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(54) **METHOD FOR MANUFACTURING ARTIFICIAL TURF AND ARTIFICIAL TURF**

(57) Disclosed is a method for manufacturing artificial turf and an artificial turf. The method comprises tufting two or more rows of artificial grass fibers through thermoplastic material to a backing of the artificial turf. The one or more pieces of thermoplastic material are arranged to form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers. The rows of thermoplastic material are melted to bond the two or more rows of artificial grass fibers to the backing.

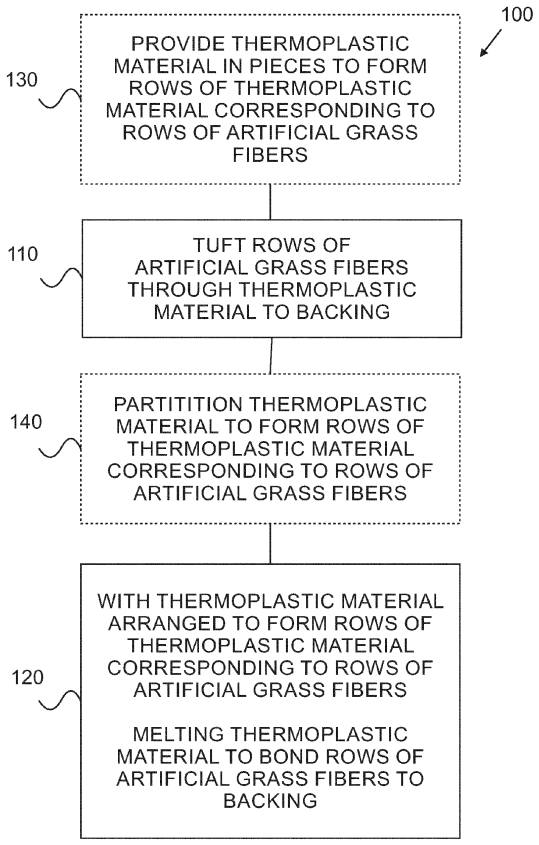

FIG. 1

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Description

FIELD

[0001] The present invention relates to an artificial turf.

BACKGROUND

[0002] In prior art, one generally known method of manufacturing artificial turf is tufting. After tufting, artificial grass fibers are typically attached to a backing of the artificial grass by latex or by polyurethane. Various hot-melt adhesives may also be used. This generally requires a separate production line with a long series of the artificial turf. The production line needs to be cleaned after each series manufactured and therefore it is not feasible to power up the line for a short series of the artificial turf. A separate manufacturing step also increases expenditure and production space requirements.

OBJECTIVE

[0003] An objective is to alleviate the disadvantages mentioned above.

[0004] In particular, it is an objective to provide an improved method for manufacturing artificial turf.

[0005] It is also an objective to provide an improved artificial turf.

SUMMARY

[0006] According to a first aspect, a method for manufacturing artificial turf is provided. The method comprises tufting two or more rows of artificial grass fibers through thermoplastic material to a backing of the artificial turf. This allows the artificial grass fibers to extend from a front side of the backing as artificial grass (i.e. as tufts), whereas the bonding takes place on a back side of the backing, the back side being on the opposite side of the backing with respect to the front side. The thermoplastic material is arranged to form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers. In one embodiment, this is done before the tufting and in another embodiment after the tufting. In any case, it can be done before melting the thermoplastic material, or the rows thereof, to bond the two or more rows of artificial grass fibers to the backing.

[0007] Importantly, forming the rows of thermoplastic material allows each of the two or more rows of artificial grass fibers to be bonded to the backing by a separate piece of thermoplastic material, each corresponding to a row of thermoplastic material. Upon melting, the thermoplastic material around each of the two or more rows of artificial grass fibers is then free to curl around the corresponding row of artificial grass fibers independent of the other rows. This can mitigate wrinkling and/or undulating of the artificial turf due to shrinking of the thermoplastic material upon the melting. This improves the quality of the artificial turf and facilitates ease of installation at the site of use.

[0008] Also importantly, the artificial grass fibers are tufted through the thermoplastic material. Accordingly, they penetrate both the backing and thermoplastic material thereby facilitating tight bonding as the thermoplastic material can act longitudinally, i.e., in the direction of the two or more rows of artificial grass fiber, between the backing and the rows of artificial grass fibers.

[0009] In addition, forming the rows of thermoplastic material allows longitudinal channels to be created within the thermoplastic material, i.e., between the rows of thermoplastic material. This provides draining paths for fluid, e.g. for water, transmitted through the backing so that no draining holes need to be made to the thermoplastic material, thereby removing the need for a separate manufacturing step.

[0010] In an embodiment, the thermoplastic material consists of a single piece of thermoplastic material which is partitioned after the tufting to form the rows of thermoplastic material. This improves the ease of tufting since the thermoplastic material may be provided as a single film which can simply be placed against the backing for tufting, i.e., without any specific alignment.

