



(11)

EP 4 818 384 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.10.2026 Bulletin 2026/41

(21) Application number: **25899646.1**

(22) Date of filing: **11.03.2025**

(51) International Patent Classification (IPC):
D04B 21/20^(2006.01) D04B 21/10^(2006.01)
D04G 1/08^(2006.01)

(52) Cooperative Patent Classification (CPC):
D04B 21/10; D04B 21/20; D04G 1/08

(86) International application number:
PCT/CN2025/081833

(87) International publication number:
WO 2026/118269 (11.06.2026 Gazette 2026/24)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **06.12.2024 CN 202411786792**
06.12.2024 CN 202423007093 U

(71) Applicant: **Changzhou Xinhui Netting Co., Ltd.**
Jintan Economic Development Zone
Changzhou, Jiangsu 213200 (CN)

(72) Inventor: **XU, Xiaohui**
hangzhou, Jiangsu 213200 (CN)

(74) Representative: **karo IP**
Patentanwlte PartG mbB
Steinstrae 16-18
40212 Dsseldorf (DE)

(54) **QUASI-WARP-KNITTED BONDED NET AND NET ROLL STRUCTURE**

(57) The present application discloses a warp-knitting-like bonded net and a net roll structure, and belongs to the field of net processing. According to the warp-knitting-like bonded net, warp yarns include a first yarn and a second yarn located on a same warp line, weft yarns are arranged in a reciprocating folded manner along a warp direction between the warp yarns, and the weft yarns are disposed between the first yarn and

the second yarn; and the first yarn and the second yarn are composited together on two sides of connection points. In this application, a looping structure of warp yarns is not provided, so that the material is saved under a condition of ensuring strength; in addition, the weft yarns are clamped between the first yarn and the second yarn, and the separation between the warp yarns and the weft yarns is difficult, thereby reducing likelihood of damage.

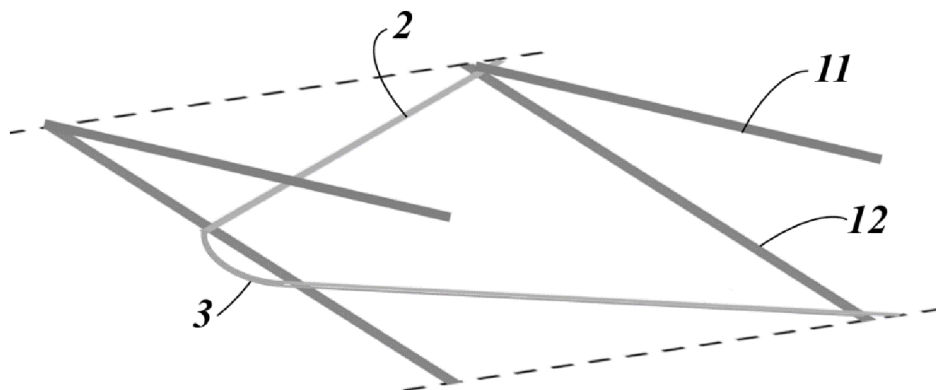


FIG. 4

EP 4 818 384 A1

Description

TECHNICAL FIELD

[0001] The present application relates to the technical field of netting processing, and more particularly, to a warp-knitting-like bonded net and a net roll structure.

BACKGROUND

[0002] Currently available bale net wraps are mostly formed by weaving through warp knitting machines. Unlike conventional woven nets, the bale net wraps are subjected to relatively large forces along a warp direction during use, and only require connection along a weft direction. Therefore, structural characteristics of the bale net wraps include relatively large mesh openings and a requirement for a certain load-bearing strength. Under a condition of maintaining a certain strength, the reduction of material usage becomes a primary profit factor.

[0003] FIG. 1 shows a structure of a currently mainstream bale net wrap on the market. This bale net wrap includes a plurality of warp chains arranged in parallel along a warp direction, each warp chain consists of a series of chain links formed by looping warp yarns and connected in sequence; and weft inlays are arranged along a weft direction between adjacent warp chains, thereby forming a net structure. Due to a warp-knitted structure, loop chain links within each warp chain, as well as between the weft inlays and the loop chain links, form looped interconnections; and after tensile force is applied, mutual pulling between looped structures causes relatively large node loss, and results in relatively large material waste.

[0004] In some improved solutions, a bale net wrap structure with laid-in warp yarns is adopted, for example, an improved solution previously proposed by an applicant, the Chinese Patent Application No. CN202211046218.1, provides a woven net in which laid-in warp yarns without looping are additionally arranged based on an original structure, thereby improving strength. Although this structure reduces material usage while ensuring strength, looping still requires a large amount of material.

[0005] To reduce material usage, a conventional laid netting structure may be referenced, such as a mesh fabric disclosed in the Chinese Patent Application No. 201210372860.9. In this structure, warp yarns and weft yarns are laid flat and bonded, and although warp yarns are not looped to form knots, the laid structure is difficult to satisfy strength requirements; in addition, due to this regular rectangular mesh structure, when deformation occurs under force along a warp direction, bonded connection points formed by hot pressing or bonding are easily damaged due to non-uniform deformation. Even if a large number of weft yarns are added, material saving cannot be achieved.

[0006] In addition, according to the structure disclosed

in the Chinese Patent Application No. 201210372860.9, warp yarns and weft yarns are laid flat in two perpendicular directions, namely, yarns are first laid in one direction from left to right, and then bonded. Compared with a looping weaving process, the above process has a relatively low efficiency. Therefore, in netting for binding use, the bonding-type netting is substantially not adopted.

SUMMARY

1. Technical Problem to Be Solved

[0007] A technical problem to be solved by the present application is to reduce material usage and reduce cost under a condition of ensuring strength of a net structure. A warp-knitting-like bonded net and a net roll structure are provided, where a double-layer bonding structure is adopted, load-bearing strength is improved without performing looping weaving, and material usage is reduced and cost is lowered.

2. Technical Solution

[0008] To achieve the above objective, a technical solution provided by the present application is as follows:

A warp-knitting-like bonded net is provided, including a plurality of warp yarns arranged in parallel along a warp direction, where the warp yarns include a first yarn and a second yarn located on a same warp line; and weft yarns arranged in a reciprocating folded manner along the warp direction between adjacent or spaced warp yarns, where the weft yarns are disposed between the first yarn and the second yarn; and a continuous hot-pressed composite segment is formed by the first yarn and the second yarn on two sides of connection points between the warp yarns and the weft yarns.

[0009] Further, along the warp direction, contact surfaces of the first yarn and the second yarn are hot-pressed and composited, and composited warp yarns form a flat surface.

[0010] Further, the weft yarn is folded between warp yarns, a fold line is formed at a turning position, the fold line and the warp yarns form two connection points, and the first yarn and the second yarn between the two connection points are hot-pressed and composited.

[0011] Further, the warp yarns or the weft yarns are monofilament yarns or film yarns made of polyethylene, polypropylene, or a mixed material of polyethylene and polypropylene.

[0012] Further, the first yarn and the second yarn have a denier of 350-650, and the weft yarn has a denier of 150-350.

[0013] Further, the bonded net has a basis weight of 4.0-12 g/m².

[0014] Further, the first yarn and the second yarn have a tensile strength of 25-38 N, and the warp yarn has a tensile strength of 1.5-3.0 times the tensile strength of the first yarn or the second yarn.

[0015] Further, the first yarn and the second yarn have a width of 0.8-5 mm.

[0016] Further, a width difference between the first yarn and the second yarn is 0-2.0 mm.

[0017] Further, auxiliary yarns are arranged between adjacent warp yarns, and the auxiliary yarns are arranged in parallel with the warp yarns, and are hot-pressed and composited with the weft yarns.

[0018] Further, the auxiliary yarns are located on one side of the weft yarns; or:

the auxiliary yarns include an upper auxiliary yarn and a lower auxiliary yarn that are hot-pressed and composited, the weft yarn is located between the upper auxiliary yarn and the lower auxiliary yarn, and a continuous hot-pressed composite segment is formed by the upper auxiliary yarn and the lower auxiliary yarn on two sides of connection points between the auxiliary yarns and the weft yarn.

[0019] A warp-knitting-like bonded net is provided, including:

a plurality of warp yarns, where the plurality of warp yarns are arranged in parallel along a warp direction, the warp yarns include a first yarn and a second yarn located on a same warp line, and contact surfaces of the first yarn and the second yarn are hot-pressed and composited;

weft yarns, where the weft yarns are arranged in a reciprocating folded manner between adjacent or spaced warp yarns, and at connection points between the weft yarns and the warp yarns, at least one of an upper surface or a lower surface of the weft yarns is hot-pressed and composited with the first yarn or the second yarn;

the first yarn and the second yarn have a denier of 200-580; and the weft yarns have a denier of 100-350.

