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

(57) Provided is a method for manufacturing an artificial turf, comprising the following steps: (1) providing a base cloth; (2) providing artificial turf yarns; (3) tufting the artificial turf yarns on the base cloth, and applying an adhesive; and (4) blowing air to the base cloth having the adhesive applied to obtain an artificial turf. According to the manufactured artificial turf, when passing through an air blowing device, water permeable holes are formed in the bonding layer applied on the base cloth; the water seepage rate of the artificial turf is increased by means of water seepage through the water permeable holes; and moreover, there is no need to pierce the adhesive applied surface of the base cloth during production, thereby avoiding damage to the structure of the artificial turf by piercing, effectively preventing the artificial turf yarns from loosening and falling off, and prolonging the service life of the artificial turf.

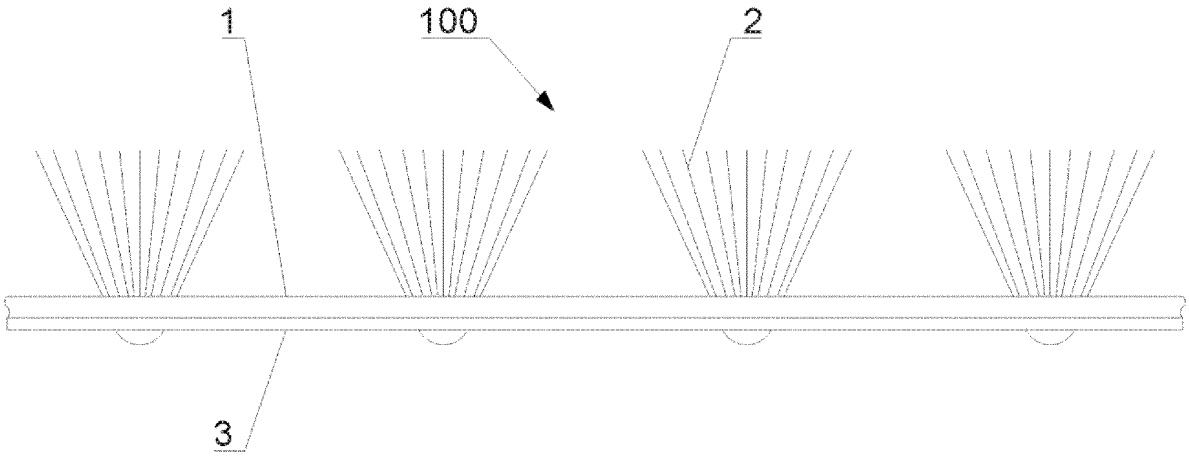

FIG. 1

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Description

Technical Field

[0001] The present invention relates to the technical field of artificial turf production, and in particular to a method for manufacturing an artificial turf.

Background

[0002] An artificial turf is widely used in various places such as sports venues, landscaping and home decoration because of exquisite and neat appearance, excellent performance, long service life, low maintenance cost and many other advantages thereof. The artificial turf can be divided into an injection-molded artificial turf and a woven artificial turf according to production processes. A method for producing an injection-molded artificial turf is to use an injection molding process to extrude plastic particles in a mold at one time, and use a bending technology to bend the turf, so that turf leaves are regularly arranged in an equidistant and equivalent manner, and the heights of the turf leaves are completely uniform. A method for producing a woven turf is to implant synthetic fibers that imitate turf leaves into a woven base cloth, and then apply a coating for fixing on the back, thereby forming an artificial turf. At present, most of the base cloths of commercially available woven artificial turfs are woven with flat warp and weft yarns, and the spacing between the warp and weft yarns is relatively small. Furthermore, the base cloth needs to be applied with an adhesive for fixing turf yarns. After the adhesive is cured, a sealed coating is formed, resulting in a low water seepage rate of the woven artificial turf, which affects the drainage performance of the artificial turf. In order to improve the water seepage rate, when manufacturers produce the woven artificial turf, a piercing device will be used to pierce the adhesive applied surface of the base cloth after the adhesive is cured. However, the piercing operation will damage the structure of the woven artificial turf, causing the artificial turf yarns near the pierced holes to loosen and fall off, which affects the appearance and service life of the woven artificial turf.

Summary of the invention

[0003] Based on the above, the present invention provides a method for manufacturing an artificial turf to solve the above-mentioned problems.