[0011] In an embodiment, the thermoplastic material consists of two or more pieces of thermoplastic material spaced from each other before the tufting to form the rows of thermoplastic material. This allows the tufting to be performed through the rows of thermoplastic material, thereby removing the need to partition the thermoplastic material after the tufting.

[0012] In an embodiment, the thermoplastic material consists of a single piece of thermoplastic material comprising one or more weakenings to form the rows of thermoplastic material upon the melting of the thermoplastic material.

[0013] In an embodiment, the thermoplastic material is embedded with electrically conductive material for facilitating the melting of the thermoplastic material. This allows the melting to be focused to the thermoplastic material, thereby reducing any effects on the rest of the artificial turf. In particular, this allows mitigating or preventing any shrinkage of the artificial grass fibers upon the melting.

[0014] In an embodiment, the thermoplastic material is of the same material as the artificial grass fibers and/or the backing. This can improve the recyclability of the artificial turf, in particular when all three are made of the same material.

[0015] In an embodiment, the thermoplastic material is polyolefin or polyester. In a further embodiment, the thermoplastic material is polyethylene or polypropylene. These have been found particularly suitable for the artificial turf.

[0016] In an embodiment, the thermoplastic material has a melting point of 60-180 degrees Celsius, more preferably 60-150 degrees Celsius, most preferably 70-100 degrees Celsius. The relatively low melting point allows

mitigating or preventing any shrinkage of the artificial grass fibers upon the melting. Thereby it can also be ready for use directly after the melting.

[0017] According to a second aspect, an artificial turf is provided. The artificial turf can be obtained or obtainable by the method according to the first aspect or any of its embodiments, alone or in any combination.

[0018] According to a third aspect, an artificial turf comprises a backing and two or more pieces of thermoplastic material. It also comprises two or more rows of artificial grass fibers tufted through the two or more pieces of thermoplastic material to the backing. The artificial grass fibers may thus extend from a front side of the backing as artificial grass and be bond to the backing on the back side of the backing by extending through the thermoplastic material. The two or more pieces of thermoplastic material form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers bonding the two or more rows of artificial grass fibers to the backing.

[0019] As described in connection of the method of the first aspect, each of the two or more pieces of thermoplastic material corresponds to a separate row of the two or more rows or artificial grass fibers. Here and there, the correspondence may be understood as the rows of thermoplastic material overlapping their corresponding row of the two or more rows of artificial grass fibers. This allows each of the rows of thermoplastic material to curl upon their corresponding row of the two or more rows of artificial grass fibers upon melting of the thermoplastic material to bond the artificial grass fibers to the backing. The thermoplastic material melted for the bonding can prevent the artificial grass fibers from detaching from the backing. Because of the solutions, no separate adhesive for the backing and the artificial grass fibers needs to be used.

[0020] Any of the features and effects disclosed in connection of the first aspect are applicable to the second and the third aspect and vice versa. It is to be understood that the aspects and embodiments described above may be used in any combination with each other. Several of the aspects and embodiments may be combined together to form a further embodiment of the invention.

[0021] The solutions allow improved efficiency for an artificial turf or the manufacturing thereof. The number of method steps and/or resources for manufacturing the artificial turf may be reduced. With the disclosed solutions the artificial turf can be provided ready for use without delay after the melting.

[0022] In accordance with the disclosure, two separate backing layers may be used for the tufting of an artificial turf: one for the actual backing and another for the thermoplastic material attaching the artificial grass fibers to the backing. Importantly, these can be against each other at the tufting, or at least positioned so that the tufting is performed through both of the layers. Also importantly, the thermoplastic material is partitioned after the tufting but before the melting and/or provided already prepartitioned for the tufting, into rows as disclosed herein. This allows the rows of thermoplastic material to curl around the rows of artificial grass fibers upon the melting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The accompanying drawings, which are included to provide a further understanding and constitute a part of this specification, illustrate examples and together with the description help to explain the principles of the disclosure. In the drawings:

Fig. 1 illustrates a method according to an example,
Fig. 2a illustrates an artificial turf according to an example in a side view, and
Fig. 2b illustrates an artificial turf according to the previous example as seen from the bottom.

[0024] Like references are used to designate equivalent or at least functionally equivalent parts in the accompanying drawings.

DETAILED DESCRIPTION

[0025] The detailed description provided below in connection with the appended drawings is intended as a description of examples and is not intended to represent the only forms in which the example may be constructed or utilized. However, the same or equivalent functions and structures may be accomplished by different examples.

[0026] Figure 1 shows an example of a method 100, which can be utilized for manufacturing artificial turf. The method comprises tufting 110 artificial grass fibers (here also "the fibers") through thermoplastic material to a backing of the artificial turf. Tufting, as such, is a technique well known to a person skilled in the art and any appropriate tufting technique may be used. Tufting an artificial turf may comprise providing a backing. Then, artificial grass fibers may be repeatedly stitched through the backing (from a backside of the backing) to form a row of loops (on the front side of the backing). The length of a stich in a tufted artificial turf may typically vary between 0.5 and 3 centimeters but other lengths are also passible. A suitable stitch length may be selected by the skilled person depending on the application. Here, also Matrix tufting technique may be utilized. In Matrix technique, the distance between successive stitches is not constant. For instance, multiple short stitches may be followed by one longer stitch in a row.

