

DESCRIPTION

Title of Invention

REINFORCING SUPPORT MEMBER AND SUPPORTER USING THE SAME

Technical Field

[0001] The present invention relates to a fiber reinforcing support member that partially reinforces and supports a fiber product worn by a wearer and a supporter using the same. In particular, the present invention relates to a reinforcing support member that reinforces and supports moving parts such as knee joints of a wearer and a supporter using the same.

Background Art

[0002] Conventional reinforcing support members of this kind and supporters using the same are made of, for example, a plate material comprising a synthetic resin plate, a coil bone material formed by pressing a metal coil to be flat, and a fiber-solidified material formed by solidifying a heat-melting resin fiber through heat treatment.

[0003] The synthetic resin plate material is disclosed, for example, in Patent Literatures 1 to 6 and is configured to have flexibility such as bending by forming the synthetic resin plate into a predetermined shape, and making a cut(s) such as a slit(s) in a part of this shape or dividing this shape into a plurality of pieces.

[0004] Further, the coil bone material is disclosed, for example, in Patent Literatures 7 and 8 and is configured to support or assist the bending and stretching movement of a wearer by storing the pressed flat metal coil in a bag-shaped storage at a bending and stretching part of a fiber product such as clothing and a supporter.

[0005] Furthermore, the fiber-solidified material is disclosed, for example, in Patent Literature 9 and is configured to have a curing region(s) formed of a thread containing the heat-melting resin fiber and a non-curing region(s) formed of a thread of an uncured fiber that is stable at a melting point of this heat-melting resin.

Citation List

Patent Literature

[0006]

Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2012-143311

Patent Literature 2: Japanese Unexamined Patent Application Publication No. 2010-104707

Patent Literature 3: Japanese Patent No. 4355364

Patent Literature 4: Japanese Unexamined Patent Application Publication No. 10-127674

Patent Literature 5: Re-publication of PCT International Publication No. 2009-157075

Patent Literature 6: Japanese Translation of PCT International Application Publication No. 2003-533304

Patent Literature 7: Japanese Unexamined Patent Application Publication No. 2011-212372

Patent Literature 8: Japanese Utility Model Registration No. 3134256

Patent Literature 9: Japanese Unexamined Patent Application Publication No. 2005-82928

Summary of Invention

Technical Problem

[0007] Each supporter described in Patent Literatures 1 to 6 is configured by molding the synthetic resin plate into the predetermined shape, and making the cut(s) such as the slit(s) in the part of this shape or dividing this shape into the plurality of pieces. Thus, such a supporter has a problem that sufficient support cannot be obtained when a wearer bends the joint, although it can provide linear support when the wearer is in a standing-up state.

[0008] Further, each supporter described in Patent Literatures 7 and 8 is configured to use the coil bone material formed by shaping the metal coil into a flat shape as an elastic reinforcing support member. Thus, such a supporter has a problem that, although it can smoothly follow the bending and stretching movement of the joint of a wearer, it cannot sufficiently support a state of the movement of the wearer with respect to either linear support when the wearer is in a standing-up state or support when the wearer bends the joint. That is, the coil bone material of the elastic reinforcing support member is supposed to be used for parts of a wearer that are originally in a stationary position, for example, the underbust part of a brassiere, the waist part of a corset, and other parts that are not deformed (stationary parts), and thus has no support for stress deformation in a longitudinal direction. This is the reason for the problem.

[0009] Furthermore, a fiber wearing tool described in Patent Literature 9 is used as a support material for knee and ankle supporters, chest and waist corsets, brassieres, and the like, and is formed of an organized body in which the heat-melting resin fiber and the uncured fiber are integrated by being woven to each other at each boundary between the curing region(s) formed of the heat-melting resin fiber and the non-curing region(s) formed of the uncured fiber. Thus, such a fiber wearing tool has a problem that, although sufficient linear support when the wearer is in the standing-up state can be obtained, it cannot smoothly follow the bending and stretching of the joint of the wearer in a case where the curing regions are closely disposed. That is, improving a linear support force of the fiber wearing tool needs to bring the respective curing regions close to each other for mutual cooperation to strengthen the support force, but bringing these curing regions close to each other may cause bending of each curing region to interfere with each other between the respective adjacent curing regions, thus hindering smooth bending.

[0010] The present invention has been made to solve the above problems. An object of the present invention is to provide a reinforcing support member and a supporter using the same that can smoothly follow bending and stretching of the joint of a wearer and support the joint of the wearer at the time of both stretching and bending.