[0020] Further, the warp yarns have an elongation at break of 45%-80%.

[0021] Further, the weft yarns between different warp yarns are arranged in parallel along a same warp-direction length.

[0022] Further, the first yarn and the second yarn have a width of 0.8-3.8 mm, and a width difference between the first yarn and the second yarn is 0-1.5 mm.

[0023] Further, the weft yarns are folded between the warp yarns, a fold line is formed at a turning position, the fold line and the warp yarns form two connection points, and a distance between the two connection points is 3-40 mm.

[0024] Further, a difference between a length of the fold line and the distance between the two connection points is defined as a redundant length, and a percentage of the

redundant length relative to the distance between the two connection points is not greater than 20%.

[0025] A warp-knitting-like bonded net is provided, including a plurality of warp yarns arranged in parallel along a warp direction and weft yarns arranged in a reciprocating folded manner between the warp yarns, where the warp yarns include a first yarn and a second yarn located on a same warp line; and bonded composite segments are formed by the first yarn and the second yarn on two sides of connection points between the warp yarns and the weft yarns, such that the weft yarns are fixed between the first yarn and the second yarn.

[0026] Further, the weft yarns are arranged in parallel along a same warp-direction length segment.

[0027] Further, a spacing between the warp yarns is 20-160 mm, and the bonded net has a basis weight of 4.5-10 g/m².

[0028] Or, further, a spacing between the warp yarns is 15-50 mm, and the bonded net has a basis weight of 4.5-10 g/m². Further, a spool is included, and the bonded net is wound on the spool.

[0029] Further, the first yarn and the second yarn are composited under a same tension force, thereby forming flat and straight warp yarns.

[0030] A net roll is provided, including a spool and a bonded net, where the bonded net is wound on the spool; the bonded net has a length of 3600-8000 m; a diameter of the net roll formed on the spool is 20-35 cm; the net roll has a weight of 25-56 kg; the bonded net includes a plurality of warp yarns arranged in parallel along a warp direction and weft yarns arranged in a reciprocating folded manner between the warp yarns, and the warp yarns and the weft yarns are connected by bonding.

[0031] Another net roll is provided, including a spool and a bonded net, where the bonded net is wound on the spool; the bonded net has a length of 3000-8000 m; a diameter of the net roll formed on the spool is 20-35 cm; the net roll has a weight of 25-56 kg; the bonded net includes a plurality of warp yarns arranged in parallel along a warp direction and weft yarns arranged in a reciprocating folded manner between the warp yarns, and the warp yarns and the weft yarns are connected by bonding.

[0032] In some embodiments, the bonded net adopts the structure of the bonded net described above. The bonded net may form a three-layer structure, where an upper layer is formed by warp yarns, a middle layer is formed by weft yarns, and a lower layer is formed by warp yarns; and the warp yarns of the upper layer and the warp yarns of the lower layer are bonded together, thereby restricting separation of the weft yarns from between the warp yarns.

[0033] The net roll includes a spool and a bonded net wound on the spool, the bonded net includes a plurality of warp yarns arranged in parallel along a warp direction, and the warp yarns include a first yarn and a second yarn located on a same warp line;

weft yarns arranged in a reciprocating folded manner along the warp direction between adjacent or spaced warp yarns, where the weft yarns are disposed between the first yarn and the second yarn; a continuous hot-pressed composite segment is formed by the first yarn and the second yarn on two sides of connection points between the warp yarns and the weft yarns;

the bonded net formed by composition has a flat surface structure, such that for a bonded net having a length of 3000 m, a diameter of a formed net roll is not greater than 23 cm, and for a bonded net having a length of 5000 m, a diameter of a formed net roll is not greater than 24.5 cm.

[0034] Further, the first yarn and the second yarn have a denier of 350-650.

[0035] Further, the net roll is configured for binding and packaging, a spacing between the warp yarns is 20-26 mm, and the bonded net has a basis weight of 4.5-6.5 g/m².

[0036] Further, the bonded net has the structure of the bonded net according to any one of the foregoing aspects.

3. Beneficial Effects

[0037] Compared with the prior art, the technical solutions adopted by the present application have the following beneficial effects:

[0038] According to the warp-knitting-like bonded net, warp yarns include a first yarn and a second yarn located on a same warp line, weft yarns are arranged in a reciprocating folded manner along a warp direction between the warp yarns, and the weft yarns are disposed between the first yarn and the second yarn; and the first yarn and the second yarn are composited together on two sides of connection points. In this application, a looping structure of warp yarns is not provided, so that the material is saved under a condition of ensuring strength; in addition, the weft yarns are clamped between the first yarn and the second yarn, and the separation between the warp yarns and the weft yarns is difficult, thereby reducing likelihood of damage.

BRIEF DESCRIPTION OF DRAWINGS

[0039]

FIG. 1 shows a woven net formed by a warp knitting manner, where warp yarns repeatedly loop in a radial direction, and weft yarns are connected within looped portions;

FIG. 2 shows a weaving manner similar to weft insertion, where weft yarns pass through an upper warp yarn and a lower warp yarn;

FIG. 3 is a schematic diagram of an embodiment in which weft yarns are arranged in a reciprocating

manner between adjacent warp yarns, where the weft yarns are arranged according to a same pattern; FIG. 4 is a schematic diagram in an unfolded state of a connection structure of a first warp yarn, a second warp yarn, and weft yarns, where the weft yarns are clamped between the first warp yarn and the second warp yarn;

FIG. 5 shows another embodiment structure in which auxiliary yarns are arranged located between adjacent warp yarns and are configured to enhance connection with the weft yarns;

FIG. 6 shows different embodiment structures of weft yarns, where a spacing between warp yarns is not completely equal, and after movement by a same distance, shapes formed by the weft yarns are different;

FIG. 7 is a schematic diagram of a compositing manner of warp yarns;

FIG. 8 is a schematic diagram of an embodiment of auxiliary yarns;

FIG. 9 is a schematic diagram of a structure in which weft yarns are folded between spaced warp yarns; and

FIG. 10 is a schematic diagram of a bonded net during a use state.

[0040] Descriptions of reference numerals in the drawing:

1. warp yarn; 11. first yarn; 12. second yarn;
2. weft yarn;
3. fold line;
4. auxiliary yarn; 41. upper auxiliary yarn; and 42. lower auxiliary yarn.

DETAILED DESCRIPTION OF EMBODIMENTS

[0041] To further understand the present application, the present application is described in detail in conjunction with the accompanying drawings and embodiments.

[0042] The structures, proportions, dimensions, and the like illustrated in the drawings of this specification are provided only to cooperate with the disclosure of the specification, to facilitate understanding and reading by those skilled in the art, and are not intended to limit the scope of the present application. Therefore, any modification of the structures, changes in proportions, or adjustments of dimensions, without affecting the effects achievable by the present application or the objectives attainable thereby, shall still fall within the scope of the technical content disclosed in the present application. In addition, terms such as "upper", "lower", "left", "right", and "middle" used in this specification are provided only for clarity of description and are not intended to limit the scope of the present application. The changes or adjustments in relative relationships, without substantive alteration of the technical content, shall also be regarded as within the scope of the present application.

[0043] FIG. 1 is a schematic diagram of a structure of a bale net wrap formed by a conventional weaving process, where warp yarns are repeatedly looped along a warp direction, and the warp yarns are connected by weft yarns.

[0044] A weaving manner shown in FIG. 1 is a warp knitting manner, namely, weft yarns are fixed by looping warp yarns. According to this weaving manner, one or more sets of parallel-arranged yarns are fed in a warp direction onto all working needles of a machine, and loops are formed simultaneously to form a knitted fabric. This weaving manner is referred to as warp knitting, and the formed knitted fabric is referred to as a warp-knitted fabric. According to the warp knitting process, one or more sets of parallel-arranged yarns are used, and the yarns are fed in a warp direction onto all working needles of a machine, and loops are formed simultaneously to form a fabric. Due to repeated looping in warp knitting, a relatively large amount of material is used along the warp direction.

[0045] FIG. 2 shows a structure formed by a weft insertion weaving manner; during weft insertion, relative movement occurs between weft yarns and warp yarns. The formation of a fabric is not completed after one weft insertion, and relative movement between weft yarns and warp yarns still occurs in a fabric formation zone located at a certain distance from a fell of the cloth. To avoid relative movement, bonding is performed at connection positions with the weft yarns in some solutions, thereby improving connection stability.

[0046] FIG. 2 shows a schematic diagram of a net structure in which warp yarns and weft yarns are distributed vertically. The net structure is implementable only on relatively large equipment, which has low efficiency and is prone to cracking; consequently, the net structure is not suitable for netting requiring relatively large load-bearing capacity along a warp direction. The net structure is a relatively mature technology, and production is relatively stable. A problem to be solved by the present application is how to further reduce material usage and save cost based on ensuring strength for existing netting.