[0027] The fibers are forced from the backside of the backing through the backing to form tufts on the front side of the backing. The fibers forced through the backing form a loop on the front side of the backing, which may be cut on the front side so as to form piles, the number of which for a single tuft may thus be twice the number of the fibers forced through the backing for the tuft. Each tuft may be formed by one or more fibers, i.e., the fibers

may be arranged as multi-filament ribbons. The ribbons may, in principle, comprise any number of artificial grass fibers, for example four or more fibers, such as 6-12 fibers or 8-10 fibers. The fibers in the ribbon may be referred to as the filaments of the ribbon. When a multi-filament ribbon is used, the cut loop forms one tuft, each of which can have a number of free filament ends and piles that is twice the number of filaments in the multi-filament ribbon. The tuft can thus be arranged for all the filaments of the tuft to have a common penetration point in the backing, i.e., the point at which the ribbon penetrates the backing.

[0028] The fibers may comprise or consist of thermoplastic material, such as polyolefin and/or polyester. Polypropylene and/or polyethylene, in particular, has been found advantageous. This can facilitate recyclability of the artificial turf. The length of the tufts (before the melting) may be smaller than 100 millimeters, for example 10-60 millimeters. This may be measured as the maximum extension of a tuft from the front side of the backing. The linear density, or the strength, of the artificial grass fibers, when arranged as multi-filament ribbons, may be 6000-20000 dtex. The corresponding number for an individual fiber or filament may be 500-4500 dtex.

[0029] Importantly, tufting here is performed through the thermoplastic material so that that before a tufting instrument, such as a tufting needle, forces the fibers through the backing, it first forces them through the thermoplastic material. There are thus two separate layers to be penetrated for the tufting: first, a layer of thermoplastic material and second, the backing. The layer of thermoplastic material may be initially provided in one piece or in multiple separate pieces, as is described herein. The thermoplastic material is provided on a back side of the backing.

[0030] The fibers are tufted to the backing as two or more rows, e.g. ten or more rows. For a single backing, the number of rows may be large, easily tens of rows. The fibers are stitched along the rows so that a single fiber may continue even along the whole length of the row. For separate rows, separate fibers may be used. The longitudinal direction may thus refer to the direction of the rows of the fibers and the direction of the fibers themselves. The two or more rows may be parallel or substantially parallel. Any or all of the two or more rows may be substantially straight, facilitating ease of manufacturing, but in some applications any or all of them may also be curved. The distance between two adjacent rows of the two or more rows may vary depending on the application. For example, it may be 0,25-2 centimeters. It may be constant for any pair of adjacent rows of the two or more rows or it may vary.

[0031] The thermoplastic material is arranged to form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers. Each row of the two or more rows thus has a row of thermoplastic material overlapping it. For this purpose, the number of the rows of thermoplastic material equals the number of rows of artificial grass fibers, i.e., being two or more. The rows of thermoplastic material are separate so that, for example, fluid flowing through the backing may escape between them. Importantly, the rows being separate from each other allows them to curl upon the corresponding row of artificial grass fibers to bond the artificial grass fibers to the backing. This curling can be achieved by melting the thermoplastic material, in particular by heating. The thermoplastic material may extend along the whole length of any or all of the two or more rows of artificial grass fibers.

[0032] In the method 120, when the thermoplastic material is arranged to form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers, it is melted to bond the two or more rows of artificial grass fibers to the backing. The thermoplastic material is aligned against the backing for the tufting before the tufting. However, the rows of thermoplastic material may be formed before and/or after the tufting.

[0033] Before the tufting 130, the thermoplastic material may be provided as two or more pieces of thermoplastic material. These may be aligned to overlap the two or more rows of artificial grass fibers to form any or all of the rows of thermoplastic material. For this purpose, they may be spaced from each other, already before the tufting.

[0034] The thermoplastic material may also be provided, before the tufting, as a single piece of thermoplastic material. It may comprise one or more weakenings to form any or all of the rows of thermoplastic material upon the melting of the thermoplastic material.

[0035] In both cases, whether the thermoplastic material is provided as a single piece or as two or more pieces before the tufting, after the tufting 140, the thermoplastic material may be (actively) partitioned to form any or all of the (remaining) rows of thermoplastic material. For example, the thermoplastic material may be provided before the tufting as a single piece, e.g. as a single film, which can, by the tufting, be initially attached to the backing and, after that, partitioned to form the rows of thermoplastic material. Or it can be provided before the tufting as multiple pieces, where further partitioning is performed after the tufting.

