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(54) **PREFABRICATED ROLLABLE ARTIFICIAL GRASS SURFACE AND METHOD OF LAYING**

(57) A prefabricated rollable artificial grass surface comprising a turf sheet (1) and a plurality of ribbons (3), representing blades of grass, wherein said plurality of ribbons (3) are arranged on a first side (6a) of the turf sheet (1), characterized in that the prefabricated rollable artificial grass surface further comprises a thermal regu-

lating means in the form of a channel system (2) on a second side (6b) of the turf sheet, wherein said second side (6b) is opposite to said first side (6a) of the turf sheet (1). This prefabricated rollable artificial grass surface provides a simplified solution for the laying of artificial grass surfaces with thermal regulating means.

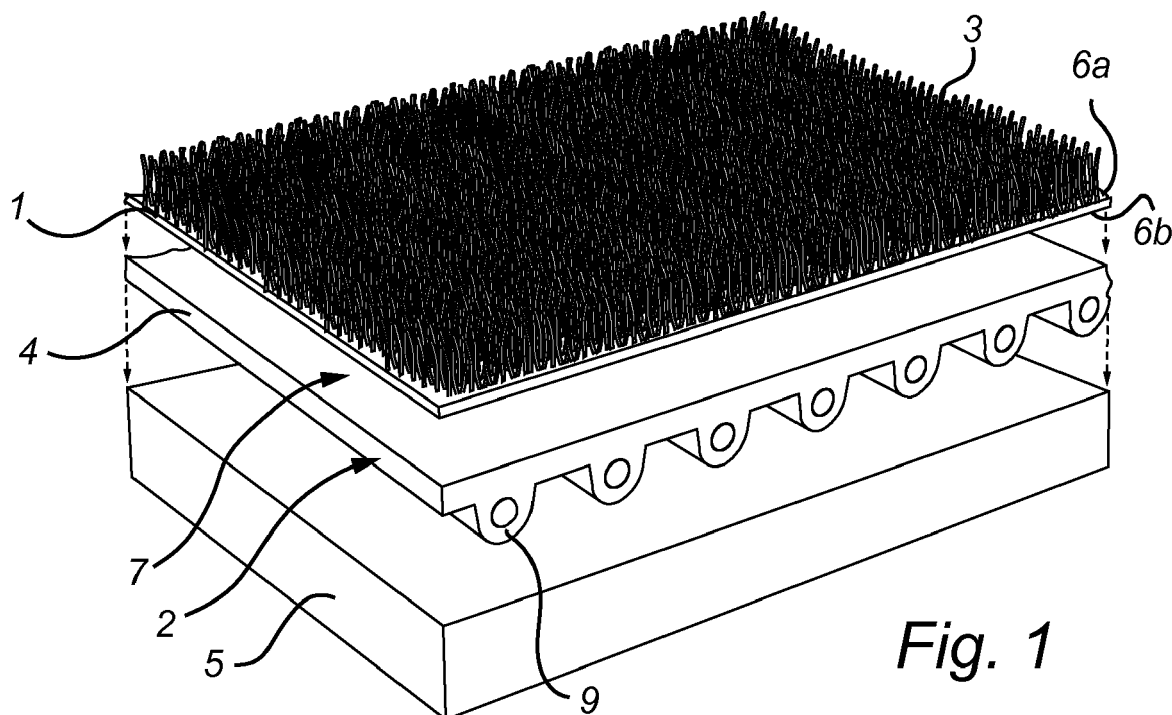


Fig. 1

Description

Technical field of the invention

[0001] The invention relates to artificial grass surfaces. More precisely, the invention relates to artificial grass surfaces with thermal regulating means.

Background of the invention

[0002] Artificial grass surfaces are widely used for football pitches and other recreational grass surfaces. In order to increase the utilization of the pitch heating can be required to prevent snow accumulation and, for pitches situated in warmer climate, cooling of the pitch can also be of interest. For these reasons, thermal regulating means are used in combination with artificial grass surfaces.

[0003] WO 03/025288 describes an artificial grass surface including widely spaced rows of ribbons projecting from a flexible backing sheet arranged on the ground. Thermal regulating means are attached to the backing sheet in the spaces between the rows of ribbons. A relatively thick infill layer is disposed on the top of the backing sheet, thereby burying the thermal regulating means and holding the ribbons upright. The infill layer may include a growing medium for plant growth. In one embodiment, electric cables are integrated into the artificial grass surface in order to heat the surface for de-icing or to maintain plant root warmth. In another embodiment, perforated flexible pipes are integrated into the artificial grass surface to moisten the surface, thereby cooling the surface when the moisture evaporates.