[0047] FIG. 3 shows a warp-knitting-like bonded net, where a warp direction is perpendicular to a weft direction, a plurality of warp yarns 1 arranged in parallel are distributed along the warp direction, weft yarns 2 arranged in a reciprocating folded manner are disposed between adjacent warp yarns 1, and the weft yarns 2 extend along the warp direction during folding and connect two adjacent warp yarns 1.

[0048] A warp-knitting-like bonded net provided in the present application has a structure of an embodiment as shown in FIG. 3, including a plurality of warp yarns 1 arranged in parallel along a warp direction, and weft yarns 2 arranged in a reciprocating folded manner along the warp direction between adjacent warp yarns 1, in a zigzag-like structure, mainly for connecting the warp yarns 1 and maintaining integrity of a net surface.

[0049] Referring to FIG. 4, the warp yarns 1 include a

first yarn 11 and a second yarn 12 located on a same warp line, the weft yarns 2 are disposed between the first yarn 11 and the second yarn 12, and a continuous hot-pressed composite segment is formed by the first yarn 11 and the second yarn 12 on two sides of connection points between the warp yarns 1 and the weft yarns 2. The continuous hot-pressed composite segment may be as shown in FIG. 7, where dashed segments in a radial direction indicate uncomposited portions, and non-dashed portions indicate hot-pressed composited portions.

[0050] The first yarn 11 and the second yarn 12 are composited on two sides of the connection points, such that the weft yarns 2 are clamped between the first yarn 11 and the second yarn 12, thereby improving overall strength. By compositing the first yarn 11 and the second yarn 12, a relatively large number of connection points are formed, and a certain load-bearing strength is provided in a direction perpendicular to a net surface, such that separation is not prone to occur.

[0051] Compared with a conventional warp knitting manner, warp yarns in the structure of this embodiment do not require repeated looping weaving, thereby saving a large amount of material. Meanwhile, the reduction of strength caused by looping is avoided. Compared with a weft insertion weaving manner, the weft yarns only move within a small range in a transverse direction under static load, widths in a weft direction are controlled by a plurality of weft insertion needles, and a number of warp yarns may be selected according to width requirements; compared with a weaving manner in which warp yarns and weft yarns are interwoven by weft insertion, this processing process is relatively simple, cost is lower, and production speed is faster, thereby achieving efficiency similar to warp knitting while reducing material usage.

[0052] For bonding connection of netting, although bonding is also applied in the prior art, bonding is mostly used together with a weft insertion manner to further enhance connection. It can be conceivable that weaving is directly replaced with hot pressing or bonding. For netting for binding use, load is mainly borne along a direction of warp yarns, and weft yarns only serve a connection function, therefore load is mainly along the direction of the warp yarns. In a case where only bonding connection is adopted, warp yarns and weft yarns are composited and connected on one side, and after force is applied to the warp yarns, the deformation of the warp yarns causes distances between warp yarns to increase or decrease, and this variation causes separation at connection positions between the warp yarns and the weft yarns, such that the warp yarns 1 are prone to be peeled from the weft yarns 2. This is also a reason why existing netting adopts weaving or weft insertion processing, which aims to ensure connection strength and avoid separation.

[0053] In this embodiment, to address a peeling problem, an upper-and-lower bonding manner is adopted for fixing, connection points of the weft yarns 2 are limited

between hot-pressed composite segments, and separation from the warp yarns 1 is difficult, thereby ensuring that the weft yarns 2 are not easily peeled, and the integrity of the net surface is maintained. It should be noted that, a structure in which a single warp yarn 1 having relatively high strength is arranged only on one side of the weft yarns 2 results in a certain reduction in tensile strength along the warp direction and a more complex process; however, connection strength with the weft yarns 2 in a direction perpendicular to the net surface is significantly improved.

[0054] In one embodiment, hot-pressed composite segments may be composite segments formed at a certain distance on two sides of connection points, such as 1-2 cm, and the weft yarns 2 are limited within the hot-pressed composite segments and do not move along a warp direction. The hot-pressed composite segments may be discontinuous at positions other than the connection points, as shown in FIG. 7. In FIG. 7, dashed lines along a warp direction indicate non-composited connection portions, and non-dashed portions indicate composited portions.

[0055] In another embodiment, along a warp direction, contact surfaces of the first yarn 11 and the second yarn 12 are hot-pressed and composited, namely, the first yarn 11 and the second yarn 12 are integrally composited and may extend across the warp direction. The first yarn 11 and the second yarn 12 are composited together to simultaneously bear loads and have higher strength. Further, composited warp yarns 1 form flat surfaces. The first yarn 11 and the second yarn 12 are generally composited under a same tension force, and no significant deformation occurs in the first yarn 11 and the second yarn 12 during tensioning, such that the first yarn 11 and the second yarn 12 are composited under a same stretching condition and have an integral effect after compositing.

[0056] In a case where one yarn undergoes elastic deformation during compositing while another yarn is in a non-stretched state, composited warp yarns have a certain curvature, and loads cannot be resisted under a same stretching condition, thereby making it difficult to achieve maximum strength performance.

[0057] For convenience of processing, the weft yarns 2 are folded between the warp yarns 1, fold lines 3 are formed at turning positions, and the fold lines 3 and the warp yarns 1 form two connection points. Between the two connection points, the first yarn 11 and the second yarn 12 are hot-pressed and composited together, thereby preventing the fold lines 3 from separation between the first yarn 11 and the second yarn 12.

[0058] The warp yarns 1 or the weft yarns 2 may be monofilament yarns or film yarns made of polyethylene, polypropylene, or a mixed material of polyethylene and polypropylene. In other embodiments for manufacturing netting for different uses, other materials may also be used. This is not specifically limited.

[0059] In different embodiments, two yarns of the warp

yarns 1 may have a denier of 200-800. In a case where two yarns have a denier close to 200, the structure is suitable for applications requiring relatively low load-bearing capacity along a warp direction; and in a case where two yarns have a denier of about 700, the structure is suitable for applications requiring relatively high strength. The weft yarns 2 mainly serve a connection function, and have a denier of 100-500.

[0060] Further, the first yarn 11 and the second yarn 12 have a denier of 350-650, such as 400 or 520, and the weft yarn 2 has a denier of 150-350, such as 200 or 280. When used for bale net wrap, the bonded net has a basis weight of 4.0-12 g/m², such as 5 g/m², 7 g/m², or 9 g/m². The spacing between warp yarns 1 and a spacing between weft yarns 2 can be adjusted or controlled to meet requirements of different applications. In some embodiments, the spacing between warp yarns 1 is 20-100 mm, such as 35 mm, 56 mm, or 80 mm.

[0061] In some embodiments, the first yarn 11 and the second yarn 12 have a tensile strength of 20-50 N, and the warp yarns 1 have a tensile strength of 1.5-3.0 times the tensile strength of one of the first yarn 11 or the second yarn 12. After compositing of the first yarn 11 and the second yarn 12, the strength of the warp yarns 1 is defined, thereby enabling selection of suitable materials for the warp yarns 1 and the weft yarns 2.

[0062] Optionally, the widths of the first yarn 11 and the second yarn 12 are 0.8-3.5 mm, such as 1.2 mm or 2.5 mm, and the range is suitable for binding use. In a case where the widths are 2.5-8 mm, the structure may be used for shading nets. The widths of the first yarn 11 and the second yarn 12 may be the same or may be different. To increase strength in a direction perpendicular to a net surface, a difference between the first yarn 11 and the second yarn 12 is generally selected within a relatively small range. For example, in some embodiments, a width difference between the first yarn 11 and the second yarn 12 is not greater than 1.5 mm. A smaller width difference results in a larger contact area and higher connection strength.

[0063] In other embodiments, referring to FIG. 5, auxiliary yarns 4 are arranged between adjacent warp yarns 1, and the auxiliary yarns 4 are arranged in parallel with the warp yarns 1, and are hot-pressed and composited with the weft yarns 2. In some application scenarios, mesh density is increased and leakage prevention performance is improved by adding the auxiliary yarns 4. During implementation, the auxiliary yarns 4 may be located on one side of the weft yarns 2; and the auxiliary yarns 4 may be arranged only between some adjacent warp yarns 1, or the auxiliary yarns 4 may be arranged between all adjacent warp yarns 1.

[0064] Referring to FIG. 8, in one embodiment, the auxiliary yarns 4 include an upper auxiliary yarn 41 and a lower auxiliary yarn 42 that are hot-pressed and composited, and the weft yarns 2 are located between the upper auxiliary yarn 41 and the lower auxiliary yarn 42. It should be noted that the auxiliary yarns and the warp

yarns may have no difference in material and basis weight, and a difference is that the warp yarns are yarns at bending connection points of the weft yarns, and the weft yarns are connected with the auxiliary yarns only in a linear direction, and the weft yarns do not fold back at positions of the auxiliary yarns.