[0036] The partitioning may involve (actively) creating one or more weakenings to the thermoplastic material and/or completely separating the thermoplastic material into pieces for any or all of the rows of thermoplastic material. This may involve removing thermoplastic material to introduce a channel between any or all adjacent rows of thermoplastic material, which can be manifested as a gap of extended width. The partitioning may comprise or consist of cutting, for example, either mechanically or non-mechanically, e.g. by laser cutting. The partitioning may comprise or consist of cutting through the thermoplastic material along its whole length for completely separating the thermoplastic material into pieces and/or only creating weakenings that do not immediately separate the thermoplastic material into pieces. The

weakenings facilitate the breaking of the thermoplastic material at the weakenings upon the melting. The weakenings may comprise or consist of, for example, recesses extending only partially into the depth dimension of the thermoplastic material and/or partial cut-throughs, such as perforations and/or dashed grooves, through the thermoplastic material. Both the weakenings and/or cutting through the thermoplastic material allows defining the rows of thermoplastic material. What is important is that the partitioning facilitates curling of the thermoplastic material into separate rows of thermoplastic material, as defined by the partitioning, upon the melting so that these rows may bond the corresponding of the two or more rows of artificial grass fibers to the backing. Any or all of the rows of thermoplastic material may thus be separate already before the melting or they may be separated upon melting due to the partitioning. The partitioning and/or any or all of the weakenings may be in the longitudinal direction.

[0037] The backing and/or the thermoplastic material may be provided from rolls of the corresponding materials. They may be provided separately, e.g. from separate rolls, and combined at or before the tufting. This can be done any time before the tufting instrument, e.g. a tufting needle, penetrates the backing. The tufting may be performed simultaneously for the backing and the thermoplastic material, i.e. both are penetrated for the tufting during the same thrust of the tufting instrument.

[0038] The tufts may be cut into piles at any time after the tufting. Cutting them into piles before the melting of the thermoplastic material allows the cutting to be performed during the same or subsequent process step with the tufting, possibly without repositioning the tufted backing after the tufting. Cutting them into piles after the melting of the thermoplastic material allows the cutting to be performed on stabilized tufts bonded to the backing by the thermoplastic material.

[0039] Figure 2a shows an example of an artificial turf 200 in a side view. The artificial turf can be manufactured by the method 100 as disclosed herein. The example is shown along the longitudinal direction 210, which corresponds to the direction of the artificial grass fibers of the artificial turf.

[0040] The artificial turf comprises the backing 220. It has a front side 222 and a backside 224, on the opposite side with respect to the front side. The front side and the backside may be substantially parallel. The backing can be of substantially constant thickness. It can substantially homogeneous or a composite. Suitable materials and constructions for the backing are known in the art. The backing may comprise or consist of woven and/or non-woven structure. Here, in particular, the backing may be, for example, a mesh, a woven fabric or other net structure. This can allow fluid, such as water, to pass through the backing. In general, the backing may comprise one or more paths, such as through holes, for allowing fluid, such as water, to pass through the backing. Having multiple through holes at separate points along the backing for draining the artificial turf can be advantageous. The artificial turf may have any width, for example one or more meters, e.g. four meters or more. Accordingly, also the backing may have such a width. The backing may be of substantially uniform thickness. It may be provided as a sheet or a film. The backing may comprise or consist of thermoplastic material, such as polyolefin and/or polyester. Polypropylene and/or polyethylene, in particular, has been found advantageous. The weight of the backing may be less than a kilogram per square meter, for example 100-500 grams per square meter.

[0041] The artificial turf comprises the two or more rows of artificial grass fibers. Here, only a part of a single row is illustrated with two successive tufts 230. Each of the tufts in the example comprise six piles and have thus been obtained from three filaments, or by cutting three fibers after the tufting. on the backside of the backing, the tufts are still joined by remaining strands 232 of the three fibers. Strands 234 also connect to subsequent tufts (not illustrated) in the row of artificial grass fibers. Examples for the artificial grass fibers and the two or more rows thereof are also given with reference to Figure 1 above.

[0042] The two or more rows of artificial grass fibers are tufted to the backing through thermoplastic material 240. The thermoplastic material may be provided as a film. The completed artificial turf comprises two or more pieces of this thermoplastic material, where the number of the pieces may be equal or larger than the number of the two or more rows of artificial grass fibers. For each of the two or more rows mentioned, there should be at least one piece of the thermoplastic material but naturally there may be multiple pieces also, for example along the length of the rows of artificial grass fibers. Nevertheless, manufacturing may be simplified by providing, for each of the two or more rows of artificial grass fibers, one piece of thermoplastic material extending substantially along the whole length of the corresponding row and thereby bonding the corresponding row to the backing along its whole length. The two or more pieces of thermoplastic material form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers bonding the two or more rows of artificial grass fibers to the backing. For this purpose, the thermoplastic material may have been melted. Because of the side view, only one of such rows is visible in this figure, however.

[0043] The artificial turf may comprise one or more additional material layers. For example, on the back side of the backing there may be one or more additional layers for supporting the artificial turf. These may have different material properties. On the front side of the backing, the artificial turf may be supplemented with infill material, such as rubber pieces and/or sand. This may allow improving the elasticity of the artificial turf and/or supporting the tufts.