[0004] A problem with existing artificial grass surfaces with thermal regulation require extensive preparation work in the process of laying the artificial grass surface on a pitch.

Summary of the invention

[0005] It is an object of the present invention to provide an improved and simplified solution for the laying of artificial grass surfaces with thermal regulating means.

[0006] According to a first aspect of the invention, this and other objects are achieved by a prefabricated rollable artificial grass surface comprising a turf sheet and a plurality of ribbons, representing straws of grass, wherein the plurality of ribbons are arranged on a first side of the turf sheet, characterized in that the prefabricated rollable artificial grass surface further comprises a thermal regulating means in the form of a channel system on a second side of the turf sheet, wherein the second side is opposite to the first side of the turf sheet.

[0007] "Prefabricated" here means that the thermal regulating means are attached to or integrated with the turf sheet already in the manufacturing process of the artificial grass surface. Such prefabrication enables simplified application of artificial grass surface. Application

of the prefabricated rollable artificial grass surface according to the invention simply requires rolling out the grass surface with integrated thermal regulating means onto the pitch, thereby avoiding separate arrangement of a channel system to an artificial turf.

[0008] The channel system of the prefabricated rollable artificial grass surface may be formed in one piece. Furthermore, the channel system may be woven onto the turf sheet or alternatively be glued onto the turf sheet. The channel system and the turf sheet may also be formed in one piece as a single layer.

[0009] According to an embodiment of the invention, the channel system comprises a first set of parallel flexible tubes along the length of the prefabricated rollable artificial grass surface. This is a simple form of channel system, which is easy to manufacture, e.g. by extrusion.

[0010] The channel system may further comprise a second set of parallel flexible tubes along the width of the prefabricated rollable artificial grass surface, wherein the second set of parallel flexible tubes connects the first set of parallel flexible tubes. Such transversal tubes may serve to equalize pressure in the system, and serve to improve flow through the system.

[0011] According to another embodiment of the invention, the channel system comprises a meander shaped flexible tube along the length of the prefabricated rollable artificial grass surface. This embodiment enables for cutting of the prefabricated rollable artificial grass surface where the tube tangent the side of the prefabricated rollable artificial grass surface without cutting the tube itself, then turning the continuation of the prefabricated rollable artificial grass surface around this side to let the tube continue through the next strip. Alternatively, main tubes along one side or two opposite sides of the laid artificial grass surface can be used to connect the tubes of the strips of prefabricated rollable artificial grass surface.

[0012] The prefabricated rollable artificial grass surface may further comprise a supporting base of elastic material on the second side of the turf sheet. The supporting base of elastic material may be sandwiched between the turf sheet and the channel system, or alternatively the channel system may be sandwiched between the turf sheet and the supporting base.

[0013] Using a supporting base of elastic material in the prefabricated rollable artificial grass surface helps achieving a desired firmness of the pitch without requiring additional preparation work on the ground. It also helps protecting the channel system, which can be placed in cut-outs in the supporting base and thus not be exposed to excessive forces from the load on the laid artificial grass surface.

[0014] According to another aspect of the invention, there is provided a method of laying an artificial grass surface, the method comprising the steps of: providing a prefabricated rollable artificial grass surface according to the first aspect of the invention, arranging strips of the prefabricated rollable artificial grass surface along each other so as to cover said area, and connecting channel

systems of each section so as to form one aggregate channel system for the entire area.

[0015] The connection of channel systems may be accomplished by connecting main tubes to a set of parallel flexible tubes of each strip of the artificial grass surface.

[0016] If the channel system includes a meander shaped tube, the connection can include separating a section of the meander shaped tube from the channel system, and orienting a subsequent strip next to a preceding strip so that said section bridges the channel systems of each strip.

[0017] It is noted that the invention relates to all possible combinations of features in the claims.

Brief description of the drawings

[0018] The present invention will be described in more detail with reference to the appended drawings, showing currently preferred embodiments of the invention.

Fig. 1 is a partially exploded perspective view of a cross section of the prefabricated rollable artificial surface according to an embodiment of the invention.