Solution to Problem

[0011] An aspect of the present invention provides a reinforcing support member including: a support section in which both of an outer fabric and a lining fabric are knitted, woven, or braided with one ground thread, a knitted stitch, a woven stitch, or a braided stitch is joined between the outer fabric and the lining fabric with the one ground thread or another ground thread to arrange and form a plurality of elongated three-dimensional fabrics, and a plurality of bone bodies formed by fusing and solidifying the plurality of three-dimensional fabrics are arranged; and a connection section that joins another stretchable ground thread to the one ground thread in the knitted stitch, the woven stitch, or the braided stitch at end edges of the plurality of three-dimensional fabrics between respective adjacent ones of the plurality of three-dimensional fabrics.

[0012] Optionally, in the reinforcing support member according to the aspect of the present invention, the connection section integrally forms the plurality of elongated three-dimensional fabrics by knitting, weaving, or braiding the other stretchable ground thread to the knitted stitch, the woven stitch, or the braided stitch at end edges in an arrangement direction in the outer fabric of one three-dimensional fabric and the lining fabric of the other three-dimensional fabric between the adjacent three-dimensional fabrics.

[0013] Optionally, in the reinforcing support member according to the aspect of the present invention, the one ground thread is formed to contain a heat-fusible resin fiber, and the other stretchable ground thread is formed as uncured fiber that is stable in fusion of the heat-fusible resin fiber.

[0014] Optionally, in the reinforcing support member according to the aspect of the present invention, the support section is formed such that the knitted stitch, the woven stitch, or the braided stitch at end edges in an arrangement direction in the outer fabric and the lining fabric of the plurality of three-dimensional fabrics is alternately shifted in the arrangement direction.

[0015] Optionally, the reinforcing support member according to the aspect of the present invention further includes a fabric selvage section that is arranged at end edges in an arrangement direction of three-dimensional fabrics located at both side edges of the plurality of three-dimensional fabrics and is knitted, woven, or braided with a ground thread made of an uncured fiber that is stable in fusion of the heat-fusible resin fiber.

[0016] Optionally, in the reinforcing support member according to the aspect of the present invention, the other ground thread contains a heat-fusible resin fiber and is fused and solidified by heating together with melting by heating of the one ground thread.

Optionally, this reinforcing support member may be used for a supporter.

[0017] Another aspect of the present invention provides a supporter in which any of the reinforcing support member as described above is arranged at a position corresponding to a bent part of a wearer.

Optionally, the supporter according to the other aspect of the present invention includes: a first anchor part that is woven with a fabric having a loop surface of a hook-and-loop fastener and is fastened to a thigh of a wearer; a main body part having a second anchor

part that is a belt-shaped fabric and is arranged at least below a popliteal region of the wearer in a worn state, a first support part that is arranged on one side from below a part corresponding to a patella of the wearer in the worn state, and a second support part that is arranged on the other side of the part corresponding to the patella of the wearer so as to intersect with the first support part below the part corresponding to the patella of the wearer in the worn state; and a connection support part in which at least both ends of the reinforcing support member are joined to the first anchor part and the second anchor part to integrate the first anchor part and the main body part.

[0018] Optionally, the supporter according to the other aspect of the present invention further includes: a first fastening part that is joined to an end of the second support part and has a hook surface of a hook-and-loop fastener that attaches/detaches to/from the loop surface of the first anchor part; a second fastening part that is joined to one end or the other end of the first anchor part and has a hook surface of a hook-and-loop fastener that attaches/detaches to/from the loop surface of the first anchor part; and a third fastening part that is joined to an end of the first support part and has a hook surface of a hook-and-loop fastener that attaches/detaches to/from the loop surface of the first anchor part, wherein the first support part is arranged on one end side of the main body part, the second support part is arranged on the other end side of the main body part, and the second anchor part is arranged between the first support part and the second support part.

[0019] Optionally, in the supporter according to the other aspect of the present invention, the main body part is formed of a linear belt-shaped element of an equal width.

Optionally, in the supporter according to the other aspect of the present invention, the reinforcing support member of the connection support part is directly fixed to the main body part by sewing.

Advantageous Effects of Invention

[0020] The reinforcing support member according to the aspect of the present invention can support and reinforce various parts of a wearer in a close contact state with various wearing tools such as knitted fabrics and woven fabrics.