[0044] Figure 2b shows the example of the artificial turf 200 from a bottom view, i.e., from the backside 224 of the backing 220. Here, also the longitudinal direction 210

is illustrated accordingly. The artificial grass fibers, or the strands 232 thereof, extend in the longitudinal direction on the backside of the backing. While the thermoplastic material is originally sandwiched between the strands and the backing, it may have curled upon melting to partially or fully envelop any or all of the strands.

[0045] The figure illustrates how two adjacent rows 240, 242 of the thermoplastic material may be positioned. The rows may be of substantially constant width but alternatively the width may vary along the longitudinal direction. The rows may have been obtained by providing them separately already before tufting. Alternatively, they may have been provided from a single piece of thermoplastic material partitioned into two pieces after tufting. The rows may have a channel 250 in between them. This may be manifested as a finite gap, which may be due to removal of the thermoplastic material after the tufting and/or curling of the thermoplastic material upon the melting. The width of the channel may be smaller or larger than the width of the rows of thermoplastic material. The channel may be of substantially constant width but alternatively the width may vary along the longitudinal direction. Any of the aforementioned may apply for any or all pairs of adjacent rows of the thermoplastic material and the channels between them. Any or all of the rows of thermoplastic material may be substantially straight but, as for the rows of the fibers, any or all of them may also be curved in some applications. Any or all of the rows of thermoplastic material may be parallel. They may be aligned in the longitudinal direction.

[0046] The thermoplastic material may have been coupled with the backing for the tufting with the temperature of the thermoplastic material below its melting point. It has thus been melted only after the tufting. The thermoplastic material may be melted by heating. For the melting, direct and/or indirect heating may be used. The melting may be facilitated by any available means, including but not limited to the following, alone or in any combination: hot air, radiant heat, microwave radiation, ultrasound and inductive heating.

[0047] For the disclosed solution, there is no need to laminate the artificial turf on the backside of the backing. Since the thermoplastic material between the backing and the strands of the artificial grass fibers on the backside of the backing, no adhesive layers are needed on the back of the strands. This further allows mitigation of wrinkling and/or undulating of the artificial turf. The absence of any lamination also allows fluids, such as water, to pass through the artificial turf. No separate manufacturing step is required for introducing holes to the thermoplastic material.

[0048] The thermoplastic material may be, in particular, polyolefin or polyester. In particular, the thermoplastic material may comprise or consist of polyethylene and/or polypropylene. Similarly, the backing and/or the artificial grass fibers may comprise or consist of polyolefin and/or polyester, in particular polyethylene and/or polypropylene. The thermoplastic material may comprise or consist of the same material as the artificial grass fibers and/or the backing. The thermoplastic material may a melting point of 60 degrees Celsius or more, for example 70 degrees or more. Alternatively or additionally, the melting point may be 180 degrees Celsius or less, for example 150 degrees Celsius or less, or even 100 degrees Celsius or less. The thermoplastic material may be embedded with one or more other materials, in particular for allowing the melting to be focused to the thermoplastic material. Suitable material for this purpose, in particular, can be electrically conductive material for facilitating the melting of the thermoplastic material, for example by inductive heating. The thermoplastic material may be provided as a film, or pieces thereof, having thickness of less than 5 millimeters (before the melting), for example 50-1500 microns. After the melting, the thickness may similarly be still remain less than 5 millimeters, for example less than 2 millimeters. The thermoplastic material may be treated with meltable adhesive, such as EVA (ethyl vinyl acetate) glue, for initially (before the melting) attaching it to the backing.

[0049] The different functions discussed herein may be performed in a different order and/or concurrently with each other.

[0050] Any range or device value given herein may be extended or altered without losing the effect sought, unless indicated otherwise. Also any example may be combined with another example unless explicitly disallowed.

[0051] Although the subject matter has been described in language specific to structural features and/or acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as examples of implementing the claims and other equivalent features and acts are intended to be within the scope of the claims.

[0052] It will be understood that the benefits and advantages described above may relate to one embodiment or may relate to several embodiments. The embodiments are not limited to those that solve any or all of the stated problems or those that have any or all of the stated benefits and advantages. It will further be understood that reference to 'an' item may refer to one or more of those items.

[0053] The term 'comprising' is used herein to mean including the method, blocks or elements identified, but that such blocks or elements do not comprise an exclusive list and a method or apparatus may contain additional blocks or elements.

[0054] Numerical descriptors such as 'first', 'second', and the like are used in this text simply as a way of differentiating between parts that otherwise have similar names. The numerical descriptors are not to be construed as indicating any particular order, such as an order of preference, manufacture, or occurrence in any particular structure.

[0055] Expressions such as 'plurality' are in this text to

indicate that the entities referred thereby are in plural, i.e. the number of the entities is two or more.

[0056] Although the invention has been described in conjunction with a certain type of apparatus and/or method, it should be understood that the invention is not limited to any certain type of apparatus and/or method. While the present inventions have been described in connection with a number of examples, embodiments and implementations, the present inventions are not so limited, but rather cover various modifications, and equivalent arrangements, which fall within the purview of the claims. Although various examples have been described above with a certain degree of particularity, or with reference to one or more individual embodiments, those skilled in the art could make numerous alterations to the disclosed examples without departing from the scope of this specification.

