flat and in place by weighing it down.

[0004] European Patent EP 2 206 833 A1 discloses a method for producing a particulate infill material for synthetic-grass structures envisaging providing a mass of thermoplastic material with a filler consisting of coconut-based material and subjecting said mass of thermoplastic material with the filler consisting of coconut-based material to granulation so as to obtain the aforesaid particulate infill material. Preferentially, the thermoplastic material is in particulate form, and the coconut-based material is in particulate form (fibrous, ground and/or shredded). The mixture obtained by mixing the thermoplastic material and the coconut-based material is preferentially heated in order to bring about softening of the thermoplastic material with the corresponding formation of a matrix of thermoplastic material that incorporates the coconut-based material as filler.

SUMMARY

[0005] The invention provides for an artificial turf and the use of composite components as artificial turf infill in the independent claims. Embodiments are given in the dependent claims.

[0006] The properties of the infill used in artificial turf may have a large impact on how realistically the artificial turf performs. Embodiments may use an artificial turf infill that incorporates composite infill components. The composite infill components comprise a water absorbent yarn that is covered with a jacket formed from an elastomeric compound. The elastomeric compound provides protection for the water absorbent yarn and may also be used to color or control the appearance of the artificial turf infill.

[0007] The water absorbent yarn may provide a means of efficiently storing water in the artificial turf infill. As the water evaporates it may serve to cool the artificial turf. Additionally, in football (soccer) players often slide in a controlled manner as part of the game. Having water in the artificial turf infill may aid players in sliding.

[0008] In one aspect, the invention provides for an artificial turf comprising an artificial turf infill. The artificial turf infill comprises composite infill components. The infill components comprise a water absorbent yarn. A yarn as used herein encompasses a continuous length of material that comprises a number or a large number of interlocked fibers. The water absorbent yarn is covered with a jacket. The jacket is formed from an elastomeric compound. An elastomeric compound as used herein encompasses a material that is formed with a polymer that has viscoelasticity. The jacket may be flexible and may return to its original position when deformed. The jacket comprises at least one opening. The at least one opening exposes the water absorbent yarn.

[0009] This embodiment may be beneficial because the water absorbent yarn may absorb and retain water. The retention of water by an artificial turf infill may be beneficial in that it may help to limit the temperature of an artificial turf surface during a game or sporting event. The evaporation of water from the water absorbent yarn may help to cool the surface. Additionally, having water available in the artificial turf infill may also give superior properties to the artificial turf surface for playing various games. For example in soccer or football it is common that players may make sliding motions. Having water within the artificial turf infill may help to impart a realistic slide or sliding ability in the artificial turf that compares to real or organic turf from grass.

[0010] In another embodiment, the elastomeric compound is elastic between 5° C and 50° C. The elastomeric compound may be elastic at temperatures lower than this range also. Being elastic at a minimum between 5° C and 50° C may have the advantage of making the artificial turf softer and more realistic.

[0011] In another embodiment, the water absorbent yarn has a circular cross section. This embodiment may be advantageous because the artificial turf infill may have a regular form that has predictable mechanical properties.

[0012] In another embodiment the water absorbent fiber comprises fibers that extend in a length direction that is perpendicular or mostly perpendicular to the circular cross section.

[0013] In another embodiment, the water absorbent yarn has a diameter. The diameter may for example be circularly shaped. This embodiment may be advantageous because the artificial turf infill may have a regular form that has predictable mechanical properties. In some examples, the yarn may comprise fibers that have an individual diameter smaller than the diameter of the yarn. For example the individual diameter of the fibers may be a factor of at least 5, 10, or 50 times smaller than the diameter of the yarn.

[0014] In another embodiment, the water absorbent yarn comprises interlocking fibers. The interlocking of fibers may be beneficial because the fibers may be less likely to fall apart during use.