Further, the supporter according to the other aspect of the present invention supports a joint of a wearer from both sides with the reinforcing support member, and the reinforcing support member deforms and follows with bending and stretching of the joint, thus making it possible to support the wearer in any posture before, during, or after the deformation.

Brief Description of Drawings

[0021]

FIG. 1A is a plan view of a reinforcing support member according to a first embodiment of the present invention;

FIG. 1B is a cross-sectional view taken along line I-I in FIG. 1A;

FIG. 2A is a plan view of a reinforcing support member according to a second embodiment of the present invention;

FIG. 2B is a cross-sectional view taken along line II-II in FIG. 2A;

FIG. 3A is a knitting configuration diagram of a connection section in the reinforcing support member according to the second embodiment of the present invention;

FIG. 3B is a cross-sectional view taken along line III-III in FIG. 3A;

FIG. 4A is a plan view illustrating a stretched state of the reinforcing support member according to the second embodiment of the present invention;

FIG. 4B is a plan view illustrating a bent state of the reinforcing support member according to the second embodiment of the present invention;

FIG. 4C is a cross-sectional view taken along line IV-IV in FIG. 4B;

FIG. 5A is a front view illustrating a schematic configuration of a supporter according to a third embodiment of the invention;

FIG. 5B is a rear view illustrating the schematic configuration of the supporter according to the third embodiment of the invention;

FIGS. 6A to 6D are diagrams illustrating the fastening operation of the supporter according to the third embodiment of the present invention;

FIG. 7A is a front view illustrating a schematic configuration of a supporter according to a fourth embodiment of the invention; and

FIG. 7B is a rear view illustrating the schematic configuration of the supporter according to the fourth embodiment of the invention.

Description of Embodiments

[0022] (First Embodiment of the Present Invention)

Hereinafter, a reinforcing support member 100 according to a first embodiment of the present invention will be described with reference to FIGS. 1A and 1B.

In these figures, the reinforcing support member 100 according to the present embodiment is configured to include: a support section 1 consisting of three columns of bone bodies 14, 15, 16 formed by fusing and solidifying three columns of elongated three-dimensional (3D) fabrics 11, 12, 13 through heating, each of the 3D fabrics 11, 12, 13 being formed by knitting both of an outer fabric 1A and a lining fabric 1B with a first ground thread 10 containing a heat-fusible resin fiber and joining between the outer fabric 1A and the lining fabric 1B with the first ground thread 10 or second ground thread 10a; and a connection section 2 that joins a third ground thread 20 to stitches at end edges of the 3D fabrics 11, 12, 13 between respective adjacent ones of the 3D fabrics 11, 12, 13, the third ground thread 20 being stretchable and made of an uncured fiber that is stable in fusion of the heat-fusible resin fiber of the first ground thread 10. The number of fabrics to be arranged can be appropriately adjusted according to a fixing force required for a part where to wear. The number of fabrics

to be arranged is preferably 2 or more, particularly preferably 2 to 7, and most preferably 2 to 4.

[0023] The size of the respective elongated 3D fabrics is preferably 5 to 30 cm x 0.5 to 2 cm, more preferably 10 to 25 cm x 0.5 to 1.5 cm, most preferably 15 to 20 cm x 0.5 to 1 cm. Further, the ratio of the long side to the short side of such a 3D fabric is preferably 30:1 to 15:1, more preferably 25:1 to 15:1, and most preferably 22:1 to 18:1.

Furthermore, the thickness of such a 3D fabric is preferably 0.1 to 1 cm, more preferably 0.1 to 0.6 cm, and most preferably 0.1 to 0.4 cm.

[0024] The connection section 2 is configured to have the three elongated 3D fabrics 11, 12, 13 integrally formed by knitting the third ground thread 20 to the stitches at the end edges in an arrangement direction in the outer fabric 11a of one adjacent 3D fabric 11 and the lining fabric 12b of the other adjacent 3D fabric 12 between the adjacent 3D fabrics 11 and 12 as well as to the stitches on the end edges in the outer fabric 12a of one adjacent 3D fabric 12 and the lining fabric 13b of the other adjacent 3D fabric 13 between the adjacent 3D fabrics 12 and 13.