Claims

1. A method for manufacturing artificial turf, the method comprising:

- tufting two or more rows of artificial grass fibers through thermoplastic material to a backing of the artificial turf; and
- melting the thermoplastic material to bond the two or more rows of artificial grass fibers to the backing;

wherein the thermoplastic material is arranged to form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers.

2. The method according to claim 1, wherein the thermoplastic material consists of a single piece of thermoplastic material which is partitioned after the tufting to form the rows of thermoplastic material.

3. The method according to claim 1, wherein the thermoplastic material consists of two or more pieces of thermoplastic material spaced from each other before the tufting to form the rows of thermoplastic material.

4. The method according to claim 1, wherein the thermoplastic material consists of a single piece of thermoplastic material comprising one or more weakenings to form the rows of thermoplastic material upon the melting of the thermoplastic material.

5. The method according to any of the preceding claims, wherein the thermoplastic material is embedded with electrically conductive material for facilitating the melting of the thermoplastic material.

6. The method according to any of the preceding claims, wherein the thermoplastic material is of the same material as the artificial grass fibers and/or the backing.

7. The method according to any of the preceding claims, wherein the thermoplastic material is polyolefin or polyester.

8. The method according to any of the preceding claims, wherein the thermoplastic material is polyethylene or polypropylene.

9. The method according to any of the preceding claims, wherein the thermoplastic material has a melting point of 60-180 degrees Celsius, more preferably 60-150 degrees Celsius, most preferably 70-100 degrees Celsius.

10. Artificial turf comprising:

- a backing;
- two or more pieces of thermoplastic material;
- two or more rows of artificial grass fibers tufted to the backing through the two or more pieces of thermoplastic material;

wherein the two or more pieces of thermoplastic material form rows of thermoplastic material corresponding to the two or more rows of artificial grass fibers bonding the two or more rows of artificial grass fibers to the backing.

11. The artificial turf according to claim 10, wherein the thermoplastic material is embedded with electrically conductive material for facilitating melting of the thermoplastic material.

12. The artificial turf according to any of claims 10 and 11, wherein the thermoplastic material is of the same material as the artificial grass fibers and/or the backing.

13. The artificial turf according to any of claims 10-12, wherein the thermoplastic material is polyolefin or polyester.

14. The artificial turf according to any of claims 10-13, wherein the thermoplastic material is polyethylene or polypropylene.

15. The artificial turf according to any of claims 10-14, wherein the thermoplastic material has a melting point of 60-180 degrees Celsius, more preferably 60-150 degrees Celsius, most preferably 70-100 degrees Celsius.