[0065] The auxiliary yarns 4 may be arranged in a middle region between two warp yarns 1 to increase strength. A plurality of auxiliary yarns 4 may also be arranged close to the warp yarns 1. The auxiliary yarns 4 may be monofilament yarns or film yarns made of polyethylene, polypropylene, or a mixed material of polyethylene and polypropylene. Or the auxiliary yarns 4 may be made of other monofilament yarns or film yarn materials. In some embodiments, the auxiliary yarns 4 and the warp yarns 1 are made of a same material and have a same denier.

[0066] In another embodiment, different from the foregoing descriptions, the weft yarns 2 are folded in a reciprocating manner between spaced warp yarns 1, and each warp yarn 1 has a fold-back of the weft yarns. The spaced arrangement refers to a configuration in which at least one additional warp yarn is located between two warp yarns, and differs from an adjacent relationship. Taking an example of one intervening warp yarn.

[0067] As shown in FIG. 9, in one conceivable embodiment, warp yarns 1a and 1c form fold angles 3a with weft yarn A; a warp yarn 1b provides spacing between the warp yarns 1a and 1c, and the warp yarn 1b intersects with the weft yarn 2. Meanwhile, the warp yarn 1b forms a fold angle 3b with a weft yarn B. A number of warp yarns between two adjacent fold-backs of a same weft yarn is not greater than two, thereby avoiding formation of a relatively large edge width and reducing likelihood of edge breakage. During practical use, the combination with auxiliary yarns may also be adopted.

[0068] In another embodiment, a warp-knitting-like bonded net is provided, which includes warp yarns 1 and weft yarns 2, where a plurality of warp yarns 1 are arranged in parallel along a warp direction, and the warp yarns 1 include a first yarn 11 and a second yarn 12 located on a same warp line, and contact surfaces of the first yarn 11 and the second yarn 12 are hot-pressed and composited. The weft yarns 2 are arranged in a reciprocating folded manner between adjacent warp yarns 1, and at connection points between the weft yarns 2 and the warp yarns 1, an upper surface of the weft yarns 2 is hot-pressed and composited with the first yarn 11, and a lower surface of the weft yarns 2 is hot-pressed and composited with the second yarn 12.

[0069] The "same warp line" does not require complete overlap between the first yarn 11 and the second yarn 12, and a composite surface having a certain width between the first yarn 11 and the second yarn 12 is sufficient.

[0070] More specifically, the first yarn 11 and the second yarn 12 have a denier of 180, and the weft yarns 2 have a denier of 120; in a wide bonded net, the first yarn

11 and the second yarn 12 have a denier of 520, and the weft yarns 2 have a denier of 300. The denier of the first yarn 11 and the second yarn 12 may be controlled within a range of 200-580, and the denier of the weft yarns 2 is 100-350.

[0071] Further, the elongation at break of the warp yarns 1 is controlled within 45%-80%, for example 45%-50%, 50%-65%, or 70%-80%. The elongation at break is an important indicator for measuring plastic deformation capability of a material. Since tensile load is borne along a warp direction, a certain elongation at break enables the warp yarns to be less prone to breakage. A higher elongation at break may also be selected, but strength is reduced; for binding rigid materials, warp yarns having relatively low elongation at break may be selected, and for materials having lower weight and higher softness, warp yarns having relatively high elongation at break may be selected.

[0072] Referring to FIG. 3, in some embodiments, the weft yarns 2 between different warp yarns 1 are arranged in parallel along a same warp-direction length. By adopting the arrangement, during processing, guide needles for feeding the weft yarns 2 swing left and right simultaneously, and requirements for a drive program are relatively simple.

[0073] During implementation, a plurality of sets of guide needles may also be used to form different weft yarn paths. For example, the warp yarns 1 may be arranged in a form of alternating large spacing and small spacing, as shown in FIG. 6, where b1 represents a large spacing and b2 represents a small spacing, and weft yarns within the large spacing b1 and weft yarns within the small spacing b2 may be non-parallel.

[0074] In terms of material dimensions, the first yarn 11 and the second yarn 12 have a width of 0.8-3.5 mm; for example, the first yarn 11 is 3.2 mm and the second yarn 12 is 1.5 mm; or the first yarn 11 is 2.5 mm and the second yarn 12 is 2.5 mm; or the first yarn 11 is 2.2 mm and the second yarn 12 is 1.3 mm. A width difference between the first yarn 11 and the second yarn 12 may be controlled within 1.5 mm.

[0075] The weft yarns 2 are folded between the warp yarns 1, fold lines 3 are formed at turning positions, and the fold lines 3 and the warp yarns 1 form two connection points. For use as a shading net, spacing may be relatively dense, such as 0.5-3 mm; for use as a bale net wrap, spacing may be relatively large. A distance between two connection points is generally 3-60 mm, such as 5 mm, 12 mm, 23 mm, 33 mm, or 40 mm.

[0076] In combination of the above embodiments, a difference between a length of the fold line 3 and a distance between two connection points is defined as a redundant length, and a percentage of the redundant length relative to the distance between the two connection points is not greater than 20%, such as 1.5%, 2.2%, or 8%. The redundant length is formed to maintain continuous processing and does not contribute to strength, and excessive redundant length results in material

waste.

[0077] In combination of the above embodiments, as an alternative embodiment, a warp-knitting-like bonded net is provided, where the first yarn 11 and the second yarn 12 are composited by bonding. Specifically, the bonded net includes a plurality of warp yarns 1 arranged in parallel along a warp direction and weft yarns 2 arranged in a reciprocating folded manner between the warp yarns 1, where the warp yarns 1 include a first yarn 11 and a second yarn 12 located on a same warp line; and bonded composite segments are formed by the first yarn 11 and the second yarn 12 on two sides of connection points between the warp yarns 1 and the weft yarns 2, such that the weft yarns 2 are fixed between the first yarn 11 and the second yarn 12.

[0078] In addition to bonding by hot-press compositing, bonding may also be performed by adhesive bonding. That is, an adhesive is applied on connection surfaces of the first yarn 11 and the second yarn 12, and contact surfaces of the first yarn 11 and the second yarn 12 are bonded together. Meanwhile, the weft yarns 2 are also fixed between the first yarn 11 and the second yarn 12 by bonding. During bonding, the first yarn 11 and the second yarn 12 are composited under a same tension force to form flat and straight warp yarns 1, and the first yarn 11 and the second yarn 12 simultaneously provide tensile force to achieve a compositing effect. For the weft yarns 2, the weft yarns 2 are arranged in parallel along a same warp-direction length segment. The spacing between the warp yarns 1 may be 20 mm, 30 mm, 35 mm, 60 mm, 120 mm, or 180 mm; and the bonded net has a basis weight of 4.5-10 g/m². Compared with hot-press compositing, adhesive bonding increases weight to a certain extent, and the use of adhesive incurs a certain raw material cost.

[0079] In conventional bonded nets, including hot-press types and adhesive-bonding types, processing of an entire net is mostly achieved according to a weaving concept, namely, warp yarns are interlaced among weft yarns, or one warp yarn is located above weft yarns and another offset warp yarn is located below the weft yarns; during compositing, fixation is performed only at connection points by hot pressing or adhesive bonding, and load perpendicular to a net surface is borne by an interlaced weaving structure.

[0080] Referring to FIG. 10, a net roll structure provided in this embodiment includes a spool and a bonded net, where the bonded net is wound on the spool; the bonded net has a length of 3600-8000 m; a diameter D of a net roll formed on the spool is 20-35 cm; the net roll has a weight of 25-56 kg; and a width W may be adjusted during processing according to requirements. The bonded net includes a plurality of warp yarns 1 arranged in parallel along a warp direction and weft yarns 2 arranged in a reciprocating folded manner between the warp yarns 1, and the warp yarns 1 and the weft yarns 2 are connected by bonding.

[0081] In the net roll structure, the bonded net adopts structures described in the foregoing embodiments or

combinations thereof.

[0082] In a possible embodiment of a net roll, the net roll includes a spool and a bonded net wound on the spool, the bonded net including a plurality of warp yarns 1 arranged in parallel along a warp direction, where the warp yarns 1 include a first yarn 11 and a second yarn 12 located on a same warp line; and weft yarns 2 are arranged in a reciprocating folded manner along the warp direction and are disposed between the first yarn 11 and the second yarn 12. The first yarn 11 and the second yarn 12 may have a denier of 350-480, and the weft yarns 2 have a denier not greater than 350. The continuous hot-pressed composite segment is formed by the first yarn 11 and the second yarn 12 on two sides of connection points between the warp yarns 1 and the weft yarns 2. Since the first yarn 11 and the second yarn 12 are directly composited face-to-face, the formed bonded net has a flat surface structure, and thickness is relatively small, such that for a bonded net having a length of 3000 m, a diameter of a formed net roll is not greater than 23 cm, and for a bonded net having a length of 5000 m, a diameter of a formed net roll is not greater than 24.5 cm. Under a same roll diameter, a greater length is achieved. The above roll diameter comparison is performed under a condition that a diameter of the spool is within 90-98 mm, and during measurement, as long as an outer diameter of the spool is within 90-98 mm, the comparison of net roll diameters corresponding to the above length ranges is applicable.

