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3,513,061

SYNTHETIC TURF SURFACE

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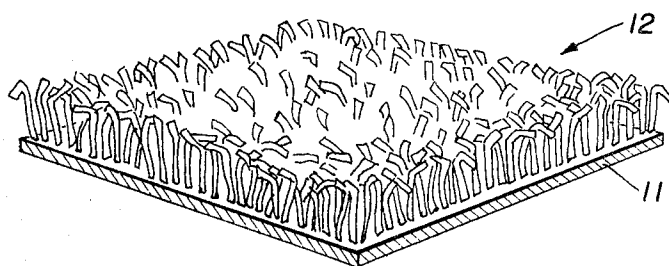


FIG. 1.

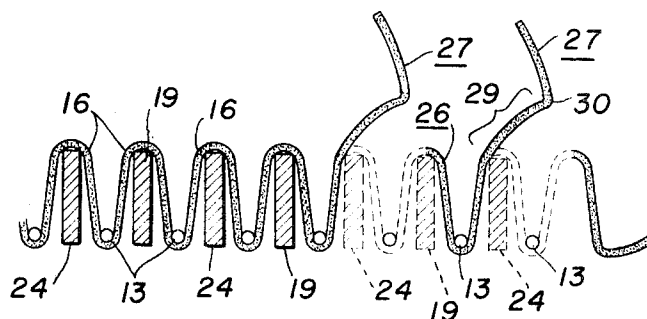


FIG. 2.

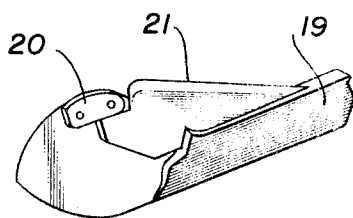


FIG. 3.

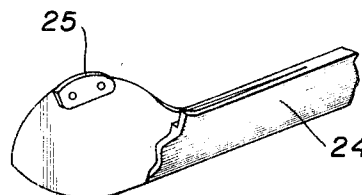


FIG. 4.

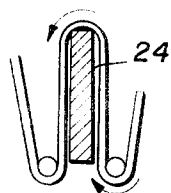


FIG. 5.

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SYNTHETIC TURF SURFACE

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5 Claims

ABSTRACT OF THE DISCLOSURE

A synthetic turf is disclosed which is particularly useful as a golf green. The turf is a woven fabric having cut thermoplastic monofilament ribbons extending from a base. A portion of the ribbons are of one length and the remainder are at least twice as long. The longer ribbons have a curved portion which simulates natural grass. The ribbons have a denier of 300–1200, a width of 0.01"–0.3" and a thickness of 0.001" to 0.003".

The method of making the same comprises fabricating a carpet structure having a backing from which extends a plurality of courses of loops of a synthetic filament, the loops being positioned in rows extending transverse to the courses. A first row of loops is severed near the tips thereof and a second row of loops adjacent to the first row is pulled to remove from the backing that portion of each filament extending to the point of severing in the first row. The severing and pulling steps are repeated sequentially along the carpet to transform it from a loop to a cut pile carpet.

This invention relates to synthetic turf surfaces and more particularly to simulated-grass carpeting suitable for outdoor recreational purposes.

It is known to make simulated-grass carpeting or synthetic turf for recreational uses such as golf greens, etc. Conventionally, these simulated turf surfaces include a backing from which extends a plurality of filaments simulating grass. One of the biggest objections to known materials of this type is that ball roll on such a surface is not always true. For example, a golf ball stroked on such a surface will deviate or drift from a straight line path as it slows to a stop unless it is stroked along a line parallel to the warp direction. This is, of course, undesirable since the golfer cannot depend upon the ball to travel along a straight line.

In addition, existing simulated turf surfaces do not decelerate golf balls at the same rate as natural turf. Generally, conventional synthetic turf is only 1/2 to 1/3 as effective as natural turf in decelerating a golf ball. In other words, a golf ball stroked with a given force, will travel 2 to 3 times as far on conventional simulated turf surfaces as it will on natural turf. This is another disadvantage of conventional synthetic turf. With these problems in mind, one of the objects of this invention is to provide a novel and improved synthetic turf.