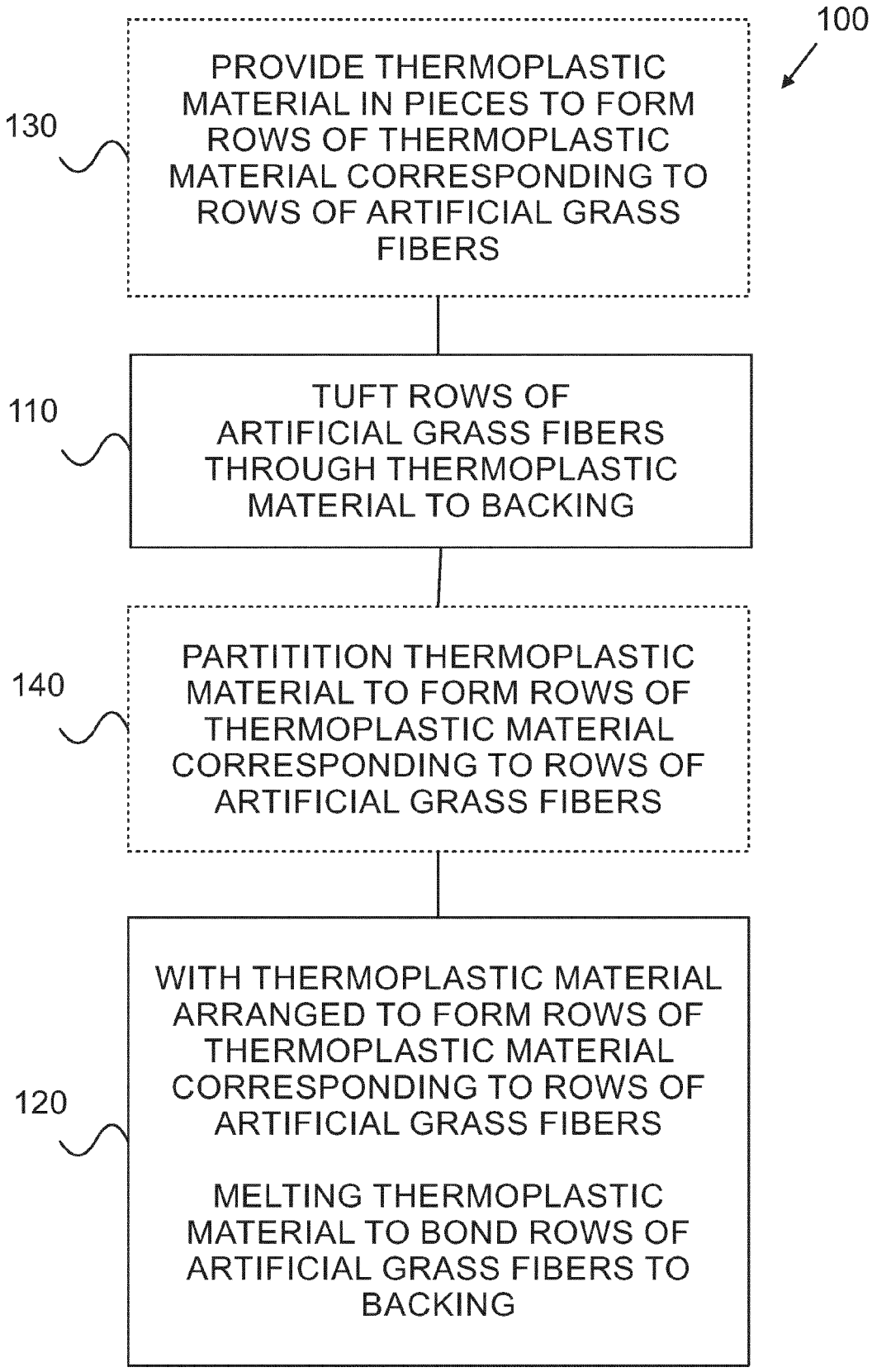
100
130
PROVIDE THERMOPLASTIC MATERIAL IN PIECES TO FORM ROWS OF THERMOPLASTIC MATERIAL CORRESPONDING TO ROWS OF ARTIFICIAL GRASS FIBERS
110
TUFT ROWS OF ARTIFICIAL GRASS FIBERS THROUGH THERMOPLASTIC MATERIAL TO BACKING
140
PARTITITION THERMOPLASTIC MATERIAL TO FORM ROWS OF THERMOPLASTIC MATERIAL CORRESPONDING TO ROWS OF ARTIFICIAL GRASS FIBERS
120
WITH THERMOPLASTIC MATERIAL ARRANGED TO FORM ROWS OF THERMOPLASTIC MATERIAL CORRESPONDING TO ROWS OF ARTIFICIAL GRASS FIBERS
MELTING THERMOPLASTIC MATERIAL TO BOND ROWS OF ARTIFICIAL GRASS FIBERS TO BACKING