[0015] In another embodiment, the water absorbent yarn comprises any one of the following: hygroscopic fibers, burlap fibers, jute fibers, cotton fibers, wool fibers, hemp fibers, polyester fibers, natural fibers, keratin synthetic fibers, fibers with a hydrophilic surface, and combinations thereof. The use of any of these fibers or mixtures thereof may provide for an artificial turf infill that is able to retain water in an efficient means.
[0016] The use of burlap (jute) fibers may be beneficial because burlap has a high resistance to molding and bacterial decay. Additionally, burlap is able to store for its weight a large amount of water. For example, infill material made with burlap as the water absorbent yarn may be able to store approximately 450 g of water per 1 kg of dry artificial turf infill. The use of burlap may therefore provide for an artificial turf infill with superior water retention properties.

[0017] Burlap or jute fibers may also be easily recycled. Burlap is typically used for the storage of food such as in potato sacks. Old burlap materials or bags may be re-beaten to break up the fibers and then re-spun easily into a new yarn which may be used for manufacturing the artificial turf infill.

[0018] In another embodiment the jacket comprises an elastomeric compound and a central region. The peripheral portion surrounds the central region. The peripheral portion is partially saturated with an elastomeric compound. The central region is free of the elastomeric compound. This embodiment may be beneficial because the jacket may have superior adhesion to the water absorbent yarn while at the same time leaving the central region free to absorb water.

[0019] In another embodiment, the jacket is formed from a cured liquid. The yarn comprises a peripheral portion and a central region. The peripheral portion surrounds the central region. The peripheral portion is partially saturated with an elastomeric compound. The central region is free of the elastomeric compound. This embodiment may be beneficial because the jacket may have superior adhesion to the water absorbent yarn while at the same time leaving the central region free to absorb water.

[0020] In another embodiment, the jacket comprises between 6% and 10% of the composite infill components by weight. That is to say that 90% to 94% of the composite infill by weight is the water absorbent yarn.

[0021] The use of a composite infill that has a jacket formed from the elastomeric compound that covers the water absorbent yarn may further be beneficial because the jacket can impart qualities that the water absorbent yarn may not have by itself. For example the jacket may be dyed or colored so that the artificial turf retains a particular appearance. The use of a jacket may also protect the water absorbent yarn and extend its useful period.

[0022] In another embodiment, the jacket has a thickness between 4u and 8u.

[0023] In another embodiment, the jacket has a length between 0.4 mm and any one of the following: 0.5 mm, 1.0 mm, 1.5 mm, 2.0 mm, 2.5 mm, 3.0 mm, 3.5 mm, 4.0 mm, 4.5 mm, 5.0 mm, and 5.5 mm. The different length of the artificial turf infill may have different properties.

[0024] The artificial turf infill can be cut so that it is relatively symmetric with regards to the diameter and the length of the infill provides an infill that is more granular and packs more tightly.

[0025] The use of artificial turf infill where the length is much longer than the diameter may be beneficial in some instances in that the artificial turf may intertwine with itself and also with fibers that are used to form the pile of the artificial turf. This may help to keep the composite infill components in place with respect to each other and also reduce the effect of splash. The splash effect is when a ball or other object ballistically hits an artificial turf surface and amounts of the artificial turf infill are knocked away from the artificial turf surface. This results in artificial turf infill being knocked away from the artificial turf surface. This effect resembles a ball or other object splashing or hitting a paddle where water is knocked up. In this case the artificial turf infill is knocked up temporarily.

[0026] The term “pile” as used herein refers to the fibers collectively used to form the artificial turf surface. For example, an artificial turf carpet may comprise a large number of artificial turf fibers which are attached to a backing. The artificial turf fibers are collectively referred to as the pile, and the pile forms the artificial turf surface.

[0027] Increasing the length of the artificial turf infill may also have the advantage that the artificial turf infill packs less tightly. This may reduce how securely the cleats of an athletic shoe grip the artificial turf. The length can be adjusted such that cleats grip the surface sufficiently to enable athletic performance to balance that of the shoe to release the spray of water from the turf surface.