Fig. 2 is a cross section of the prefabricated rollable artificial surface according to another embodiment of the invention.

Fig. 3 is a cross section of the prefabricated rollable artificial surface according to yet another embodiment of the invention.

Fig. 4 is a schematic view of covering an area with a prefabricated rollable artificial surface according to an embodiment of the invention.

Fig. 5a - 5b is a schematic view of covering an area with a prefabricated rollable artificial surface according to another embodiment of the invention.

Fig. 6 schematically illustrates manufacturing of a prefabricated artificial surface according to an embodiment of the invention.

[0019] As illustrated in the figures, the sizes of layers and regions may be exaggerated for illustrative purposes and, thus, may be provided to illustrate the general structures of embodiments of the present invention. Like reference numerals refer to like elements throughout.

Detailed description of the invention

[0020] Fig. 1 shows a prefabricated rollable artificial grass surface according to an embodiment of the invention. The prefabricated rollable artificial grass surface according to this embodiment includes an artificial grass layer 7, including a turf sheet 1, with a plurality of ribbons 3 extending from a first side 6a of the turf sheet 1. The first side 6 of the turf sheet 1 is to be interpreted as the side facing up when the artificial grass surface is laid. On a second side 6b of the turf sheet 1, opposite to the first side 6a and consequently also the side facing down when the artificial grass surface is laid, is provided a channel

system 2, here including a base layer 4 and a set of flexible tubes 9. It is noted that the channel system 2 alternatively be constructed as a web of tubes 9 without a joining base layer or as individual tubes separated from each other.

[0021] The turf sheet 1 is suitably made out of a material that can withstand the force and wear that is to be asserted on the artificial grass surface, for instance from maintenance vehicles and studded shoes, and should furthermore be proof to any ultraviolet light and suited to withstand any temperatures that occur in the local environment. An example of a material that can be used for the turf sheet 1 is polypropylene fabric, and the fabric may further be woven or needle punched to provide good drainage. However, any flexible material that allows for rolling up and rolling out the prefabricated rollable artificial grass surface can be used according to the invention. For instance, ethylene propylene diene monomer rubber or polyvinyl chloride are examples of other materials that can be used.

[0022] The ribbons 3 are made from any material that provides suitable softness and abrasion resistance to the ribbons 3, such as for instance, but not limited to, polyethylene or polypropylene. The ends of the ribbons 3 might interweave each other and might be fibrillated, split or frayed to further simulate the appearance of natural grass. The artificial grass layer 7 can for example be a conventional artificial grass surface, such as FieldTurf® 360 XL 42-13.

[0023] The channel system 2 can for instance be made out of a polymer material that withstands the use of water with ethylene glycol, propylene glycol or chlorine. The channel system 2 should also be able to withstand the use of a solution of salt and water, such as for instance brine. The tubes of the channel system 2 should be flexible in order to enable for it to hold for the process of rolling up and rolling out the prefabricated rollable artificial grass surface. Another benefit of having flexible tubes in the tube channel system 2 is that it reduces the risk of frost weathering in the channel system 2.

[0024] In one example, the channel system is extruded, in which case the tubes preferably extend in the longitudinal direction of the surface (i.e. along its length). Other examples include more complicated channel systems, e.g. including also tubes extending across the surface, connecting the longitudinal tubes. According to one embodiment, the channel system 2 is of the type used for solar heating of pool water.

[0025] The channel system 2 is attached to the artificial grass layer 7 by appropriate means, e.g. adhesive, welding, stitching, etc. As one example, the ribbons 3 are used to stitch the turf sheet 1 to the base layer 4 of the channel system 2.

[0026] The prefabricated rollable artificial grass surface is laid on the ground 5, where the ground might additionally be prepared with an isolating layer in order to improve the thermal regulation in the prefabricated rollable artificial grass surface. Alternatively, an isolating

layer can be attached directly to the prefabricated rollable artificial grass surface in the fabrication process to further simplify the laying of artificial grass surface.

[0027] After laying the prefabricated rollable artificial grass surface on the pitch, there might be provided an additional infill layer of particulate material upon the turf sheet 1. Such an infill layer might for instance consist of sand granules, resilient rubber granules or a mixture thereof. The particulate material used should in this case also provide sufficient heat dissipating for enabling the channel system 2 to thermally regulate the surface of the pitch.