[0025] The first and second ground threads 10 and 10a use ground thread made of a polyester resin fiber, and may be a ground thread of a core-sheath composite multifilament ("MELSET," a product manufactured by UNITIKA LTD.) with a high viscosity polyester resin in the core (i.e., on the inside) and a crystalline polyester resin boasting a low melting point in the sheath (i.e., on the outside), for example. The first ground thread 10 and the second ground thread 10a may use thermoplastic synthetic fibers such as nylon resins, acrylic resins, and vinylon resins, in addition to the polyester resin.

[0026] The third ground thread 20 may use, for example, polyurethane resins, polyester resins, nylon resins.

[0027] The 3D fabrics 11, 12, 13 have a two-dimensional planar structure in a weft direction and a warp direction with the first ground thread 10, and are also formed in a thickness direction with the same ground thread 10 as that knitted in the warp direction, thus enabling a three-dimensional structure to be configured. These 3D fabrics 11, 12, 13 may also be knitted by knitting machines having a two-row needle bed, a four-row needle bed, or the like, such as a raschel knitting machine and a double raschel knitting machine.

[0028] The 3D fabrics 11, 12, 13 knitted with the ground thread of the core-sheath composite multifilament are solidified after only the resin part on the outside of the ground thread is melted by heat treatment, thus retaining the characteristics of the ground thread itself and, at the same time, enabling the knitted 3D fabrics to be three-dimensionally formed with their shapes unchanged as the three columns of bone bodies 14, 15, 16 as well as enabling strength to be given thereto by the solidification to be rigid bodies having an elastic force.

[0029] In this way the three columns of bone bodies 14, 15, 16 are configured to be formed as the rigid bodies having an elastic force adjacent to each other, and to be integrated by joining the stretchable third ground thread 20 to the stitches on the end edges of the 3D fabrics 11, 12 (corresponding to the bone bodies 14, 15) and the 3D fabrics 12, 13 (corresponding to the bone

bodies 15, 16), between the respective adjacent ones (14, 15; 15, 16) of the bone bodies 14, 15, 16. In particular, these bone bodies 14, 15, 16 are preferably configured to be integrated by joining the stretchable third ground thread 20 to the stitches on the end edges in the outer fabrics 11a resp. 12a of the 3D fabrics 11 resp. 12 (corresponding to the bone bodies 14 resp. 15) and in the lining fabrics 12b resp. 13b of the 3D fabrics 12 resp. 13 (corresponding to the bone bodies 15 resp. 16). This allows the support member to have strong stress against compression and stretching in a longitudinal direction in a linear upright state, and also have both smooth bending movement and strong bending stress at the time of bending.

[0030] The reinforcing support member 100 according to the present embodiment can smoothly perform bending movement at the time of bending and has strong bending stress, in addition to the strong linear support force, so that it can also be applied to various functional clothes having deformable or moving parts, such as supporters (for a knee, elbow, neck, wrist, ankle, finger, etc.), corsets, underwear, wearable support clothing further having driving parts, and equipment.

[0031] (Second Embodiment of the Present Invention)

A reinforcing support member 200 according to a second embodiment of the present invention will be described with reference to FIGS. 2A and 2B, FIGS. 3A and 3B, and FIGS. 4A to 4C.

In the respective figures, the reinforcing support member 200 according to the present embodiment is configured to include the support section 1 and the connection section 2 in common, just like the reinforcing support member according to the first embodiment, and in addition to this configuration, further include a fabric selvage section 3 arranged at end edges in the arrangement direction of the 3D fabrics 11, 13 located at both side edges of the support section 1 and knitted with a polyester thread (regular polyester thread) made of an uncured fiber that is stable in fusion of the first ground thread 10. Providing the fabric selvage section 3 allows the reinforcing supporting member 200 to be fixed by sewing or other methods and design such as color and shape to be imparted as necessary, without affecting performance of the reinforcing support member 200. The thread configuring the fabric selvage section 3 may be appropriately selected other than the polyester thread. When the bone bodies 14, 15, 16 are made of the heat-fusible resin fiber, fibers such as cotton, rayon resins, and nylon resins having a higher melting point than that of said resin fiber may be used.

[0032] Further, the support section 1 is configured to include step parts 14c, 15c, 15d, 16c formed by knitting, while alternately shifting in the arrangement direction, the stitches on the end edges in the arrangement direction in the outer fabrics 11a, 12a, 13a and the lining fabrics 11b, 12b, 13b of the 3D fabrics 11, 12, 13.