[0083] To achieve appropriate tensile strength and basis weight, when the net is configured for binding and packaging, the spacing between the warp yarns 1 is 20-26 mm, and the bonded net has a basis weight of 4.5-6.5 g/m²; and under a width of 1.23 m, about 60 warp yarns are provided, and the tensile strength can reach more than 300 kg.

[0084] In other embodiments, the bonded net may be combined with the foregoing contents, and existing structures of the above binding nets may be incorporated into the net roll to realize different embodiments. Details are not repeated herein.

[0085] The warp-knitting-like bonded net provided in the present application divides warp yarns into a first yarn and a second yarn, weft yarns are arranged in a reciprocating folded manner along a warp direction between the warp yarns, and the weft yarns are disposed between the first yarn and the second yarn; and on two sides of connection points between the weft yarns and the warp yarns, the first yarn and the second yarn are composited together to form a three-layer structure having an effect similar to weaving. The bonded net has no looping structure of warp yarns, so that the material is saved under a condition of ensuring strength, and cost is significantly reduced.

[0086] The foregoing provides a descriptive illustration of the present application and the embodiments of the present application, the description has no limiting effect, and the illustrations in the figures represent only one

embodiment of the present application, and the actual structure is not limited thereto. Therefore, those of ordinary skill in the art, guided by the present application, may design a structure or an embodiment similar to the technical solution without departing from the inventive concept of the present application, and such structure or embodiment falls within the scope of protection of the present application.

Claims

1. A warp-knitting-like bonded net, comprising: a plurality of warp yarns (1) arranged in parallel along a warp direction, wherein the warp yarns (1) comprise a first yarn (11) and a second yarn (12) located on a same warp line; and weft yarns (2) arranged in a reciprocating folded manner along the warp direction between adjacent or spaced warp yarns (1), wherein the weft yarns (2) are disposed between the first yarn (11) and the second yarn (12); a continuous hot-pressed composite segment is formed by the first yarn (11) and the second yarn (12) on two sides of connection points between the warp yarns (1) and the weft yarns (2).
2. The warp-knitting-like bonded net according to claim 1, wherein along the warp direction, contact surfaces of the first yarn (11) and the second yarn (12) are hot-pressed and composited, and composited warp yarns (1) form a flat surface.
3. The warp-knitting-like bonded net according to claim 1, wherein the weft yarn (2) is folded between the warp yarns (1), a fold line (3) is formed at a turning position, the fold line (3) and the warp yarns (1) form two connection points, and the first yarn (11) and the second yarn (12) between the two connection points are hot-pressed and composited.
4. The warp-knitting-like bonded net according to claim 1, wherein the warp yarns (1) or the weft yarns (2) are monofilament yarns or film yarns made of polyethylene, polypropylene, or a mixed material of polyethylene and polypropylene.
5. The warp-knitting-like bonded net according to any one of claims 1-4, wherein the first yarn (11) and the second yarn (12) have a denier of 350-650, and the weft yarn (2) has a denier of 150-350.
6. The warp-knitting-like bonded net according to claim 5, wherein the bonded net has a basis weight of 4.0-12 g/m².
7. The warp-knitting-like bonded net according to claim 5, wherein the first yarn (11) and the second yarn (12) have a tensile strength of 20-50 N, and the warp yarn

(1) has a tensile strength of 1.5-3.0 times the tensile strength of the first yarn (11) or the second yarn (12).

8. The warp-knitting-like bonded net according to claim 5, wherein the first yarn (11) and the second yarn (12) have a width of 0.8-5 mm.
9. The warp-knitting-like bonded net according to claim 8, wherein a difference between the width of the first yarn (11) and the width of the second yarn (12) is 0-2.0 mm.
10. The warp-knitting-like bonded net according to claim 1, wherein auxiliary yarns (4) are arranged between adjacent warp yarns (1), and the auxiliary yarns (4) are arranged in parallel with the warp yarns (1), and are hot-pressed and composited with the weft yarns (2).
11. The warp-knitting-like bonded net according to claim 10, wherein the auxiliary yarns (4) are located on one side of the weft yarns (2); or: the auxiliary yarns (4) comprise an upper auxiliary yarn and a lower auxiliary yarn that are hot-pressed and composited, the weft yarn (2) is located between the upper auxiliary yarn and the lower auxiliary yarn, and a continuous hot-pressed composite segment is formed by the upper auxiliary yarn and the lower auxiliary yarn on two sides of connection points between the auxiliary yarns (4) and the weft yarn (2).
12. A warp-knitting-like bonded net, comprising: a plurality of warp yarns (1), wherein the plurality of warp yarns (1) are arranged in parallel along a warp direction, the warp yarns (1) comprise a first yarn (11) and a second yarn (12) located on a same warp line, and contact surfaces of the first yarn (11) and the second yarn (12) are hot-pressed and composited; weft yarns (2), wherein the weft yarns (2) are arranged in a reciprocating folded manner between adjacent or spaced warp yarns (1), and at connection points between the weft yarns (2) and the warp yarns (1), at least one of an upper surface or a lower surface of the weft yarns (2) is hot-pressed and composited with the first yarn (11) or the second yarn (12); the first yarn (11) and the second yarn (12) have a denier of 200-580; and the weft yarns (2) have a denier of 100-350.
13. The warp-knitting-like bonded net according to claim 12, wherein the warp yarns (1) have an elongation at break of 45%-80%.
14. The warp-knitting-like bonded net according to claim 12, wherein the weft yarns (2) between different warp

yarns (1) are arranged in parallel along a same warp-direction length.

15. The warp-knitting-like bonded net according to claim 12, wherein the first yarn (11) and the second yarn (12) have a width of 0.8-3.8 mm, and a difference between the width of the first yarn (11) and the width of the second yarn (12) is 0-1.5 mm. 5
16. The warp-knitting-like bonded net according to claim 12, wherein the weft yarns (2) are folded between the warp yarns (1), a fold line (3) is formed at a turning position, the fold line (3) and the warp yarns (1) form two connection points, and a distance between the two connection points is 3-60 mm. 10
17. The warp-knitting-like bonded net according to claim 16, wherein a difference between a length of the fold line (3) and the distance between the two connection points is defined as a redundant length, and a percentage of the redundant length relative to the distance between the two connection points is not greater than 20%. 20
18. A warp-knitting-like bonded net, comprising: a plurality of warp yarns (1) arranged in parallel along a warp direction and weft yarns (2) arranged in a reciprocating folded manner between the warp yarns (1), wherein the warp yarns (1) comprise a first yarn (11) and a second yarn (12) located on a same warp line; and bonded composite segments are formed by the first yarn (11) and the second yarn (12) on two sides of connection points between the warp yarns (1) and the weft yarns (2), such that the weft yarns (2) are fixed between the first yarn (11) and the second yarn (12). 25
19. The warp-knitting-like bonded net according to claim 18, wherein the weft yarns (2) are arranged in parallel along a same warp-direction length segment. 30
20. The warp-knitting-like bonded net according to claim 18, wherein a spacing between the warp yarns (1) is 20-160 mm, and the bonded net has a basis weight of 4.5-10 g/m². 35
21. The warp-knitting-like bonded net according to claim 18, wherein a spacing between the warp yarns (1) is 15-50 mm, and the bonded net has a basis weight of 4.5-10 g/m². 40
22. The warp-knitting-like bonded net according to claim 18, further comprising a spool, wherein the bonded net is wound on the spool. 45
23. The warp-knitting-like bonded net according to claim 18, wherein the first yarn (11) and the second yarn (12) are composited under a same tension force, 50

thereby forming flat and straight warp yarns (1).