[0028] In another embodiment, the composite infill components have a thickness between 0.3 mm and 0.5 mm. The thickness of the composite infill components may also be considered to be the outside diameter or thickness of the jacket. The choice of the thickness between 0.3 mm and 0.5 mm may be beneficial because the composite infill components do not pack too hard within the artificial turf surface but are still soft enough that they are able to pack compactly to form a surface which resembles real turf.

[0029] In another embodiment, the jacket is a cylindrical jacket. The jacket may for instance be due to an extrusion process or may be due to an effect where the yarn is coated. Either of these may result in a cylindrical jacket. In some instances the jacket has an oval-shaped profile or may be asymmetric.

[0030] In another embodiment, the at least one opening is a cylindrical section. For example the composite infill components could be cylindrical-shaped and one or two ends may be cut such that they resemble cylindrical sections.

[0031] In another embodiment, the at least one opening is two openings. For example in one embodiment the composite infill components may be cylindrical-shaped and they may be cut on both sides of the cylinder thus exposing the water absorbent yarn.

[0032] In another embodiment, the artificial turf comprises an artificial turf carpet with a pile. The artificial turf carpet comprises a backing. The artificial turf carpet further comprises artificial grass fibers. The artificial grass fibers are tufted into the backing. The artificial grass fibers form the pile. The artificial grass fibers are secured to the backing. The artificial turf infill is distributed within the pile.

[0033] In another embodiment, the artificial turf comprises a sand layer between the backing and the artificial turf infill. The sand layer may help to hold the artificial turf carpet in place. Placing the artificial turf infill on the sand layer may help to provide for a superior artificial turf surface. For example the sand layer may provide for ready drainage of standing water on the artificial turf. However, having too much drainage may be a disadvantage because the artificial turf infill is preferably damp or has some moisture to maintain cooling of the artificial turf surface as well as making it easy to slide on the artificial turf. The use of the composite infill components may provide for an artificial turf infill that readily and quickly absorbs water. When water is sprayed on the surface or it rains the composite infill components will quickly absorb any water or large portions of the water which initially goes on the surface. Any extra water may then flow into the sand layer where it is drained away from the surface.
In another embodiment, the artificial turf comprises a drainage system for draining standing water from the artificial turf. The backing of the artificial turf or an elastic layer may be placed on the drainage system. As with the embodiment that comprises the sand layer, this may provide for a way of regulating the amount of water that is on the artificial turf. The artificial turf infill will quickly absorb water and any excess will then be drained away by the drainage system.

In another embodiment, the composite infill components have a length. The water absorbent yarn is substantially aligned with the length. The yarn may be made from a collection of fibers which is twisted or formed into a thread or a strand-like structure. The yarn may have a length that represents the average orientation of fibers.

In another aspect, the invention provides for the use of composite components as artificial turf infill. The composite components comprise a water absorbent yarn. The water absorbent yarn is covered with a jacket. The jacket is formed from an elastomeric compound. The jacket comprises at least one opening. The at least one opening exposes the water absorbent fibers. The advantages of the use of the composite components in artificial turf infill have been previously discussed.

It is understood that one or more of the aforementioned embodiments of the invention may be combined as long as the combined embodiments are not mutually exclusive.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following embodiments of the invention are explained in greater detail, by way of example only, making reference to the drawings in which:

FIG. 1 illustrates an example of an artificial turf;

FIG. 2 illustrates a further example of an artificial turf;

FIG. 3 illustrates a further example of an artificial turf;

FIG. 4 illustrates an example of a composite infill component;

FIG. 5 shows a side view of the composite infill component of FIG. 4;

FIG. 6 illustrates a machine for coating yarn;

FIG. 7 illustrates a two component coater for coating a yarn with a two component jacket;

FIG. 8 illustrates a further example of a machine for coating yarn; and

FIG. 9 illustrates a further example of a machine for coating yarn.