[0028] In Fig. 2 an embodiment is shown where a supporting base 8 is glued to the second side 6b of the turf sheet 1 and the channel system 2 is glued to the side to be facing down of the supporting base 8. The channel system 2 is here attached beneath the supporting base, however the channel system 2 can alternatively lie within the supporting base 8 or be integrated directly into the turf sheet 1 to form a single layer, with or without an underlying supporting base 8. Fig. 3 shows an alternative embodiment where the channel system 2 is attached (e.g. glued) directly to the turf sheet 1, while the supporting base is attached (e.g. glued) to the other side of the channel system 2. It should be noted that any means of attaching the layers of the prefabricated rollable artificial grass surface can be used according to the invention.

[0029] Referring to both Fig. 2 and Fig. 3, the supporting base 8 preferably has cut-outs for receiving the tubes of the channel system 2 when attaching the supporting base 8 and the channel system 2 to each other. The material for the supporting base 8 can be chosen from a wide variety of elastic materials, however it is advantageous to use a material that can hold at least for the life span of the turf sheet 1. The thickness of the supporting base 8 can be chosen based on the estimated load on the artificial grass surface to be able to properly protect the channel system 2, typically between 8 and 40 mm. Referring to Fig 3, the material of the supporting base 8 should be of sufficient heat conduction for the channel system 2 to be able to regulate the temperature of the turf sheet 1.

[0030] Fig. 4 shows a schematic view of one example of covering an area with strips 10 of a prefabricated rollable artificial grass surface according to an embodiment of the invention. The contours of the strips 10 are here indicated by dashed lines. The prefabricated rollable artificial grass surface here comprises a first set of parallel flexible tubes 12 along the length of the strip 10 and a second set of parallel flexible tubes 11 along the width of the strip.

[0031] When the strips have been arranged on the area to be covered by artificial grass, the open ends of the tubes 12 are connected by main tubes 13 extending along the ends of the strips 10.

[0032] The illustration shows an embodiment where the second set of parallel flexible tubes 12 has two parallel tubes connecting the first set of parallel tubes, how-

ever both the first set of parallel flexible tubes 11 and the second set of parallel flexible tubes 12 might comprise any plurality of parallel tubes according to the invention.

[0033] Fig. 5a - 5b show a schematic view of a further example of covering an area with strips 10 of a prefabricated rollable artificial grass surface according to an embodiment of the invention. The prefabricated surface here has a channel system comprising a meander shaped flexible tube 14 extending back and forth across the artificial grass surface. In this embodiment, the roll is again cut into strips 10a 10b. However, in this case, a section 15 forming a bend of the meander shaped tube 14 is separated from the channel system and left intact. This allows a subsequent strip 10a to be oriented next to a preceding strip 10b with the section 15 bridging the channel systems of each strip 10a, 10b.

[0034] Alternatively, main tubes along one side or two opposite sides of the laid artificial grass surface pitch can be used to connect the tubes of the strips of prefabricated rollable artificial grass surface, similar to the main tubes 13 shown in Fig. 4.

[0035] Referring to Fig. 4 and 5, the distance between the parallel tubes depends on what power is needed from the thermal regulating means, the dimensions of the channel system and the depth at which the channel system lies. Normally, the distance between the parallel tubes is between 150 and 250 mm.

[0036] Fig. 6 illustrates a way of producing a prefabricated rollable artificial grass surface according to one embodiment of the invention. A turf sheet 1 is here attached to a channel system 2 to form one integrated piece using two roller. The layers may be welded, glued, or attached by any other means. In the illustrated case, the ribbons 3 are already attached to the turf sheet 1. However, the ribbons of the turf sheet may also be attached after the rollers, and possibly used to stitch the turf sheet 1 to the channel system 2.