24. A net roll, comprising a spool and a bonded net, wherein the bonded net is wound on the spool; the bonded net has a length of 3600-8000 m; a diameter of the net roll formed on the spool is 20-35 cm; the net roll has a weight of 25-56 kg; and the bonded net comprises a plurality of warp yarns (1) arranged in parallel along a warp direction and weft yarns (2) arranged in a reciprocating folded manner between the warp yarns (1), and the warp yarns (1) and the weft yarns (2) are connected by bonding. 5
25. A net roll, comprising a spool and a bonded net, wherein the bonded net is wound on the spool; the bonded net has a length of 3000-8000 m; a diameter of the net roll formed on the spool is 20-35 cm; the net roll has a weight of 25-56 kg; and the bonded net comprises a plurality of warp yarns (1) arranged in parallel along a warp direction and weft yarns (2) arranged in a reciprocating folded manner between the warp yarns (1), and the warp yarns (1) and the weft yarns (2) are connected by bonding. 10
26. The net roll according to claim 24 or 25, wherein the bonded net has the structure according to any one of claims 1-23. 25
27. A net roll, comprising a spool and a bonded net wound on the spool, wherein the bonded net comprises a plurality of warp yarns (1) arranged in parallel along a warp direction, wherein the warp yarns (1) comprise a first yarn (11) and a second yarn (12) located on a same warp line; 30
- weft yarns (2) arranged in a reciprocating folded manner along the warp direction between adjacent or spaced warp yarns (1), wherein the weft yarns (2) are disposed between the first yarn (11) and the second yarn (12); a continuous hot-pressed composite segment is formed by the first yarn (11) and the second yarn (12) on two sides of connection points between the warp yarns (1) and the weft yarns (2); the bonded net formed by composition has a flat surface structure, such that for a bonded net having a length of 3000 m, a diameter of a formed net roll is not greater than 23 cm, and for a bonded net having a length of 5000 m, a diameter of a formed net roll is not greater than 24.5 cm. 35
28. The net roll according to claim 27, wherein the first yarn (11) and the second yarn (12) have a denier of 350-650. 40

29. The net roll according to claim 27, wherein the net is configured for binding and packaging, a spacing between the warp yarns (1) is 20-26 mm, and the bonded net has a basis weight of 4.5-6.5 g/m².

5

30. The net roll according to claim 27, wherein the bonded net has the structure of the bonded net according to any one of claims 1-23.