DETAILED DESCRIPTION

Like numbered elements in these figures are either equivalent elements or perform the same function. Elements which have been discussed previously will not necessarily be discussed in later figures if the function is equivalent.

FIG. 1 shows an example of an artificial turf 100. The artificial turf 100 comprises an artificial turf carpet 102. The artificial turf carpet comprises a backing 104 and also artificial grass fibers 106. The artificial grass fibers 106 are tufted into the backing 104 and are secured 108 to the backing 104. The artificial turf fibers 106 form a pile 103. The artificial turf carpet 102 is resting on a ground 110 or surface. Between and distributed between the artificial grass fibers 106 and within the pile 103 is an artificial turf infill 112. In this example the artificial turf infill 112 is made from individual composite infill components 114.

FIG. 2 shows a further example of an artificial turf 200. The artificial turf 200 is similar to the artificial turf 100 shown in FIG. 1 except there is additionally a sand layer 202 between the artificial turf infill 112 and the backing 104. The use of the sand layer 202 may be advantageous because it may help to hold the artificial turf carpet 102 in place. It may also have the technical benefit that the sand layer 202 works in conjunction with the artificial turf infill 112 to regulate the amount of water on the surface of the artificial turf 200. For example if it rains or if water is sprayed onto the surface of the artificial turf 200 the composite infill components 114 will rapidly absorb and saturate with water. The sand layer 202 may then aid in draining away excess water and preventing it from standing on the surface of the artificial turf 200.

FIG. 3 shows a further example of an artificial turf 300. The artificial turf 300 is similar to the artificial turf 200 shown in FIG. 2 with the addition of several additional layers. Directly underneath the backing 104 is an elastic layer 302. The elastic layer may for example be a mat or other material such as sand and elastomeric granulate or a mixture thereof that readily absorbs shock. The elastic layer 302 is optional. The backing 104 and/or the elastic layer 302 may have holes or may be porous so that water that is standing on the artificial turf 300 can be drained away. The elastic layer 302 is directly sitting on a drainage system 304. The drainage system 304 may comprise granulate material, drainage tiles, drainage pipes or other system for rapidly draining water off the surface of the artificial turf 300. The artificial turf depicted in FIG. 300 may have superior qualities when water is used to cool or improve sliding properties. Water that initially goes on the surface is readily absorbed by the composite infill components 114 that make up the artificial turf infill 112. When they have filled with water excess water may then go into and possibly be stored in the sand layer 202. When the sand layer 202 is saturated it may drain through the backing 104 and/or the elastic layer 302 into the drainage system 304.

FIG. 4 shows an example of a composite infill component 114. In this example the composite infill component is cylindrical-shaped. However, it is not necessary for the composite infill component to have a cylindrical shape or be perfectly cylindrical as is depicted. The composite infill component 114 can be seen as having a length 400 and a diameter 402. In an inner core of the composite infill component 114 is water absorbent yarn 404. Surrounding the water absorbent yarn 404 is a jacket 406 which serves as a protector or a cladding for the water absorbent yarn 404. The composite infill component 114 as depicted may be manufactured by coating a yarn 404 with a jacket material 406.

It can be seen that in this example the composite infill component 114 has had both ends cut, there are therefore two exposed openings 408. The openings 408 form cylindrical sections in this example. Some of the properties of the artificial turf infill can be adjusted by changing the diameter 402 and the length 400. If the length 400 is similar to the diameter 402 then the artificial turf infill will take on a grain-like or a granular form. As the length 400 is increased the properties of the artificial turf infill may change. For example the artificial turf infill may pack less
densely. The density may therefore be adjusted by controlling the length 400 or controlling the distribution of lengths 400. Additionally, as the length 400 is increased the tendency of the artificial turf infill to splash may be reduced because the various composite infill components 114 may become entwined with themselves and/or artificial grass fibers.