Another object of this invention is to provide a simulated turf or grass recreational surface which does not have a tendency to deflect a rolling ball from a straight line path.

A further object of this invention is to provide a simulated-grass recreational surface having the appearance of natural grass.

Still another object of this invention is to provide a synthetic turf having ball deceleration characteristics similar to natural turf.

A further object of this invention is to provide a simulated-grass recreational surface which has a backing from which extends a plurality of synthetic filaments in ribbon form, portions of the synthetic filaments having a molec-

ular orientation which varies from one side of the filament to the other.

One embodiment of the present invention contemplates making a simulated-grass recreational surface or synthetic turf by weaving a loop pile carpet structure, the loops of said carpet structure being made of a synthetic monofilament having a flat, ribbon-like configuration. A first row of loops is cut near the tips thereof and then tension is applied to an adjacent row of filaments to pull out the cut ends out of the backing layer. These two steps are repeated alternately along the carpet to provide a cut pile carpet having pile filaments of two different lengths.

Other objects and advantages of the invention will become apparent when the following detailed description is read in conjunction with the appended drawing, in which FIG. 1 is a perspective view of a swatch of the synthetic turf or recreational surface of the present invention,

FIG. 2 is an enlarged cross-sectional view showing the manner in which the looped pile is cut and pulled out of the backing layer to provide a cut pile carpet,

FIG. 3 is an enlarged view of a conventional wire used in a carpet loom showing the knife utilized to cut the looped pile,

FIG. 4 is a perspective view of a carpet loom wire with the cutting blade removed, and

FIG. 5 is an enlarged cross-sectional view showing the manner in which the pile filaments are pulled across the sharp corners of the wire as the wire is withdrawn from the row of loops.

Referring now in detail to the drawing, there is shown a backing layer 11 from which extends a plurality of synthetic filaments to form a simulated-grass recreational surface or turf 12. The backing layer 11 is a woven structure which is fabricated on a carpet loom in such a manner that picks 13 hold filament loops 16 in an upright position. For clarity, the warp threads are omitted from the drawing. This type of carpet weaving is conventional and may be done on a Wilton or Velvet loom.

The filaments making up the loops 16 are extruded synthetic thermoplastic monofilaments in ribbon form and have a denier within the range of 300 to 1200, a width in the range of 0.01–0.3" and a thickness in the range of 0.001–0.003". The filaments, which are generally flat and ribbonlike to simulate natural grass and possess suitable bending properties, may be pigmented green to simulate the color of grass. Other colors may be used for special effects.

Some of the thermoplastic compositions which may be used for making the ribbon are nylon, polypropylene, acrylic, polyester, etc. Of these, nylon is preferred.

The monofilament ribbons run along the backing layer in courses as shown in FIG. 2 with the loops 16 being arranged in rows perpendicular to the courses. At this stage of the fabrication the recreational surface has the construction and configuration of a woven loop pile carpet.

The wires used in the weaving of this recreational surface are those conventionally used in the making of cut pile woven carpets with the exception that the knives utilized for cutting the loops are removed from half of the wires (i.e., every other wire). FIG. 3 shows the conventional wire 19 which has an enlarged head 20 and a cutting blade 21. When the wire 19 is pulled along the row of loops to remove it therefrom, the blade 21 will sever each loop at or near the tip thereof to convert the carpet from a loop pile carpet to a cut pile carpet.

FIG. 4 shows a wire 24 having an enlarged head 25 but no cutting blade 21. The purpose of this wire 24 will be explained hereinafter.

The wires 19 and 24 are used alternately in fabricating the recreational surface. In other words, as the carpet is woven each wire 19 will be positioned between two wires

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24 and each wire 24 will be positioned between two wires 19. A number of these wires are utilized in weaving the carpet and as each new loop 16 is formed the wire most remote from that loop is pulled out of its row of loops in a well known manner.