[0004] The technical solution adopted by the present invention to solve the technical problems is: Provided is a method for manufacturing an artificial turf, including the following steps:

(1) providing a base cloth;
(2) providing artificial turf yarns;
(3) implanting the artificial turf yarns in step (2) on the base cloth in step (1) by tufting, and applying an adhesive to the surface of the base cloth; and
(4) blowing air to the base cloth having the adhesive applied through an air blowing device to obtain an artificial turf after the adhesive is cured.

[0005] Further, the base cloth in step (1) includes warp yarns and weft yarns, and the warp yarns and the weft yarns are cross-woven with each other.

[0006] Further, the adhesive applying mode in step (4) is scraping or roller coating, and the air pressure blown out by the air blowing device is 1-4 MPa.

[0007] Further, the cross section of the warp yarn is a flat structure, the weft yarns include first yarns and second yarns, the cross section of the first yarn is a circular structure, the cross section of the second yarn is a flat structure, and the first yarns and the second yarns are interlaced.

[0008] Further, the cross section of the weft yarn is a flat structure, the warp yarns include first yarns and second yarns, the cross section of the first yarn is a circular structure, the cross section of the second yarn is a flat structure, and the first yarns and the second yarns are interlaced.

[0009] Further, a method for manufacturing the base cloth includes the following steps:
selecting warp yarns and weft yarns, placing the warp yarns and the weft yarns on a weaving machine for weaving, and performing shaping and coiling operations to obtain a base cloth.

[0010] Further, a method for manufacturing artificial turf yarns in step (2) includes the following steps: placing granules in a wire drawing machine, adding a drawing liquid to the wire drawing machine, controlling a drawing temperature and a retraction ratio, melting and extruding the granules through a wire drawing process, and performing drawing, shaping and coiling operations to obtain artificial turf yarns.

[0011] Further, the granule is any one or more of polyethylene, polypropylene, polyvinyl chloride and polyamide.

[0012] Further, the drawing temperature is 100-150°C.

[0013] Further, the retraction ratio is 0.90-0.98.

[0014] The present invention has the following beneficial effects:

According to the artificial turf manufactured by the manufacturing method of the present invention, the artificial turf yarns are tufted on the base cloth, and the adhesive is applied on the base cloth opposite to a side having the artificial turf yarns tufted. When passing through the air blowing device, permeable holes are formed in the bonding layer applied on the base cloth, and the water seepage rate of the artificial turf is increased by means of water seepage through the water permeable holes. By using the artificial turf manufactured by the present invention, there is no need to pierce the adhesive applied surface of the base cloth by a piercing device, thereby avoiding damage to the structure of the artificial turf by piercing, effectively preventing the artificial turf yarns from loosening and falling off, and prolonging the service life of the artificial turf.

Description of the Drawings

[0015] The present invention will be further described below in conjunction with the accompanying drawings and embodiments.

FIG. 1 is a schematic structural view of an artificial turf of the present invention;
FIG. 2 is a cross-sectional view of the artificial turf of the present invention shown in FIG. 1;
FIG. 3 is a top view of a base cloth in the artificial turf of the present invention shown in FIG. 1; and
FIG. 4 is a cross-sectional view of the base cloth shown in FIG. 3.

[0016] In the figures: 100. artificial turf, 1. base cloth, 11. warp yarn, 12. weft yarn, 121. first yarn, 122. second yarn, 13. pinhole, 14. water permeable hole, 2. artificial turf yarn, 3. bonding layer.

Detailed Description

[0017] The present invention will be described in detail with reference to the accompanying drawings. The figures are simplified schematic views which only illustrate the basic structure of the present invention in a schematic manner, and therefore only show the components related to the present invention.

[0018] As shown in FIG. 1, the present invention provides an artificial turf 100 for laying on the ground to beautify the environment. The artificial turf 100 includes a base cloth 1, artificial turf yarns 2 tufted on the base cloth 1, and a bonding layer 3 applied on the surface of the base cloth 1 for fixing the artificial turf yarns 2. The artificial turf yarns 2 are tufted on the base cloth 1 by a tufting machine. The bonding layer 3 is applied on the base cloth 1 opposite to a side where the artificial turf yarns 2 are implanted. One end of the artificial turf yarn 2 passes through the base cloth 1 and is in contact with the bonding layer 3.