[0054] FIG. 5 shows a side view of the composite infill component 114. The side view shows the opening 408. The water absorbent yarn 404 has a central region 500 and a peripheral region 502. The peripheral region of the water absorbent yarn 404 contacts the jacket 406. In some examples, the jacket 406 may be applied as a liquid or fluid to the water absorbent yarn 404. Some of the fibers of the yarn may contact or intermingle with the material used to form the jacket 406. This may result in a region which is fully or partially saturated with the jacket material. The region which is fully or partially saturated is the peripheral region 502. The central region 500 is not filled with any of the jacket material 406. The central region 500 is free to absorb the full amount of water that it is capable of. In some examples the peripheral region 502 may help the adhesion of the jacket 406 to the water absorbent yarn 404.

[0055] FIG. 6 shows an example of a coating machine 600 which is used to coat yarn 404. In this example there is a spool with uncoated yarn 602 which passes through the machine to a spool with coated yarn 604. The coated yarn 604 may be later cut into the composite infill components. In some examples the yarn 404 after it has been coated is immediately cut into the composite infill components. After leaving the spool 602 the yarn 404 passes through a two-component coater 606. The two-component coater 606 puts the jacket on the yarn 404 in liquid form. The coated yarn 404 then passes optionally through a heater or dryer 608. The heater or dryer 608 may for instance be used to remove water from the jacket material and in some instances may also be used to activate a catalyst.

[0056] FIG. 7 illustrates the two-component coater 606 in greater detail. The two-component coater 606 has an inlet for a first component 700 and an inlet for a second component 702. The two components may for instance be components of a two-component polyurethane coating. The first and second inlets 700 and 702 join into a mixing chamber 704 where the two components mix. The mixed components then travel to an applicator ring 706. The ring has jets or sprays 708 that are used to spray the jacket material onto the water absorbent yarn 404 as it passes through the two-component coater 606. The mixture of the two components can be chosen such that the coating on the water absorbent yarn 404 is uniform and cures without dripping or drooping. Depending upon the particular mixture used the heater or dryer 608 may or may not be used.

[0057] FIG. 8 shows an alternative coating machine 800. In the Fig. shown in FIG. 8 the two-component coater 606 has been replaced with a shower head 802. The shower head 802 sprays or drops the liquid jacket material onto the yarn 404 as it passes under the shower head 802. In some examples there may be an additional component after the shower head 802 which removes excess liquid jacket material. For example the yarn 404 may pass through an orifice or on roller wheels which helps to regulate the amount of fluid which is applied to the yarn 404.

[0058] FIG. 9 shows a further example of a coating machine 900. This machine 900 is similar to the machines 800 and 600 shown in FIGS. 8 and 6. However, in this example a bath 902 is used. The yarn 404 enters the bath 902 and acquires some jacket material in liquid or fluid form. It then optionally passes through a heater 608 which may for instance be used to dry or activate a catalyst. In some examples there is an additional component between the bath 902 and the heater 608 to remove excess fluid. For instance the yarn 404 may pass through an orifice or over rollers which are used to remove excess jacket material. The example shown in FIG. 9 may for instance use a jacket material or coating which is a single component. If a catalyst is used the bath 902 can be left standing for a long time and may be used continuously without the worry that the coating material will prematurely set.

LIST OF REFERENCE NUMERALS

100 artificial turf
102 artificial turf carpet
103 pile
104 backing
106 artificial grass fibers
108 secured to backing
110 ground
112 artificial turf infill
114 composite infill component
200 artificial turf
202 sand layer
300 artificial turf infill
302 elastic layer
304 drainage system
400 length
402 diameter
404 water absorbent yarn
406 jacket
408 opening
500 central region
502 peripheral region
600 coating machine
602 spool with yarn
604 spool with coated yarn
606 two component coater
608 heater or dryer
700 inlet first component
702 inlet second component
704 mixing chamber
706 applicator ring
708 jet or spray of liquid jacket material
800 coating machine
802 showerhead
900 coating machine
902 bath

1. An artificial turf comprising an artificial turf infill, wherein the artificial turf infill comprises composite infill components, wherein the infill components comprise a water absorbent yarn, wherein the water absorbent yarn is covered with a jacket, wherein the jacket is formed from an elastomeric compound, wherein the jacket comprises at least one opening, wherein the at least one opening exposes the water absorbent yarn.