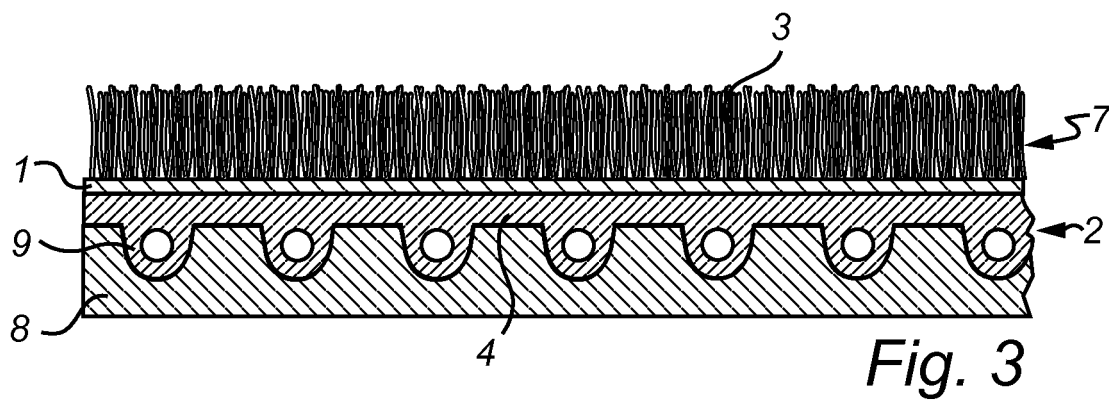
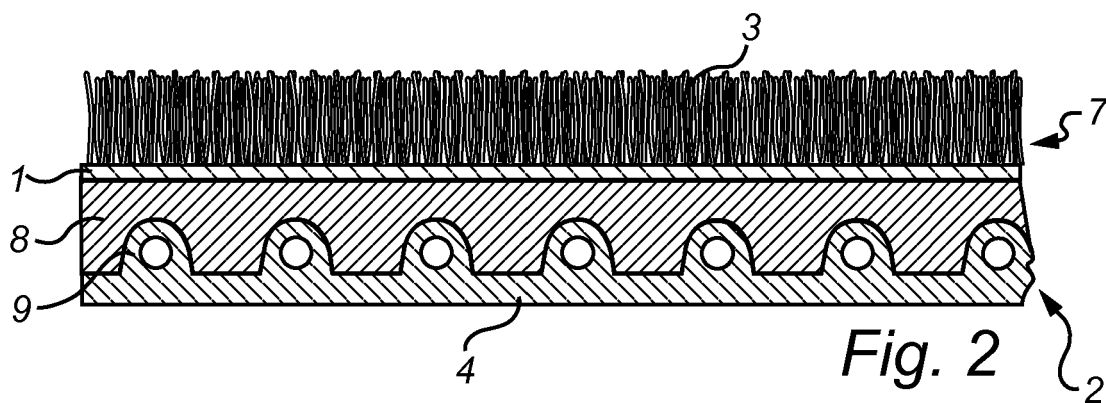
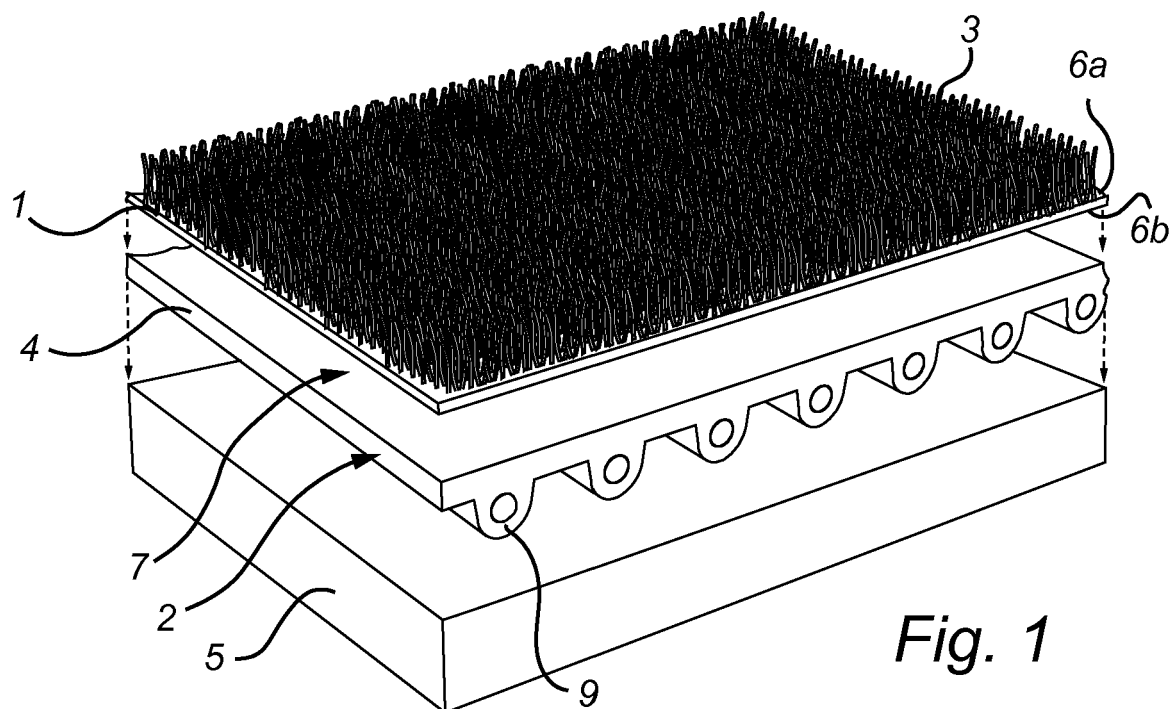
[0037] The person skilled in the art realizes that the present invention by no means is limited to the embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims. For example, the structure of the channel system may be designed in a number of different ways.

