SYNTHETIC SPORTS TURF HAVING LOWERED INFILL LEVELS

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Abstract

A durable and wear resistant synthetic sports field having a plurality of strips having a plurality of fibrillated polypropylene strands tufted within a multilayer backing material. The strands are tufted in a wide variety of pile heights, patterns, gauges, and stitch patterns depending upon end use. A particulate matter infill is introduced onto the strips at a depth between about 10% and 50% of the overall height of the strands.

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TECHNICAL FIELD AND INDUSTRIAL APPLICABILITY OF THE INVENTION

[0001] The present invention relates generally to synthetic sports fields and more specifically to a synthetic sports turf having lowered infill levels.

BACKGROUND OF THE INVENTION

[0002] Synthetic grass sports surfaces are well known. These surfaces are becoming increasingly popular as replacements for natural grass surfaces in stadiums, playgrounds, golf driving ranges, and a variety of other facilities for a variety of different uses. The synthetic grass surfaces stand up to wear much better than the natural grass surfaces, do not require as much maintenance, and can be used in partially or fully enclosed stadiums where natural grass cannot typically be grown.

[0003] Most synthetic grass surfaces comprise rows of strips or ribbons of synthetic grass-like material, extending vertically from a backing mat with particulate material infill in between the ribbons on the mat. One or more layers of aggregate material are introduced between the backing mat and on top of a smoothed and compacted subgrade. The surfaces are preferably crowned to promote water drainage.

[0004] The ribbons of synthetic grass-like material usually extend a short distance above the layer of particulate material infill layer to keep them substantially upright and represent blades of grass. The length of these ribbons of fibers, or pile elements, is dictated by the end use of the playing surface. For example, football fields utilize fibers that are longer than golf driving range surfaces.

[0005] The primary functions of particulate matter infill layer are to stabilize the pile elements, prevent graininess (i.e., prevent the tendency of the pile fabric to lay in a given direction), absorb shock, and improve the footing of a player running or walking across the surface. In addition, the particulate matter infill layer adds weight to hold down the backing material, thus helping to ensure that the strips of synthetic grass do not move or shift during play. The particulate material usually comprises sand, as shown by way of example in U.S. Pat. No. 3,993,079 and U.S. Pat. No. 4,389,435, both to Haas, Jr. The particulate matter can also comprise a mixture of sand and other materials only, including rubber infill, as shown, for example, in U.S. Pat. No. 6,338,885 to Prevost. The particulate matter can also consist essentially of resilient materials only, like rubber infill, as shown, for example, in U.S. Pat. No. 5,976,645 to Deluise et al. Moreover, the particulate matter infill layer may be layered, wherein different materials or combinations of materials constitute each layer as shown, for example, in U.S. Pat. No. 6,299,959 to Squires et al., which discloses a layered infill consisting of a rubber bottom layer (or a rubber and sand mixture), a sand/rubber middle layer, and a top layer consisting of rubber and sand.

[0006] The depth, or thickness, of the particulate layer interspersed among the pile elements is dependent upon these playability characteristics, as dictated by the ultimate end use for the athletic surface. As stated above, known synthetic grass-like materials are constructed wherein the ribbons or pile elements usually extend a short distance above the layer of particulate material, typically at least 50%, and more preferably closer to 100%, the height of the ribbons.

[0007] As one of ordinary skill appreciates, the deeper the depth or thickness of the particulate matter infill layer, the higher the raw material costs for installing the field. However, there has never been any study that compares the infill depth to the actual playability characteristics of an athletic field.

SUMMARY OF THE INVENTION

[0008] An advantage of the present invention is to reduce the raw material costs of the particulate matter infill layer of a synthetic turf field without a reduction in the playability of the synthetic turf field.

[0009] The present invention is directed to a new and improved synthetic grass surface that can be used in all types of end use applications. The durable and wear resistant synthetic sports field is formed from conventional strips of synthetic turf material in which strands of ribbons are tufled in a wide variety of pile heights, patterns, gauges, and stitch patterns through a flexible backing system. A particulate matter infill is introduced onto the strips for use on sports fields, such as football fields and soccer fields. The depth of the particulate matter infill is less than 50% of the height of the strands on the backing material, and more preferably between about 10% and 50% of the height of the strands, yet still provides a desired level of playability for the particular end use.