[0019] As shown in FIG. 1, FIG. 3 and FIG. 4, the base cloth 1 includes a plurality of warp yarns 11 and a plurality of weft yarns 12 that are cross-woven with each other, and the warp yarns 11 and the weft yarns 12 are woven by a weaving machine and then interlaced with each other to form the base cloth 1. In this embodiment, the cross section of the warp yarn 11 is a flat structure, the plurality of warp yarns 11 are arranged parallel to each other, the spacing between every two warp yarns 11 is equal, the weft yarns 12 include first yarns 121 with a circular cross section and second yarns 122 with a flat cross section, the first yarns 121 and the second yarns 122 are interlaced in parallel, and the spacing between the first yarn 121 and the second yarn 122 is equal. In another embodiment, the cross section of the weft yarn 11 is a flat structure, the plurality of weft yarns 11 are arranged parallel to each other, the spacing between every two weft yarns 11 is equal, the warp yarns 12 include first yarns 121 with a circular cross section and second yarns 122 with a flat cross section, the first yarns 121 and the second yarns 122 are interlaced in parallel, and the spacing between the first yarn 121 and the second yarn 122 is equal.

[0020] As shown in FIG. 1 and FIG. 2, pinholes 13 for accommodating the artificial turf yarns 2 are formed in the base cloth 1. The artificial turf yarns 2 are tufted and inserted in the pinholes 13 by a tufting machine. One end of the artificial turf yarn 2 tufted in the base cloth 1 passes through the pinhole 13 to form a protrusion and is in contact with the bonding layer 3. The bonding layer 3 applied on the base cloth 1 partially penetrates into the pinhole 13 to fix the artificial turf yarns 2. After the bonding layer 3 is applied, air is blown to the base cloth 1 implanted with the artificial turf yarns 2 by means of the pinholes 13 through the air blowing device. Part of the adhesive in the pinholes 13 flows to the outside of the pinholes 13 under the drive of the airflow. Water permeable holes 14 for water seepage, which are in communication with the pinholes 13, are formed in the bonding layer 3 through the gas flowing out of the pinholes 13. The water seepage rate of the artificial turf 100 is increased by means of water seepage through the water permeable holes 14.

[0021] The material of the base cloth 1 and the artificial turf yarns 2 includes any one or more of polyethylene, polypropylene, polyvinyl chloride and polyamide.

[0022] The present invention further provides a method for manufacturing the artificial turf 100, including the following steps:

(1) Warp yarns 11 and weft yarns 12 are selected, the warp yarns 11 and the weft yarns 12 are placed on a weaving machine for weaving, and shaping and coiling operations are performed to obtain a base cloth 1.
(2) Granules are placed in a wire drawing machine, a drawing liquid is added to the wire drawing machine, a drawing temperature is controlled to be 100-150°C, a retraction ratio is controlled to be 0.90-0.98, wire drawing treatment is performed on the mixed granules through a wire drawing process, and winding, shaping and coiling operations are performed to obtain artificial turf yarns 2.
(3) The artificial turf yarns 2 manufactured in step (2) are tufted by a tufting machine and implanted on the base cloth 1 manufactured in step (1), a plurality of pinholes 13 are penetrated in the surface of the base cloth 1 by the tufting machine, an adhesive is applied on the surface of the base cloth 1 by means of scraping or roller coating, air is blown to the base cloth 1 having the adhesive applied through an air blowing device at the air pressure of 1-4 MPa, the airflow causes part of the adhesive in the pinholes 13 to flow to the outside of the pinholes 13 to form water permeable holes 14, a bonding layer 3 is formed after the adhesive is cured, and coiling and packaging operations are performed to obtain an artificial turf.

[0023] The granule is any one or more of polyethylene, polypropylene, polyvinyl chloride and polyamide.

Embodiment 1

[0024] A method for manufacturing an artificial turf in this embodiment includes the following steps:

(1) Warp yarns and weft yarns are selected, the warp yarns and the weft yarns are placed on a weaving machine for weaving, and shaping and coiling operations are performed to obtain a base cloth.
(2) Polyethylene granules are placed in a wire drawing machine, a drawing liquid is added to the wire drawing machine, a drawing temperature is controlled to be 100°C, a retraction ratio is controlled to be 0.90, wire drawing treatment is performed on the mixed granules through a wire drawing process, and winding, shaping and coiling operations are performed to obtain artificial turf yarns.
(3) The artificial turf yarns manufactured in step (2) are tufted by a tufting machine and implanted on the base cloth manufactured in step (1), an adhesive is applied on the surface of the base cloth, air is blown to the base cloth having the adhesive applied through an air blowing device at the air pressure of 1 MPa, and coiling and packaging operations are performed after the adhesive is cured to obtain an artificial turf.