2. The artificial turf of claim 1, wherein the elastomeric compound is elastic, at a minimum, between 5° C. and 50° C.

3. The artificial turf of claim 1, wherein the water absorbent yarn has a circular cross section.
4. The artificial turf of claim 1, wherein the water absorbent yarn has a diameter.

5. The artificial turf of claim 1, wherein the water absorbent yarn comprises interlocking fibers.

6. The artificial turf of claim 1, wherein the water absorbent yarn comprises any one of the following: hygroscopic fibers, burlap fibers, jute fibers, cotton fibers, wool fibers, hemp fibers, polyester fibers, natural fibers, flax fibers, kenaf fibers, nettle fibers, sisal fibers, synthetic fibers, fibers with a hydrophilic surface, and combinations thereof.

7. The artificial turf of claim 1, wherein the water absorbent yarn comprises cocom fibers.

8. The artificial turf of claim 1, wherein the jacket comprises any one of the following: polyurethane, rubber, a polyolefin elastomer, a dye, a UV protective additive, polyurethane and polyole, polyurethane and a temperature sensitive catalyst, a one-component polyurethane, a two-component polyurethane, polyethylene, TPE, extruded PE, extruded TPE, and combinations thereof.

9. The artificial turf of claim 1, wherein the jacket is formed from a cured liquid, wherein the yarn comprises a peripheral portion and a central region, wherein the peripheral portion surrounds the central region, wherein the peripheral portion is partially saturated with the elastomeric compound, and wherein the central region is free of the elastomeric compound.

10. The artificial turf of claim 1, wherein the jacket comprises between 6% and 10% of the composite infill components by weight.

11. The artificial turf of claim 1, wherein the jacket has a thickness between 4 microns and 8 microns.

12. The artificial turf of claim 1, wherein the jacket has a length between 0.4 mm and any one of the following: 0.5 mm, 1.0 mm, 1.5 mm, 2.0 mm, 2.5 mm, 3.0 mm, 3.5 mm, 4.0 mm, 4.5 mm, 5.0 mm, and 5.5 mm.

13. The artificial turf of claim 1, wherein the composite infill components have a thickness between 0.3 mm and 0.5 mm.

14. The artificial turf of claim 1, wherein the jacket is a cylindrical jacket.

15. The artificial turf of claim 14, wherein the at least one opening is a cylindrical section.

16. The artificial turf of claim 1, wherein the at least one opening is two openings.

17. The artificial turf of claim 1, wherein the artificial turf comprises an artificial turf carpet with a pile, wherein the artificial turf carpet comprises a backing; wherein the artificial turf carpet further comprises artificial grass fibers, wherein the artificial grass fibers are tufted into the backing, wherein the artificial grass fibers form the pile, wherein the artificial grass fibers are secured to the backing, and wherein the artificial turf infill distributed within the pile.

18. The artificial turf of claim 17, wherein the artificial turf comprises a sand layer between the backing and the artificial turf infill.

19. The artificial turf of claim 17, wherein the artificial turf comprises a drainage system below the backing configured for draining standing water from the artificial turf.

20. The artificial turf of claim 1, wherein the composite infill components have a length, and wherein the water absorbent yarn is substantially aligned with the length.

21. The use of composite components as artificial turf infill, wherein the composite components comprise a water absorbent yarn, wherein the water absorbent yarn is covered with a jacket, wherein the jacket is formed from an elastomeric compound, wherein the jacket comprises at least one opening, wherein the at least one opening expose the water absorbent yarn.

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