FIG. 1

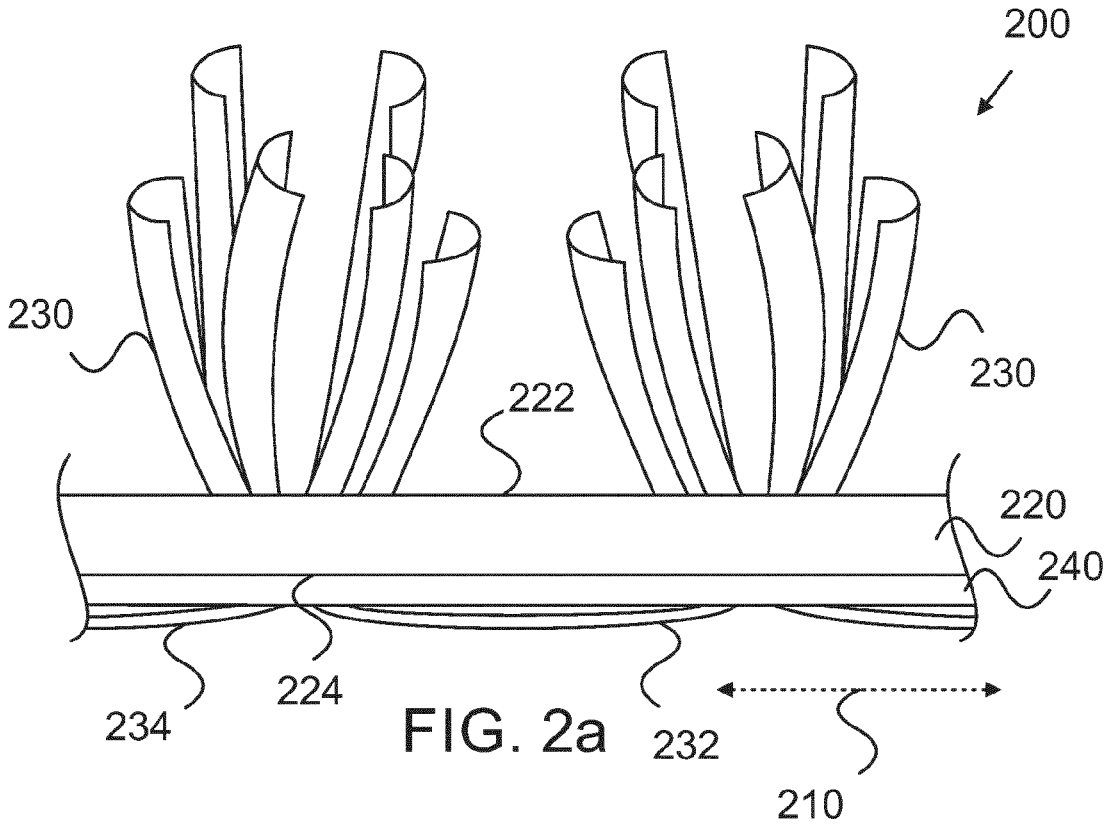
200
230
222
230
220
240
234
224
232
210

FIG. 2a

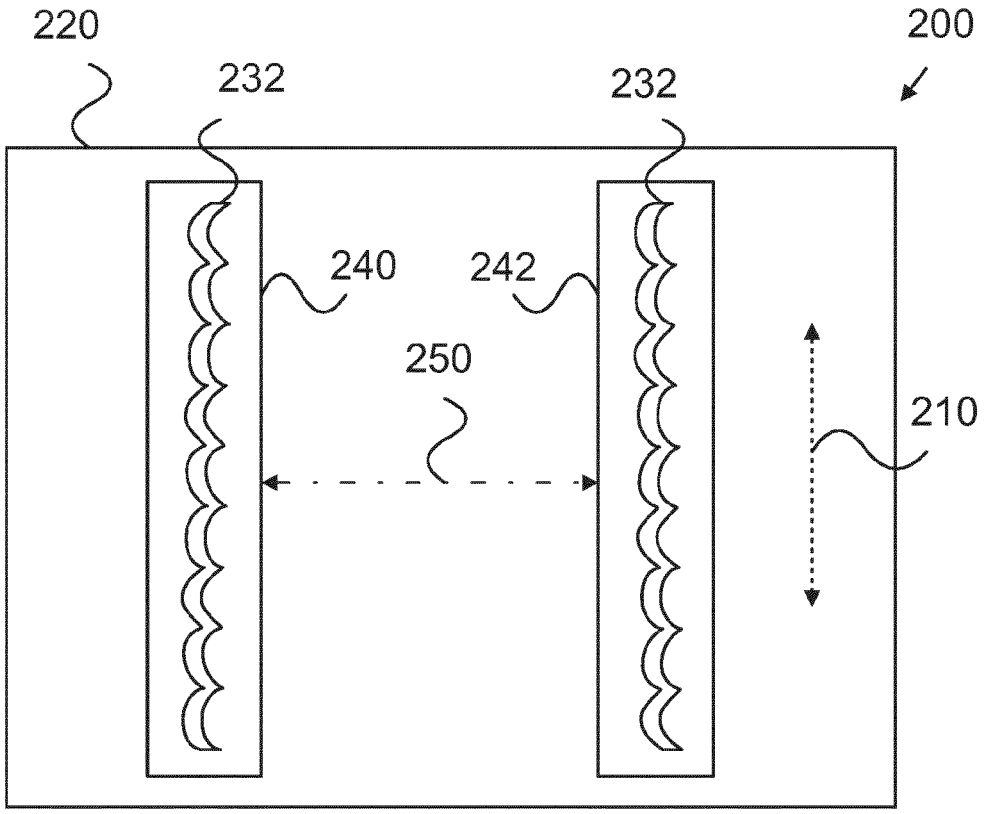
220
232
232
200
240
242
250
210

FIG. 2b

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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 1332

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 2021/292953 A1 (PAYNE BARCLAY [US] ET AL) 23 September 2021 (2021-09-23) * claim 1 * * figures 3-4 * * claim 11 * * claim 13 * * paragraphs [0048] - [0050] * * paragraph [0046] * * claims 2,4 *	1-4,6-8, 10,12-15 15	INV. D06N7/00 E01C13/08
X Y	JP 2004 143637 A (DIATEX KK) 20 May 2004 (2004-05-20) * claim 8 * * claims 9-10 * * claim 4 *	1,9 15	
X	WO 2006/019491 A2 (BARRIER BAC INC [US]) 23 February 2006 (2006-02-23) * page 2, lines 8-15 * * figures 1-4 * * page 6, line 4 - page 9, line 10 * * page 6, line 7 * * page 6, lines 15-18 * * page 7, lines 7-10 * * claim 7 * * page 7, line 13 - page 8, line 2 * * page 7, lines 1-8 *	1,10	TECHNICAL FIELDS SEARCHED (IPC) D06N E01C
X	EP 0 260 872 A2 (AVCO SYNTHETIC TURF PRODUCTION [US]) 23 March 1988 (1988-03-23) * claims 1,9 * * column 2, lines 34-45 * * column 4, lines 18-32 * * figures 1-2 * * column 6, lines 5-24 * * column 4, lines 39-55 *	1,5,10, 11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 April 2024	Beyazit, Selim

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 20 1332

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-04-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82