Embodiment 2

[0025]

(1) Warp yarns and weft yarns are selected, the warp yarns and the weft yarns are placed on a weaving machine for weaving, and shaping and coiling operations are performed to obtain a base cloth.
(2) Polypropylene granules are placed in a wire drawing machine, a drawing liquid is added to the wire drawing machine, a drawing temperature is controlled to be 110°C, a retraction ratio is controlled to be 0.92, wire drawing treatment is performed on the mixed granules through a wire drawing process, and winding, shaping and coiling operations are performed to obtain artificial turf yarns.
(3) The artificial turf yarns manufactured in step (2) are tufted by a tufting machine and implanted on the base cloth manufactured in step (1), an adhesive is applied on the surface of the base cloth, air is blown to the base cloth having the adhesive applied through an air blowing device at the air pressure of 2 MPa, and coiling and packaging operations are performed after the adhesive is cured to obtain an artificial turf.

Embodiment 3

[0026]

(1) Warp yarns and weft yarns are selected, the warp yarns and the weft yarns are placed on a weaving machine for weaving, and shaping and coiling operations are performed to obtain a base cloth.
(2) Polyvinyl chloride granules are placed in a wire drawing machine, a drawing liquid is added to the wire drawing machine, a drawing temperature is controlled to be 120°C, a retraction ratio is controlled to be 0.94, wire drawing treatment is performed on the mixed granules through a wire drawing process, and winding, shaping and coiling

operations are performed to obtain artificial turf yarns.
(3) The artificial turf yarns manufactured in step (2) are tufted by a tufting machine and implanted on the base cloth manufactured in step (1), an adhesive is applied on the surface of the base cloth, air is blown to the base cloth having the adhesive applied through an air blowing device at the air pressure of 3 MPa, and coiling and packaging operations are performed after the adhesive is cured to obtain an artificial turf.

Embodiment 4

[0027]

(1) Warp yarns and weft yarns are selected, the warp yarns and the weft yarns are placed on a weaving machine for weaving, and shaping and coiling operations are performed to obtain a base cloth.
(2) Polyamide granules are placed in a wire drawing machine, a drawing liquid is added to the wire drawing machine, a drawing temperature is controlled to be 140°C, a retraction ratio is controlled to be 0.98, wire drawing treatment is performed on the mixed granules through a wire drawing process, and winding, shaping and coiling operations are performed to obtain artificial turf yarns.
(3) The artificial turf yarns manufactured in step (2) are tufted by a tufting machine and implanted on the base cloth manufactured in step (1), an adhesive is applied on the surface of the base cloth, air is blown to the base cloth having the adhesive applied through an air blowing device at the air pressure of 4 MPa, and coiling and packaging operations are performed after the adhesive is cured to obtain an artificial turf.

Comparative Example

Commercially available artificial turf.

Experimental example:

[0028] The water seepage rates of the artificial turf samples manufactured in Embodiments 1-4 and the commercially available artificial turf sample in Comparative Example are measured by a method for testing water permeability in GB/T20394-2006 "Artificial Turf for Sports". 500 mm×500 mm of a portion of the artificial turf samples manufactured in Embodiments 1-4 and a portion of the commercially available artificial turf sample in Comparative Example are taken. The artificial turf yarns facing upwards are placed in an experimental container, and the samples are flattened. 50 L of water is poured into the experimental container, and the time S when the water completely flows out is calculated (accurate to seconds). The water seepage rates of the samples are calculated by Formula $\eta=(50/S)/0.25\times60$. Specific results are shown in Table 1:

Table 1: Measuring table of water seepage rates of artificial turf samples in Embodiments 1-4 and Comparative Example

Item	Water seepage rate (L/(min • m^2))
Standard	60
Embodiment 1	246
Embodiment 2	238
Embodiment 3	242
Embodiment 4	247
Comparative Example	62

[0029] As can be seen from Table 1, the water seepage rate of the artificial turf samples in Embodiments 1-4 manufactured by the present invention is much greater than that of the commercially available artificial turf sample. This is because the cross section of the warp yarns 11 of the artificial turf 100 manufactured by the manufacturing method of the present invention has a flat structure, and the cross section of the first yarns in the weft yarns 12 has a circular structure. After the warp yarns 11 and the weft yarns 12 are woven by the weaving machine and interlaced with each other to form the base cloth 1, when the base cloth 1 having the adhesive applied passes through the air blowing device, the airflow blown out by the air blowing device blows out part of the adhesive in the pinholes 13 on the base cloth 1. The water permeable holes 14 which are in communication with the pinholes 13 are formed in the bonding layer 3 through

the airflow blown out by the pinholes 13. The water seepage rate of the artificial turf 100 is increased by means of water seepage through the water permeable holes 14. By using the artificial turf 100 manufactured by the present invention, there is no need to pierce the adhesive applied surface of the base cloth 1 by a piercing device, thereby avoiding damage to the structure of the artificial turf 100 by piercing, effectively preventing the artificial turf yarns 2 from loosening and falling off, and prolonging the service life of the artificial turf 100.