The first row of loops is formed on one of the wires 19 with a blade 21 while the second row of loops is formed on one of the wires 24 without a cutting blade. When the wire 19 in the first row of loops is withdrawn the blade 21 severs the row of loops near the tips thereof. Then when the wire 24 (without a blade) is withdrawn from the next row of loops the enlarged head 25 applies tension to the loops in this row to pull out of the backing layer that portion of each of the filaments extending to the cut made in the first row of loops. The third wire, which has a blade 21, is then withdrawn and the blade 21 severs the loops in this row at the tips thereof. Then when the fourth wire which has no blade is withdrawn, it pulls out that portion of each of the filaments extending to the cut in the preceding row. These steps of severing and pulling are repeated sequentially on the successive rows of loops.

It can readily be seen that the cutting and pulling operations performed successively along the carpet as described hereinabove result in a synthetic turf having a cut pile of two different lengths. The length of the shorter cut pile filaments 26 will be substantially equal in length of the looped pile 16 prior to the cutting. The length of the longer cut pile filaments 27 will be (measured along the filament) approximately two to three times the length of the shorter filament 26. While the shorter filament 26 will have a fairly straight configuration, the longer filament 27 will have a configuration similar to that shown in FIG. 2. Each of the longer filaments 27 has a curved portion 29 and a fairly sharp bend or elbow 30. The bend or elbow 30 is caused by deformation of the filament 27 which is caused as tension is applied to the filament 27 as it is held by the pick 13.

The curved portion 29 is a result of pulling the filament 27 under tension over the sharp edges of the wire 24. The wire 24 is thin and has relative sharp corners. As the enlarged head 25 passes through the loop it applies tension to the filament 27 which, as it pulls out of the backing layer, is drawn across the sharp edges of the head 25 under tension. This effects a change in the molecular orientation of the side of the filament 27 in contact with the sharp edges of the wire 24. Since the molecular orientation on one side of the filament is different from that on the other side, the filament will tend to bend or curl as illustrated in FIG. 2.

It is not quite understood why but a golf ball stroked across this surface travels along a straight line with no deviation therefrom as the ball comes to a stop. Perhaps it is because the longer filaments 27, while retaining basically the configuration shown in FIG. 2, tend to assume random positions (rather than the orderly positions shown in FIG. 2) so that the same resistance is offered to the ball regardless of its direction of travel relative to the warp of the fabric. Of course, if this fabric is utilized

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on a slope the force of gravity will have some effect on the direction of ball travel. However this direction of travel will not be influenced or changed because of the nature of the surface 12.

A further advantage of this synthetic turf is that the ball deceleration rate on this turf is very similar to that of natural turf. On conventional synthetic turf a golf ball will roll several times as far, when impelled by given force, as it will on natural turf. This undesirable characteristic is overcome in the present invention.

It is to be understood that the embodiment disclosed herein merely illustrates the invention and that numerous other embodiments can be contemplated without departing from the spirit and scope of the invention.

What is claimed is:

1. A simulated grass-like woven product comprising a warp and fill backing layer, and a plurality of synthetic thermoplastic cut pile monofilament ribbons anchored in the backing layer and extending therefrom, said ribbons having a denier in the range of 300 to 1200 and a width at least three times greater than its thickness, a portion of said monofilament ribbons having a predetermined length, with the remainder of said monofilament ribbons having a length at least twice as great as said predetermined length and having along at least a portion of the length thereof a molecular orientation which varies from one value on one side of said monofilament ribbon to another value on the other side of said monofilament ribbon to thereby impart a curl to each said monofilament ribbon.

2. The product of claim 1 wherein the thermoplastic monofilament ribbon is selected from the group consisting of nylon, polypropylene, acrylic and polyester.

3. The product of claim 2 wherein the thermoplastic monofilament is nylon.

4. The product of claim 1 wherein the ribbons have a width in the range of 0.01"-0.3" and a thickness in the range of 0.001"-0.003".

5. The product of claim 1 wherein the longer ribbons include a curved portion connected to an elbow shaped bend which terminates at a cut end.

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