10

15

20

25

30

35

40

45

50

55

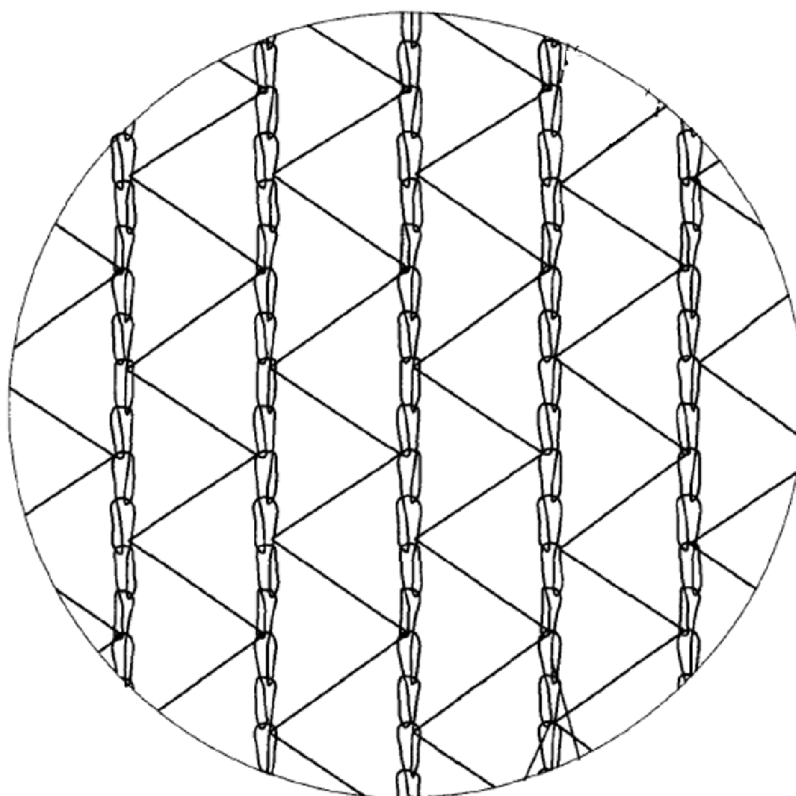


FIG. 1

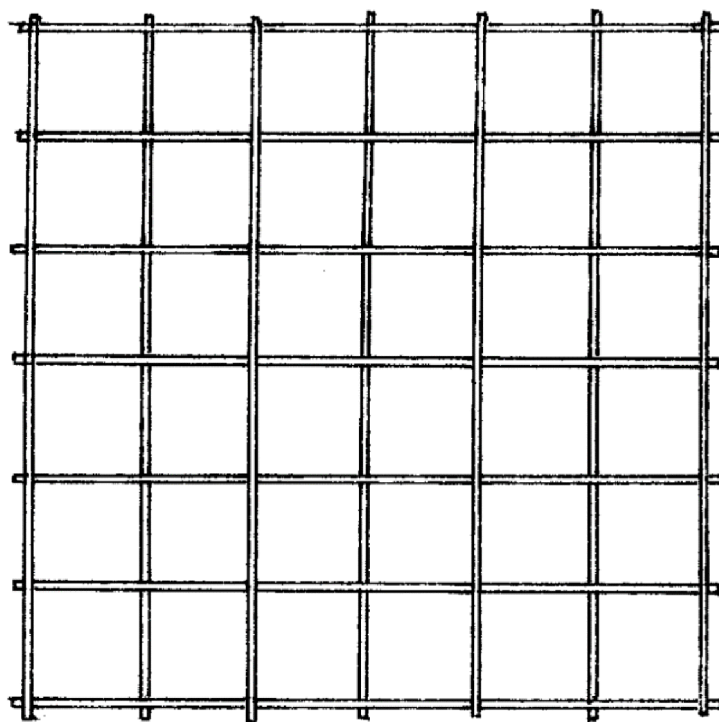


FIG. 2

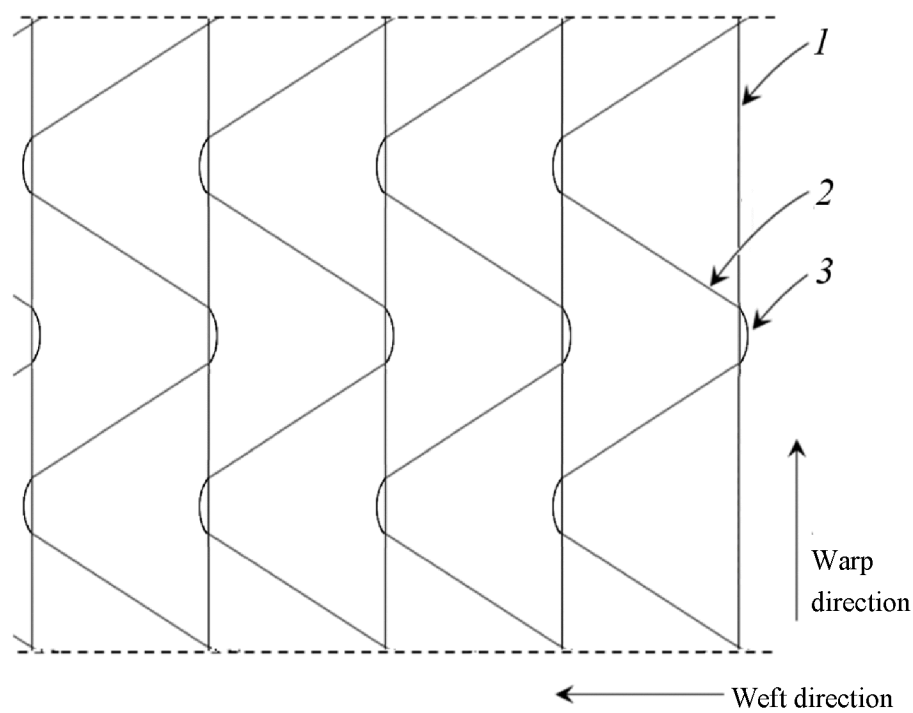


FIG. 3

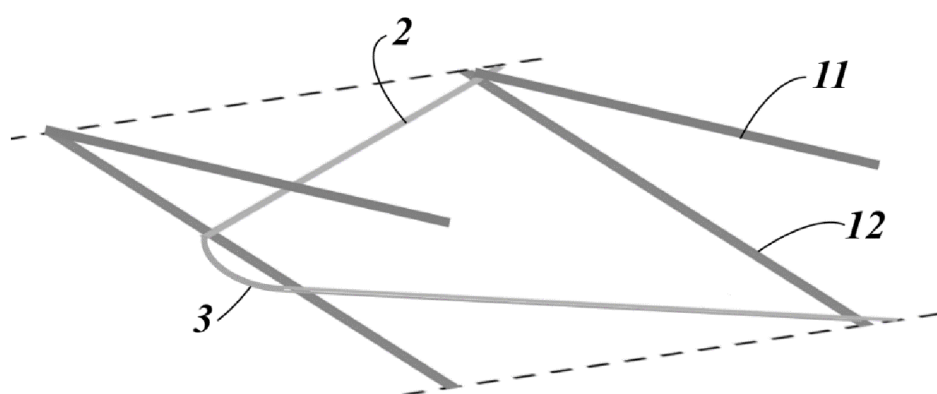


FIG. 4

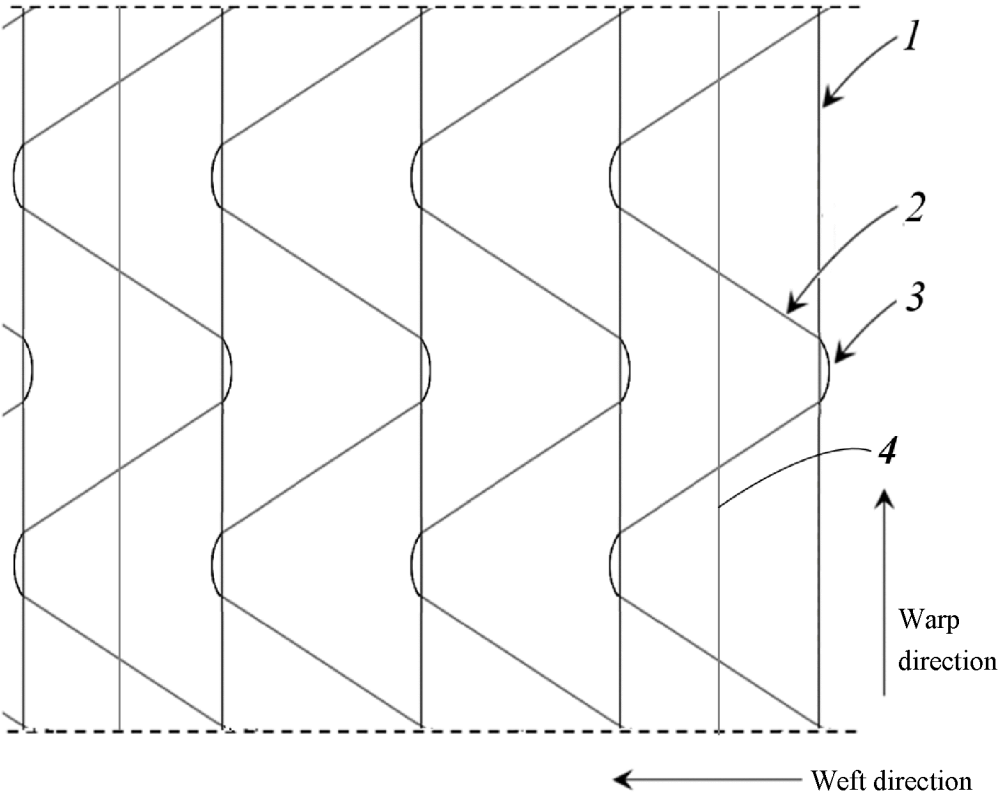


FIG. 5

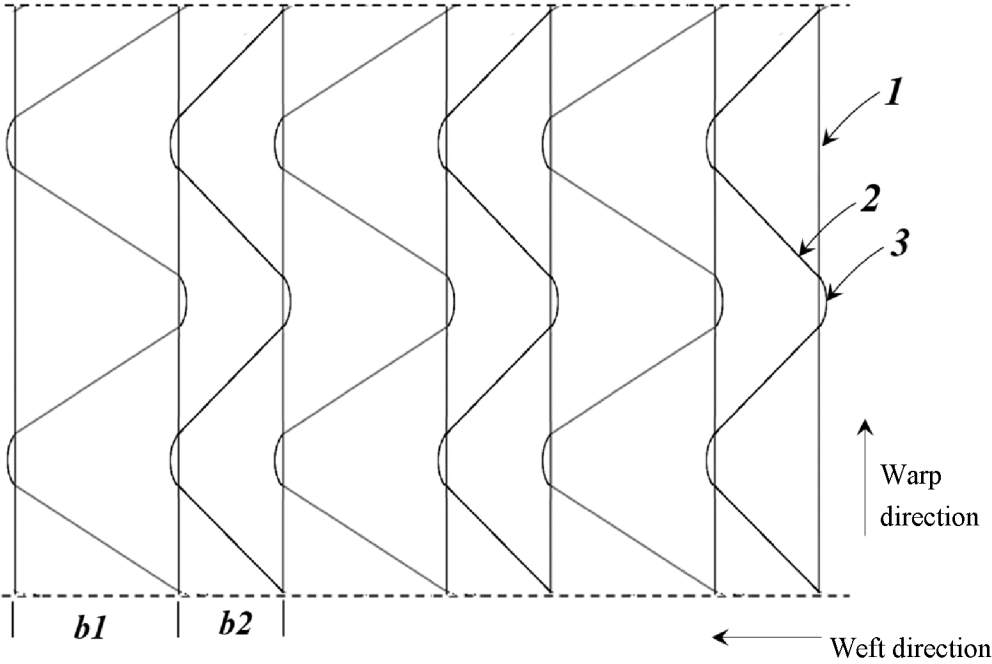


FIG. 6

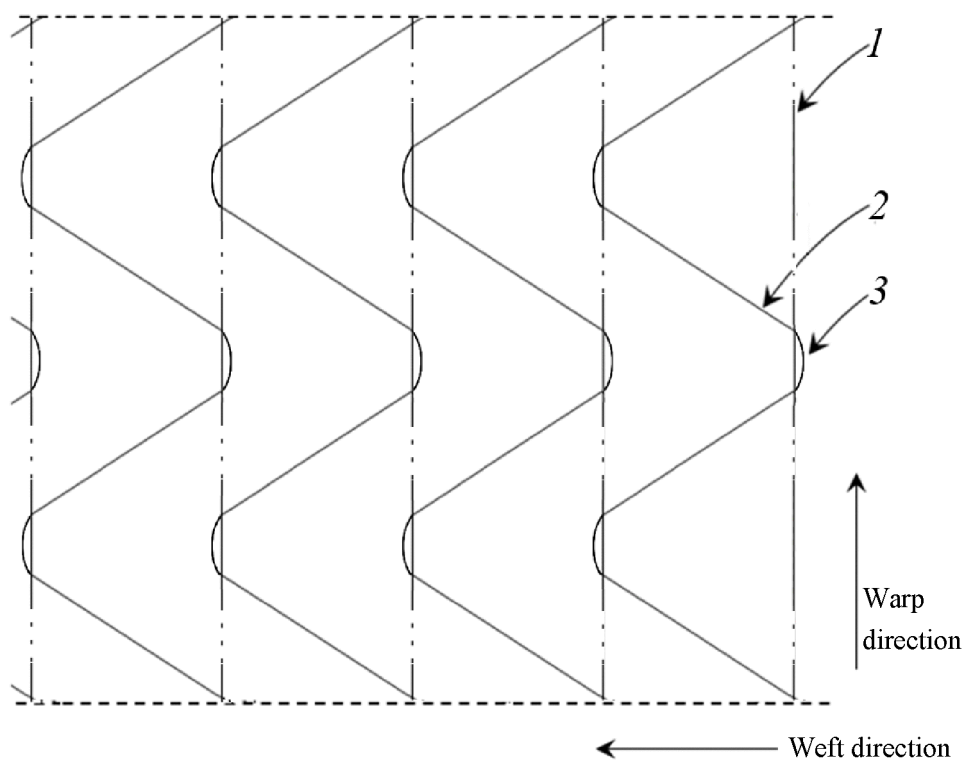


FIG. 7

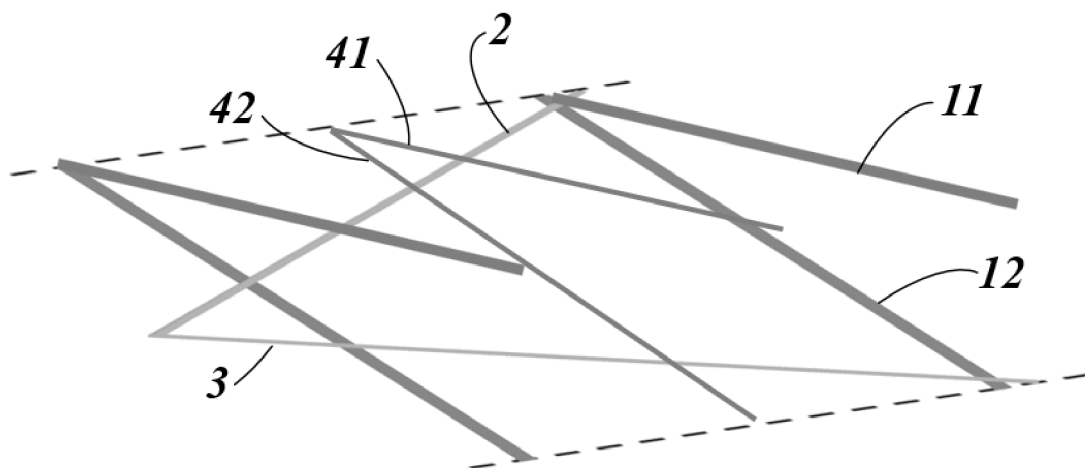


FIG. 8

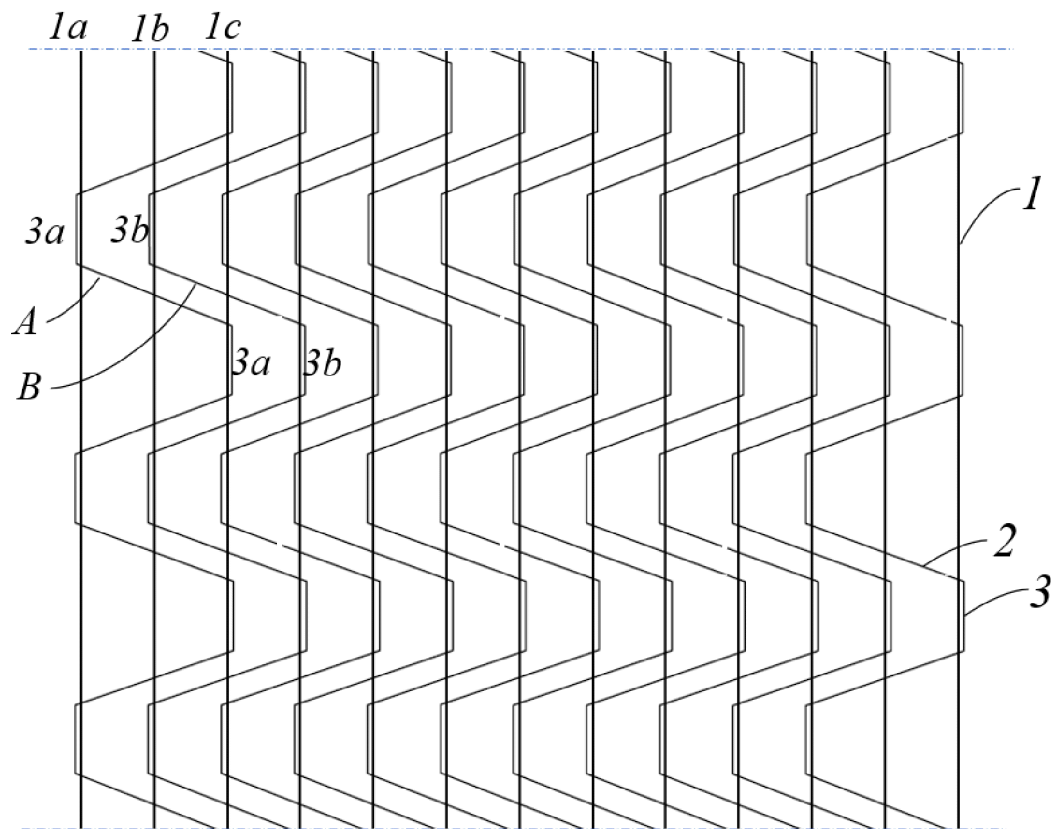


FIG. 9

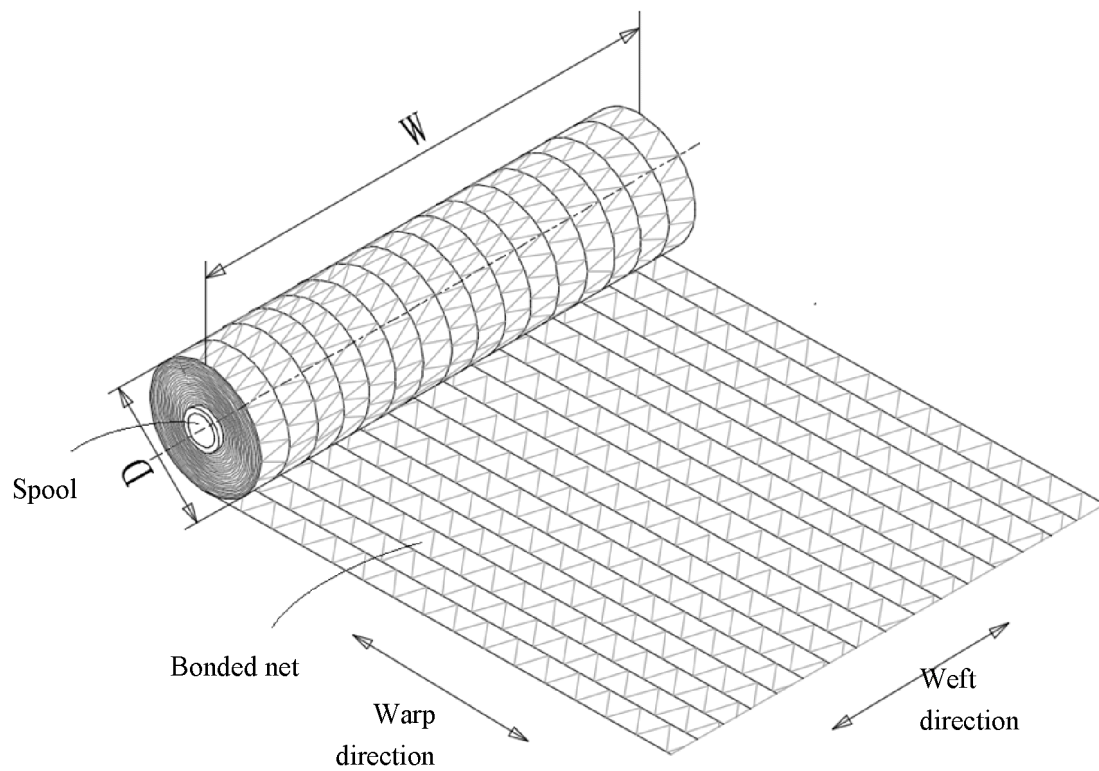


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2025/081833

A. CLASSIFICATION OF SUBJECT MATTER

D04B21/20(2006.01)i; D04B21/10(2006.01)i; D04G1/08(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)

IPC: D04B, D04G

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)

CNTXT, ENTXTC, VCN, VEN: 网, 捆, 经纱, 热, 粘合, 复合, net, bind, warp, heat, bond, composite

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 119392426 A (CHANGZHOU XINHUI NETTING CO., LTD.) 07 February 2025 (2025-02-07) claims 1-24, and figures 3-10	1-30
PX	CN 119433803 A (CHANGZHOU XINHUI NETTING CO., LTD.) 14 February 2025 (2025-02-14) description, specific embodiments, and figures 3-8	1-30
Y	CN 117904782 A (XU JIAJIE) 19 April 2024 (2024-04-19) description, specific embodiments, and figures 3-8	1-23, 26-30
Y	US 2022339897 A1 (VOLM COMPANIES INC.) 27 October 2022 (2022-10-27) description, paragraphs 0012-0015, and figures 1-2	1-23, 26-30
X	CN 117904782 A (XU JIAJIE) 19 April 2024 (2024-04-19) description, specific embodiments, and figures 3-8	24, 25
A	CN 115474482 A (CHANGZHOU XINHUI NETTING CO., LTD.) 16 December 2022 (2022-12-16) entire document	1-30