[0030] With the above-mentioned ideal embodiments of the present invention as inspiration, through the above-mentioned description content, the related staff can make various changes and modifications without departing from the scope of the present invention. The technical scope of the present invention is not limited to the content in the specification, and the technical scope thereof needs to be determined according to the scope of the claims.

Claims

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

   (1) providing a base cloth;
   (2) providing artificial turf yarns;
   (3) implanting the artificial turf yarns in step (2) on the base cloth in step (1) by tufting, and applying an adhesive to the surface of the base cloth; and
   (4) blowing air to the base cloth having the adhesive applied through an air blowing device to obtain an artificial turf after the adhesive is cured.

2. The method for manufacturing an artificial turf according to claim 1, wherein the base cloth in step (1) comprises warp yarns and weft yarns, and the warp yarns and the weft yarns are cross-woven with each other.

3. The method for manufacturing an artificial turf according to claim 1, wherein the adhesive applying mode in step (4) is scraping or roller coating, and the air pressure blown out by the air blowing device is 1-4 MPa.

4. The method for manufacturing an artificial turf according to claim 2, wherein the cross section of the warp yarn is a flat structure, the weft yarns comprise first yarns and second yarns, the cross section of the first yarn is a circular structure, the cross section of the second yarn is a flat structure, and the first yarns and the second yarns are interlaced.

5. The method for manufacturing an artificial turf according to claim 2, wherein the cross section of the weft yarn is a flat structure, the warp yarns comprise first yarns and second yarns, the cross section of the first yarn is a circular structure, the cross section of the second yarn is a flat structure, and the first yarns and the second yarns are interlaced.

6. The method for manufacturing an artificial turf according to claim 2, wherein a method for manufacturing the base cloth comprises the following steps:

   selecting warp yarns and weft yarns, placing the warp yarns and the weft yarns on a weaving machine for weaving, and performing shaping and coiling operations to obtain a base cloth.

7. The method for manufacturing an artificial turf according to claim 1, wherein a method for manufacturing artificial turf yarns in step (2) comprises the following steps:
   placing granules in a wire drawing machine, adding a drawing liquid to the wire drawing machine, controlling a drawing temperature and a retraction ratio, performing wire drawing treatment on the granules through a wire drawing process, and performing winding, shaping and winding operations to obtain artificial turf yarns.

8. The method for manufacturing an artificial turf according to claim 7, wherein the granule is any one or more of polyethylene, polypropylene, polyvinyl chloride and polyamide.