[0010] To accomplish this, in one preferred embodiment, the particulate matter infill layer is comprised of smaller, and hence denser, particulate matter than is traditionally used in athletic fields. The denser particulate matter acts to stabilize the pile elements, prevent graininess (i.e., prevent the tendency of the pile fabric to lay in a given direction), absorb shock, and improve the footing of a player running or walking across the surface at lower infill levels than what was previously thought possible. The denser particulate matter preferably is in the form of hard particles, such as sand, resilient particles such as rubber, or combinations of both hard and resilient particles.

[0011] In another preferred embodiment of the present invention, a resilient padding layer is added between the level subgrade and the backing material. The resilient padding layer serves to improve the overall shock absorption of the athletic field having the lowered infill levels.

[0012] Other objects and advantages of the present invention will become apparent upon considering the following detailed description and appended claims, and upon reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a top plan view of a sports field in accordance with one preferred embodiment of the present invention; and

[0014] FIG. 2 is a section view of a portion of the sports field of FIG. 1 in accordance with one preferred embodiment of the present invention.

DETAILED DESCRIPTION AND PREFERRED EMBODIMENTS OF THE INVENTION

[0015] FIGS. 1 and 2 illustrate a top and side section views of a sports playing surface 20, here a football field, according to one preferred embodiment of the present invention. The playing surface 20 is formed having one or more strips 22 of a synthetic turf grass surface 24 on either side of a central strip 122. The strips 22, 122 are placed on top of a substrate 64 in
rows across the field such that the respective edges 22A of adjacent strips 22 are substantially lined up and a cover the substrate 64 along a boundary defined by a first lengthwise side 44, a second lengthwise side 45, a first widthwise end 43 and a second widthwise end 44. Of course the boundary is defined by the ultimate end use and is not limited by the particular configuration described herein. It will be understood that the playing surface 20 can take on a variety of different configurations and the number, length, and shape of the strips can vary. Additionally, the playing surface 20 can be utilized for a variety of other uses.

The substrate 64 for indoor fields is typically a concrete slab or other firm subsurface. For outdoor fields the substrate material 64 is a compacted and substantially leveled subgrade, which typically consists of layers of various grades of fine and coarse aggregate material designed to enhance drainage. For example, the substrate 64 may be formed in accordance with the teachings of U.S. Pat. No. 7,189,445 to John Knox, which is herein incorporated by reference as though set forth fully herein.

As best shown in FIG. 2, the strips 22 of the synthetic grass material 24 are placed on top of the substrate 64 in rows across the field such that the respective edges of adjacent strips 22 are substantially aligned. The synthetic grass surface 24 has a plurality of strands 80 of synthetic yarn tufted (stitched) through a backing material 81 in rows separated by a first distance or gauge. The backing layer 81 preferably is formed from one or more layers (here shown as three layers 84, 86, 88) of a backing material. A secondary coating 90 is applied to the bottommost layer 88 to seal the strands 80 to the backing layer 81 and to add a layer of dimensional stability to the backing 81. It will also be understood that the backing layer can take on a variety of different configurations.

The strands 80, when applied to the backing material 81, will be preferably configured such that the tufted portion 87 of the strand is aligned in rows and further such that the uppermost ends 85 of the strands lay a particular way on the backing material 81. In other words, the tufting process is performed such that the uppermost ends 85 of the strands 80 will naturally fall substantially in the same direction on top of the backing material 81. Further, the strands 80 preferably include fibrils 88 in its upper portion 89. One non-limiting example of the synthetic grass surface 24 that may be utilized in the present invention, as well as the method for installing the playing surface, is described in U.S. patent application Ser. No. 11/144,587 to Cook et al., which is herein incorporated by reference. A series of holes 94 are preferably punched through the backing layer 81 and secondary coating 90 at predetermined locations to promote drainage to the underlying substrate 64.