☒ 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

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

28 July 2025

Date of mailing of the international search report

11 August 2025

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)
China No. 6, Xitucheng Road, Jimenqiao, Haidian District,
Beijing 100088

Authorized officer

Telephone No.

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2025/081833

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 218026603 U (CHANGZHOU XINHUI NETTING CO., LTD.) 13 December 2022 (2022-12-13) entire document	1-30
A	CN 205295657 U (ZHEJIANG CHANGXING YIJIA NET CO., LTD.) 08 June 2016 (2016-06-08) entire document	1-30
A	JP 2018028158 A (MATSUYAMA KEORI KK) 22 February 2018 (2018-02-22) entire document	1-30

TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2025/081833

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 119392426 A	07 February 2025	None	
CN 119433803 A	14 February 2025	None	
CN 117904782 A	19 April 2024	WO 2024078644 A1	18 April 2024
		AU 2023359309 A1	06 March 2025
		US 2025207304 A1	26 June 2025
US 2022339897 A1	27 October 2022	CA 3151026 A1	18 March 2021
		MX 2022002891 A	06 April 2022
		WO 2021050518 A1	18 March 2021
		AT 522338 B1	15 October 2020
		US 12251899 B2	18 March 2025
CN 115474482 A	16 December 2022	WO 2024045913 A1	07 March 2024
CN 218026603 U	13 December 2022	None	
CN 205295657 U	08 June 2016	None	
JP 2018028158 A	22 February 2018	WO 2018034221 A1	22 February 2018

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 202211046218 [0004]
- CN 201210372860 [0005] [0006]