9. The method for manufacturing an artificial turf according to claim 7, wherein the drawing temperature is 100-150°C.

10. The method for manufacturing an artificial turf according to claim 7, wherein the retraction ratio is 0.90-0.98.

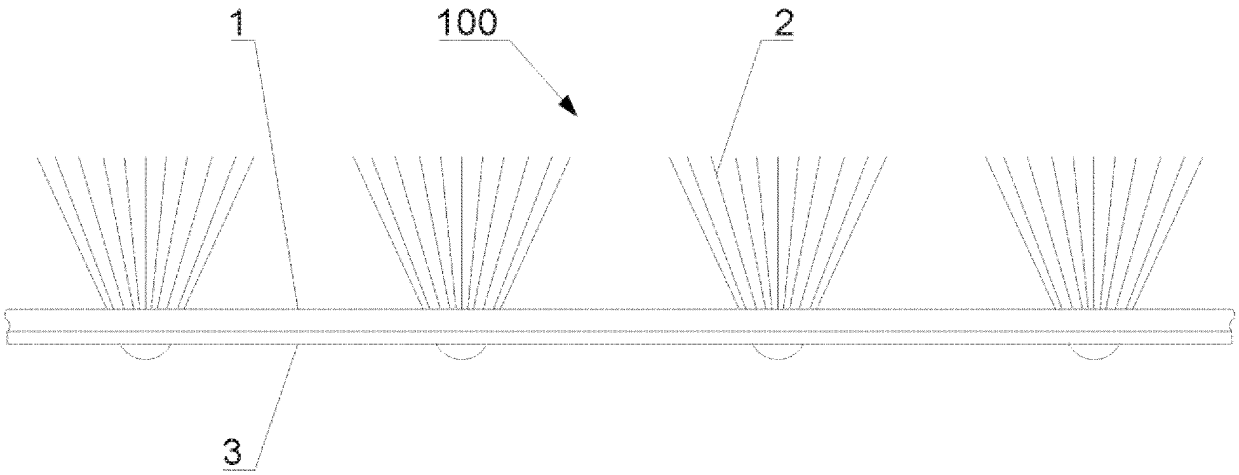

FIG. 1

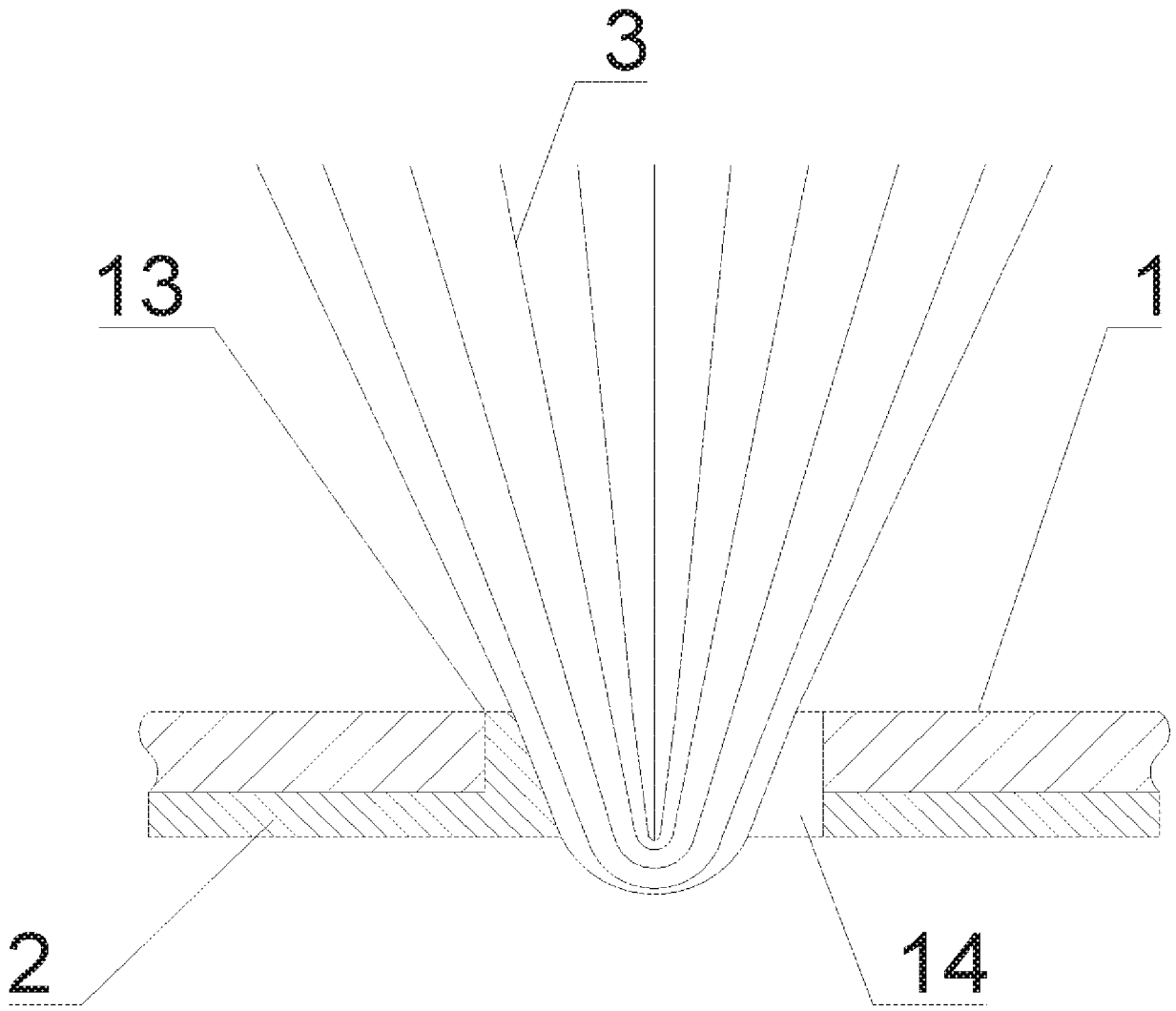

FIG. 2

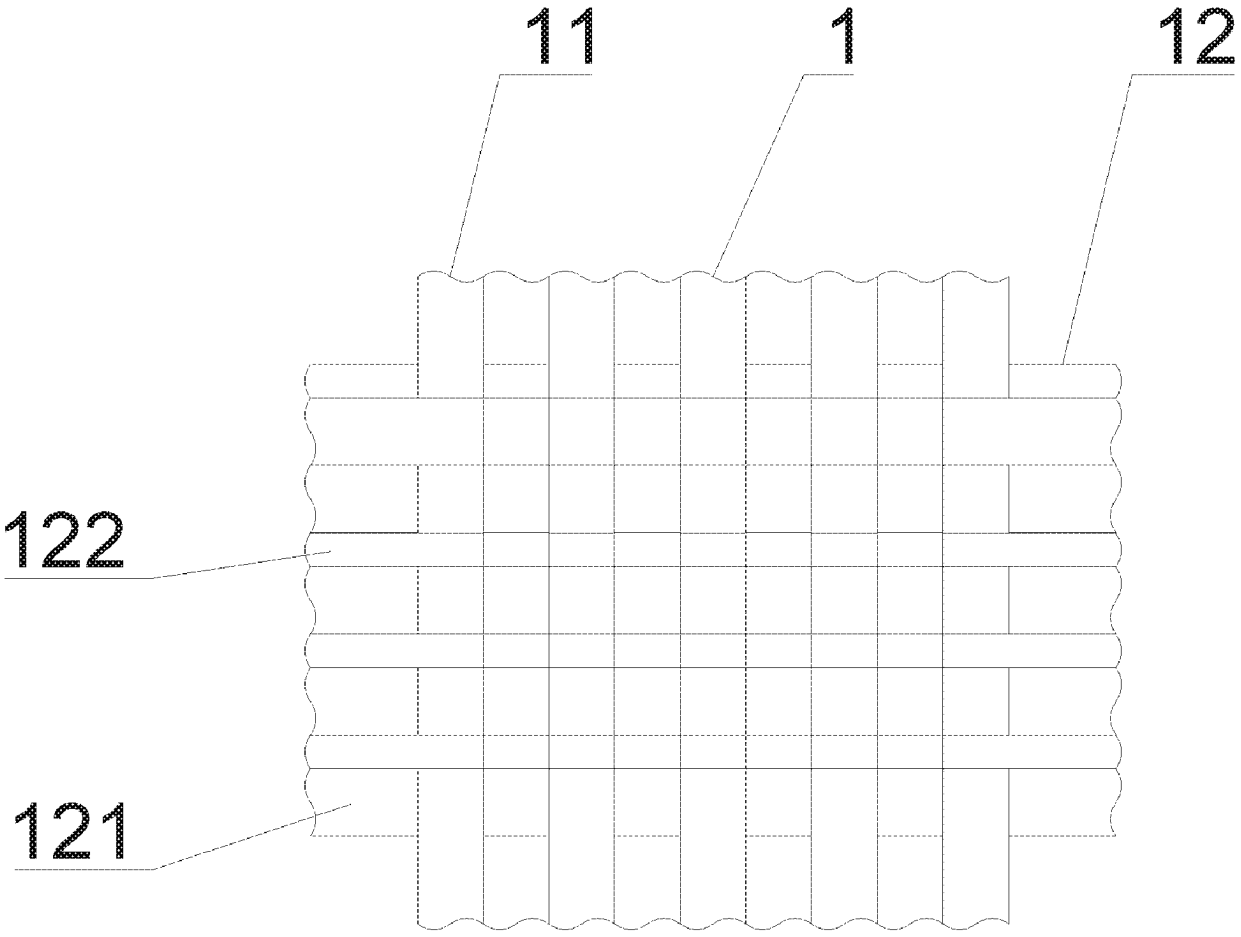

FIG. 3

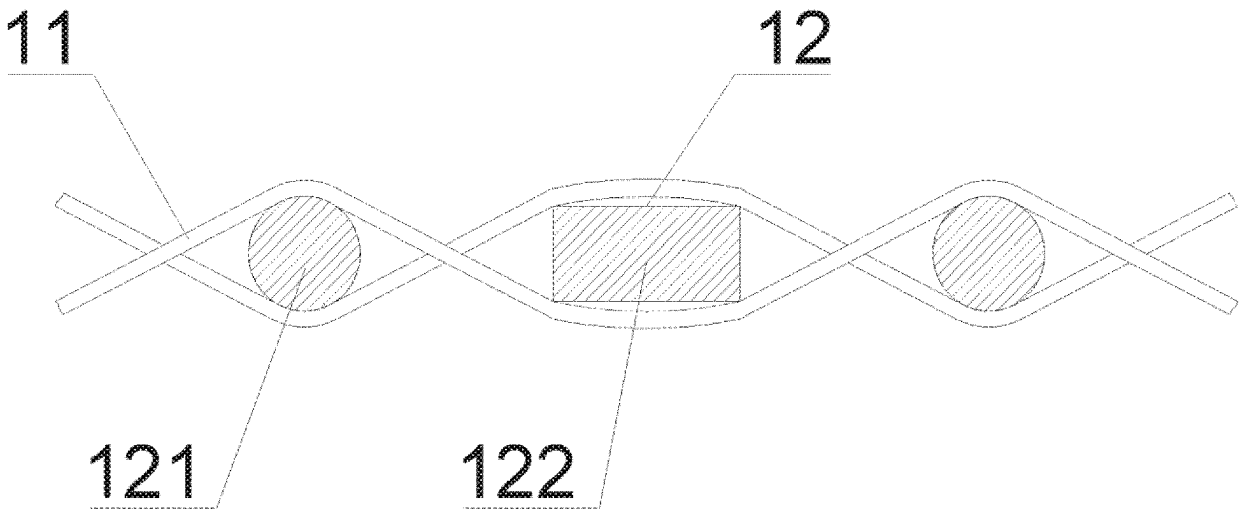

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

E01C 13/08(2006.01)i; E01C 11/22(2006.01)i; D06N 7/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E01C, D06N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI, CNABS, CNTXT, VEN, ISI WEB OF SCIENCE: 草坪, 草垫, 草皮, 草丝, 草束, 渗水, 透水, 排水, 渗液, 排液, 吹气, 胶, 粘合剂, 黏合剂, 孔, 口, 经纱, 经线, 纬纱, 纬线, 回缩比, turf, blow+, pore?, hole?, water+, liquid+, warp?, weft?, seepage, permea+, penetrat+, flat, circular, oval, special-shaped

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 06128862 A (MORITA SANGYO KK) 10 May 1994 (1994-05-10) description, paragraphs 0008-0018	1-6