A layer of infill 96 is introduced onto the backing material 81 to a depth substantially less (i.e. between about 10% and 50% of the depth) than that of the uppermost portion 85 of the strands 80 extending upward from the backing material 81.

The infill layer 96 preferably comprises hard particles, such as silica sand, and/or resilient particles, such as cryogenically ground crumb rubber. Most preferably, the infill layer 96 comprises a mixture of hard particle and resilient particles. The depth of the particulate matters infill layer 96 is calculated so as to obtain a desired thickness of between about 10% and 50% of the height of the strands while maintaining acceptable mechanical and playability properties. Thus, the infill layer 96 functions to stabilize the pile elements, prevent graininess (i.e., prevent the tendency of the pile fabric to lay in a given direction), absorb shock, and improve the footing of a player running or walking across the surface.

The silica sand could be replaced or supplemented by graded small rocks, hard and heavy granulated plastics, or other hard sand. The cryogenically ground crumb rubber could be replaced or supplemented by other resilient materials, including crumb rubber, cork, or polymer beads, for example.

To achieve adequate mechanical properties and playability characteristics and lower infill levels than is used in known synthetic turf fields (at least 50%, and more preferably closer to 100%, of the height of strands), the density of the infill layer 96 must be increased to a point wherein the denser infill layer achieves the desired mechanical and playability properties described in the preceding paragraphs. This can be accomplished by removing spaces between the hard particulates and/or packing them closer together. Other ways to increase the density of the infill layer may also be employed. Moreover, an infill layer consisting of a denser material, such as a heavier rubber, may also be utilized.

In an alternative preferred embodiment, as further shown in FIG. 2, a shock resistant layer 63 may be added between the substrate 64 and the bottommost layer 88 of the backing material 81. The shock resistant layer 63 preferably consists of a 1-inch thick layer of rubber or nylon. The shock resistant layer 63 provides enhanced shock absorption that may be desirable, depending upon the amount of infill material provided.

The present invention thus provides many advantages over synthetic turf field having deeper infill levels without an associated drop in playability or performance. First, the present invention realizes reduced raw material costs associated with lowered infill levels. Second, the process for introducing less infill also provides a cost savings associated with the time by reducing the time needed to completely introduce and groom the added infill. Further, there may be potential cost savings associated with maintaining a field having lower infill levels in terms of grooming and infill replacement. Finally, the costs associated with subsequent removal of the infill to repair or replace the underlying tufted backing or substrate is also lessened. Also, to the extent the infill is removable, a lower infill level will also provide some advantages.

While the invention has been described in terms of preferred embodiments, it will be understood, of course, that the invention is not limited thereto since modifications may be made by those skilled in the art, particularly in light of the foregoing teachings.

What is claimed is:

1. A synthetic turf field comprising:
   a substrate;
   a plurality of strips of synthetic turf laid onto said substrate, each of said plurality of strips including a plurality of synthetic strands tufted through a backing layer and extending a predetermined height above said backing layer; and
   a layer of particulate matter infill coupled onto said plurality of strips and interspersed within said plurality of synthetic strands, wherein the depth of said layer is between about 10% and about 50% of said predetermined height.
2. The synthetic turf field of claim 1, further comprising: a shock resistant layer coupled between said substrate and said backing layer.

3. The synthetic turf field of claim 1, wherein said layer of particulate matter comprises hard particles.

4. The synthetic turf field of claim 1, wherein said layer of particulate matter comprises resilient particles.

5. The synthetic turf field of claim 1, wherein said layer of particulate matter comprises a mixture of hard particles and resilient particles.

6. A synthetic turf field, comprising:
   a substrate;
   a plurality of strips of synthetic turf disposed on said substrate, each of said plurality of strips including a plurality of synthetic strands tufted through a backing layer and extending a predetermined height above said backing layer;
   a shock resistant layer coupled between said substrate and said backing layer; and
   a layer of particulate matter infill interspersed between said plurality of synthetic strands and disposed on said backing layer, wherein the depth of said layer is between about 10\% and about 50\% of said predetermined height; wherein said layer has increased density that is sufficient to support said plurality of synthetic strands.

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