[0033] The knitting of the 3D fabrics 11, 12, 13 in which the step parts 14c, 15c, 15d, 16c are formed is carried out by continuously knitting the first thread 10 in the X-axis direction as a weft thread 114a (115a) on the front side 14a (15a) and continuously knitting the first thread 10 in the X-axis direction as a weft thread 114b (115b) on the back side 14b (15b), as shown in

FIGS. 3A and 3B. For the resultant two-dimensional planar front and back sides 14a, 14b (15a, 15b) formed of these weft threads 114a, 114b (115a, 115b), the first thread 10 is joined as a warp thread 114c (115c) to the weft threads 114a, 114b (115a, 115b) in the z-axis direction to be knitted into a three-dimensional structure, forming the elongated 3D fabrics 11, 12, 13 which are continuous in the warp knitting direction (the Y-axis direction).

[0034] In this way the 3D fabrics 11, 12, 13 have the stitches on the end edges in the arrangement direction of the front side 14a (15a) and the back side 14b (15b) shifted to each other by one stitch, so that the bone bodies 14, 15 formed by being melted with heat treatment and solidified have a shape in which the opposing end faces adjacently arranged slant in a stepped shape. Since the opposing side end faces are configured to slant in this way, the reinforcing support member 200 can have, when the bone bodies 14, 15, 16 adjacent in three columns are bent (see FIG. 4B) in the arrangement direction from a linear upright state (see FIG. 4A), the corresponding adjacent end edges overlapping each other as shown in FIG. 4C as well as the respective bone bodies 14, 15, 16 integrated and connected with the stretchable third ground thread 20.

[0035] Since the bone bodies 14, 15, 16 function in this way, the reinforcing support member 200 according to the present embodiment can obtain strong stress against compression and stretching in the longitudinal direction in the linear upright state, and enable smooth bending movement, and furthermore have support force during and after such bending movement.

[0036] (Third Embodiment of the Present Invention)

A supporter 300 according to a third embodiment of the present invention will be described with reference to FIGS. 5A and 5B and FIGS. 6A to 6D.

[0037] As shown in these figures, the supporter 300 of the present invention is configured to include: a first anchor part 5 that is woven with a fabric having a loop surface 51 of a hook-and-loop fastener and is fastened to the thigh of a wearer; a main body part 4 that consists of a second anchor part 6 to be arranged at least below the popliteal region of the wearer, a first support part 7 to be arranged in a stretched state on one side from below a part corresponding to patella 500 of the wearer, and a second support part 8 to be arranged in a stretched state on the other side of the part corresponding to the wearer's patella 500 so as to intersect with the first support part 7 below the part corresponding to the wearer's patella 500, the main body part 4 being made of a belt-shaped fabric; and a connection support part 9 that is joined to the first anchor part 5 and the second anchor part 6 to integrate the first anchor part 5 and the main body part 4.

[0038] Note that the second anchor part 6 according to the present embodiment is arranged between the first support part 7 and the second support part 8 to configure the main body part 4, and the first support part 7, the second anchor part 6, and the second support part 8 are formed linearly with the same width.

Alternatively, the first support part 7 and the second support part 8 may be formed by being inclined upward toward the first anchor part 5 side, in contrast to the configuration in which they are linearly connected to the second anchor part 6.

[0039] Further, the connection support part 9 according to the present embodiment is a pair of right and left bag-shaped parts 91 enclosing the reinforcing support members 100 according to the first embodiment, and is arranged in a stretched state on both sides of the part corresponding to the wearer's patella.

In the following description, to distinguish between the left and right bag-shaped parts 91 (the reinforcing support members 100), the left bag-shaped part 91 (the reinforcing support member 100) is referred to as a left bag-shaped part 91a (a left reinforcing support member 100a), and the right bag-shaped part 91 (the reinforcing support member 100) is referred to as a right bag-shaped part 91b (a right reinforcing support member 100b), in FIGS. 5A and 5B.

[0040] Further, the supporter 300 of the present invention is configured to include: a first fastening part 80 that is joined to an end of the second support part 8 which is another end 84 of the main body part 4, and has a hook surface 83 of the hook-and-loop fastener which attaches/detaches to/from the loop surface 51 of the first anchor part 5; a second fastening part 56 that is joined to one end 52 or the other end 53 of the first anchor part 5 and has a hook surface 56c of the hook-and-loop fastener which attaches/detaches to/from the loop surface 51 of the first anchor part 5; and a third fastening part 70 that is joined to an end of the first support part 7 which is one end 74 of the main body part 4, and has a hook surface 73 of the hook-and-loop fastener which attaches/detaches to/from the loop surface 51 of the first anchor part 5.