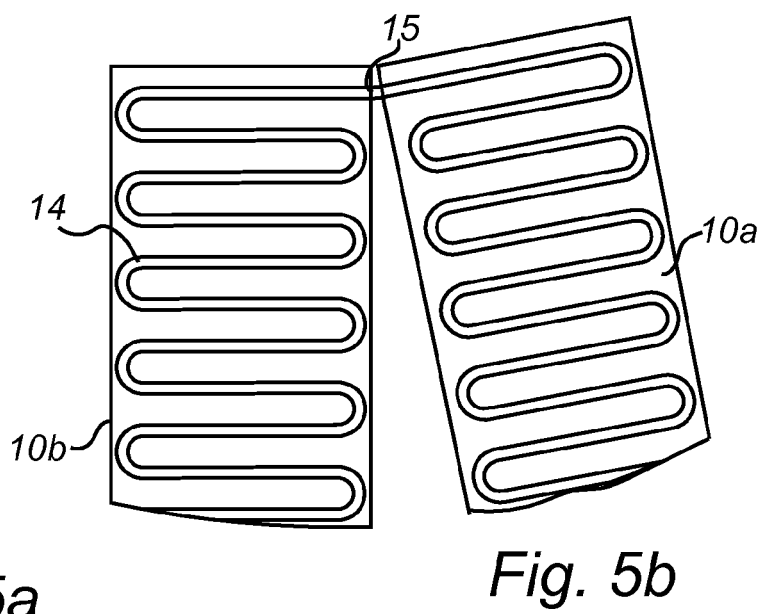
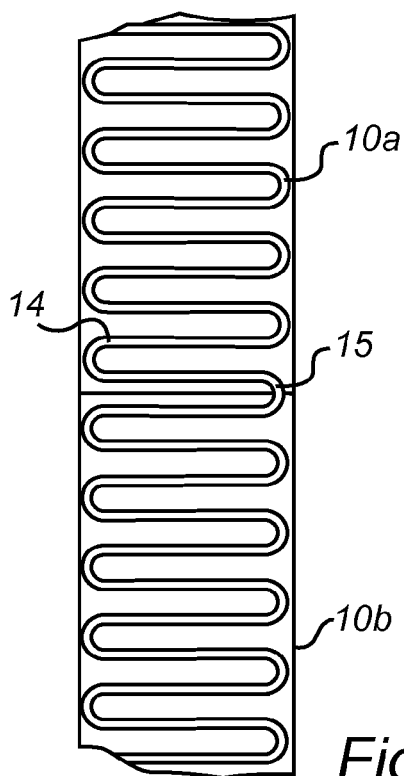
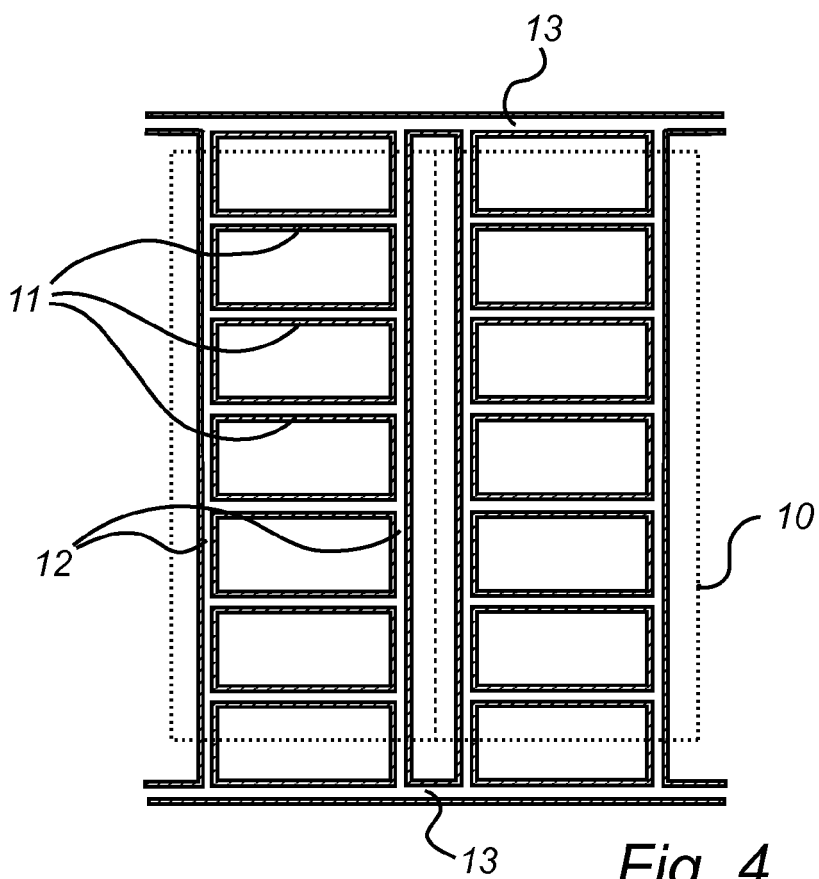
[0038] Additionally, variations to the disclosed embodiments can be understood and affected by the skilled person in practicing the claimed invention, from a study of the drawings, the disclosure and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality.