Y	JP 06128862 A (MORITA SANGYO KK) 10 May 1994 (1994-05-10) description, paragraphs 0008-0018	7-10
Y	CN 108951198 A (JIANGSU SANYE ARTIFICIAL LAWN CO., LTD.) 07 December 2018 (2018-12-07) claim 1	7-10
X	JP 63227876 A (SUMITOMO RUBBER INDUSTRIES, LTD. et al.) 22 September 1988 (1988-09-22) claims 1-4	1-3, 6
Y	JP 63227876 A (SUMITOMO RUBBER INDUSTRIES, LTD. et al.) 22 September 1988 (1988-09-22) claims 1-4	7-10
X	JP 02190501 A (SEKISUI CHEMICAL CO., LTD.) 26 July 1990 (1990-07-26) description, page 2, right upper column, line 12 to page 3, left upper column, line 17	1-3, 6

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
15 June 2022	**22 June 2022**

Name and mailing address of the ISA/CN	Authorized officer
China National Intellectual Property Administration (ISA/CN) **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China**	
Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 02190501 A (SEKISUI CHEMICAL CO., LTD.) 26 July 1990 (1990-07-26) description, page 2, right upper column, line 12 to page 3, left upper column, line 17	7-10
A	JP 11169279 A (KOEI CHEMICAL KOGYOSHO KK) 29 June 1999 (1999-06-29) entire document	1-10
A	CN 105113359 A (TAISHAN SPORTS INDUSTRY GROUP CO., LTD.) 02 December 2015 (2015-12-02) entire document	1-10
A	CN 106283711 A (JIANGSU FURUN CARPET CO., LTD.) 04 January 2017 (2017-01-04) entire document	1-10
A	CN 211713574 U (YANGZHOU HAIZHONG FABRIC CO., LTD.) 20 October 2020 (2020-10-20) entire document	1-10
A	CN 201006926 Y (SHANGHAI NEW TECHTEXTILES CO., LTD.) 16 January 2008 (2008-01-16) entire document	1-10

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/077359

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 06128862 A	10 May 1994	JP 3728628 B2	21 December 2005
CN 108951198 A	07 December 2018	None	
JP 63227876 A	22 September 1988	JP H064937 B2	19 January 1994
JP 02190501 A	26 July 1990	JP 2510272 B2	26 June 1996
JP 11169279 A	29 June 1999	None	
CN 105113359 A	02 December 2015	None	
CN 106283711 A	04 January 2017	None	
CN 211713574 U	20 October 2020	None	
CN 201006926 Y	16 January 2008	None	

Form PCT/ISA/210 (patent family annex) (January 2015)