Claims

1. A prefabricated rollable artificial grass surface comprising a turf sheet (1) and a plurality of ribbons (3), representing blades of grass, wherein said plurality

- of ribbons (3) are arranged on a first side (6a) of the turf sheet (1), **characterized in that** the prefabricated rollable artificial grass surface further comprises a thermal regulating means in the form of a channel system (2) on a second side (6b) of the turf sheet (1), wherein said second side (6b) is opposite to said first side (6) of the turf sheet (1).
2. The prefabricated rollable artificial grass surface according to claim 1, wherein said channel system (2) is formed in one piece.
 3. The prefabricated rollable artificial grass surface according to claim 2, wherein the channel system (2) is extruded.
 4. The prefabricated rollable artificial grass surface according to any of the preceding claims, wherein said channel (2) system is woven to said turf sheet (1) by the ribbons (3).
 5. The prefabricated rollable artificial grass surface according to any of the preceding claims, wherein said channel system (2) is glued to said turf sheet (1).
 6. The prefabricated rollable artificial grass surface according to any of the preceding claims, wherein the channel system (2) comprises:
 - a first set of parallel flexible tubes (11) along the length of the prefabricated rollable artificial grass surface.
 7. The prefabricated rollable artificial grass surface according to claim 6, further comprising a second set of parallel flexible tubes (12) along the width of the prefabricated rollable artificial grass surface, wherein the second set of parallel flexible tubes (12) connects the first set of parallel flexible tubes (11).
 8. The prefabricated rollable artificial grass surface according to any of claims 1-5, wherein the channel system (2) comprises a meander shaped flexible tube (14) along the length of the prefabricated rollable artificial grass surface.
 9. The prefabricated rollable artificial grass surface according to any of the preceding claims, further comprising a supporting base (8) of elastic material on the second side (6b) of said turf sheet (1).
 10. The prefabricated rollable artificial grass surface according to claim 8, wherein said supporting base (8) of elastic material is sandwiched between said turf sheet (1) and said channel system (2).
 11. The prefabricated rollable artificial grass surface according to claim 8, wherein said channel system (2) is sandwiched between said turf sheet (1) and said supporting base (8).
 12. A method of laying an artificial grass surface on an area, the method comprising the steps of:
 - providing a prefabricated rollable artificial grass surface according to one of the preceding claims;
 - arranging strips (10; 10a, 10b) of said prefabricated rollable artificial grass surface along each other so as to cover said area; and
 - connecting channel systems of each strip so as to form one aggregate channel system for the entire area.
 13. The method according to claim 12, wherein the prefabricated rollable artificial grass surface is according to claim 6 or 7, and wherein the step of connecting channel systems comprises:
 - connecting main tubes (13) to the first set of parallel flexible tubes (12) of each strip (10) of the artificial grass surface.
 14. The method according to claim 12, wherein the prefabricated rollable artificial grass surface is according to claim 8, and wherein the step of connecting channel systems comprises:
 - separating a section (15) of the meander shaped tube (14) from the channel system; and
 - orienting a subsequent strip (10a) next to a preceding strip (10a) so that said section (15) bridges the channel systems of each strip (10a, 10b).





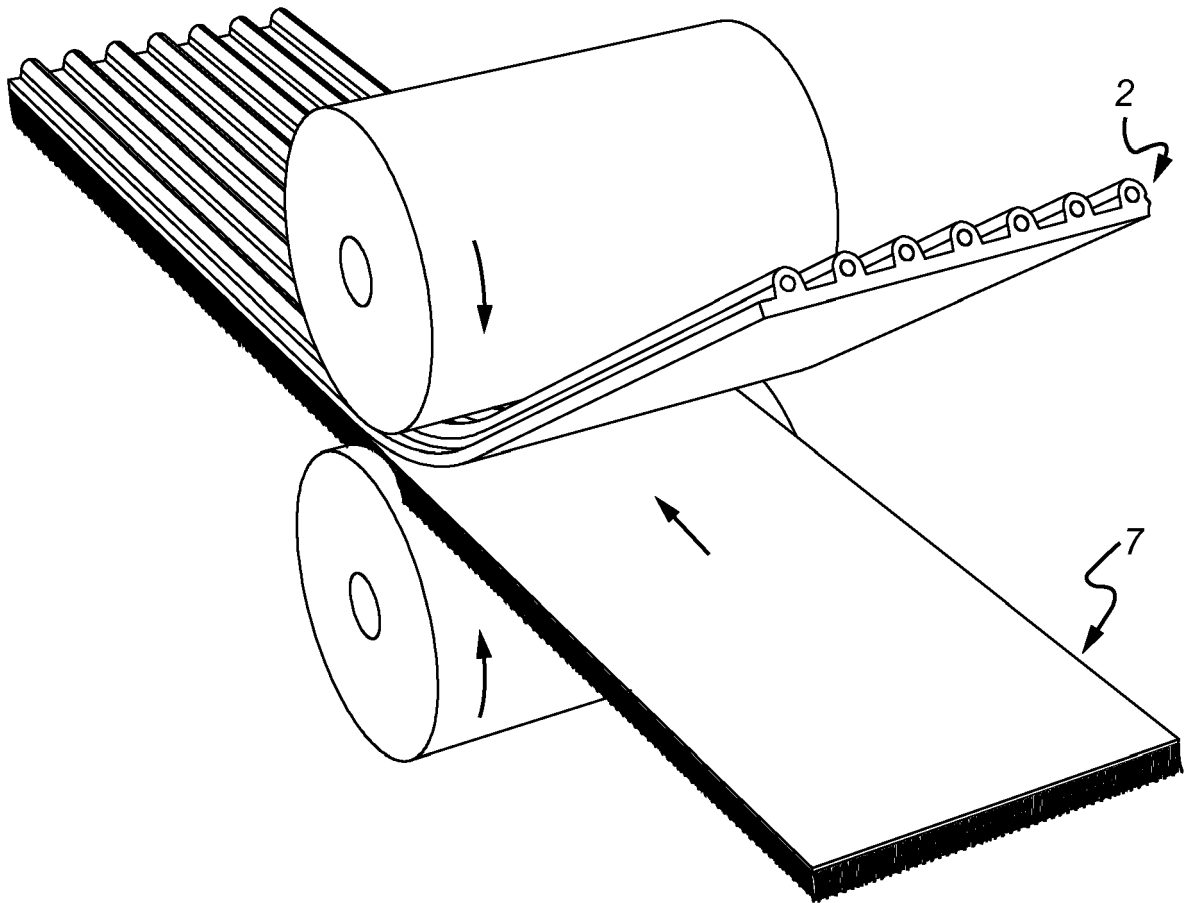


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 17 16 4775

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 September 2017	Examiner Movadat, Robin
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