[0041] Note that the third fastening part 70 (the hook surface 73) according to the present embodiment is arranged on a lining fabric surface side of the one end 74 of the main body part 4 from the viewpoint of ease of attachment/detachment and flexibility of fastening position.

Further, the third fastening part 70 according to the present embodiment has a planar shape combining a rectangle and an isosceles trapezoid as shown in FIG. 5B, for example. A rectangular part 71 thereof is sewn on one surface (lining fabric surface) of the main body part 4 and an isosceles trapezoidal part 72 thereof protrudes from the one end 74 of the main body part 4.

[0042] The third fastening part 70 has the isosceles trapezoidal part 72 protruding from the one end 74 of the main body part 4 in this way, so that the third fastening part 70 is thinned by the amount that does not overlap with the main body part 4, facilitating the wearer to grip the isosceles trapezoidal part 72 with the fingers and enabling the hook surface 73 to be easily attached/detached to/from the loop surface 51 of the first anchor part 5.

Note that the supporter may be such a dual-purpose type that it can be worn on the knee of the wearer's left or right leg.

[0043] Further, the main body part 4 according to the present embodiment may be a stretchable fabric that does not have a loop surface of a hook-and-loop fastener as shown in

FIGS. 5A and 5B, in addition to a case where it has the loop surface of the hook-and-loop fastener.

Note that the maximum elongation in the warp direction (longitudinal direction L) of the main body part 4 according to the present embodiment is set, regardless of when the main body part 4 has the loop surface of the hook-and-loop fastener or when the main body part 4 is the stretchable fabric that does not have the loop surface of the hook-and-loop fastener, preferably to 40% to 80%, more preferably 45% to 75%, most preferably 60%.

[0044] In this case, the main body part 4 requires no pile thread forming the loop surface, and also require no fusion thread for holding loops of the pile thread.

Further, the main body part 4 according to the present embodiment may use a warp ground thread in which intersection ups and downs of the warp ground thread and the weft thread are reversed, instead of the pile thread configuring the warp thread.

[0045] Further, in order to configure an intersection and a lower anchor below the knee, the main body part 4 needs to include parts (the first support part 7 and the second support part 8) intersecting below the wearer's knee and a part (the second anchor part 6) encircling the wearer's lower leg at least halfway below the popliteal region of the wearer.

[0046] Although the length around the knees and the thickness of the lower leg vary from person to person depending on gender, age, and the like, the length of the main body part 4 may be set to, for example, 44 cm to 52 cm (for example, S size: 44 cm, M size: 48 cm, and L size: 52 cm).

[0047] Further, the first anchor part 5 according to the present embodiment goes around the wearer's thigh, so that the length of its belt-shaped element is preferably set to, for example, 29 cm to 37 cm (for example, S size: 29 cm, M size: 33 cm, and L size: 37 cm).

[0048] Further, the bag-shaped parts 91 of the connection support part 9 according to the present embodiment use a 100% polyester double raschel fabric (for example, the product number "7200SK" of INOUE KNIT CO., LTD.), and are configured to enclose the reinforcing support member 100 by folding in half the double raschel fabric of a rectangular shape (for example, 17.5 cm long and 6 cm wide) with the reinforcing support member 100 sandwiched therebetween and sewing the peripheral part excluding the folded part.

[0049] Note that the bag-shaped parts 91 are not limited to the double raschel fabric, and may use any other fabrics having cushioning, such as, for example, a fabric with another fabric bonded to both sides of neoprene and a fabric with another fabric bonded to both sides of foamed urethane.

[0050] Further, the left bag-shaped part 91a (the right bag-shaped part 91b) according to the present embodiment is joined (for example, sewn) to the first anchor part 5 from the lining fabric side with an upper side of the left bag-shaped part 91a (the right bag-shaped part 91b) aligned with an upper side 55 of the first anchor part 5, at a position where the distance from the one end 52 (the other end 53) of the first anchor part 5 to the center line of the left bag-shaped part 91a (the right bag-shaped part 91b) is 5 to 7 cm, and is also joined (for example,

sewn) to the main body part 4 from the lining fabric side with a lower side of the left bag-shaped part 91a (the right bag-shaped part 91b) aligned with a lower side of the main body part 4, at a position where the distance from the one end 74 (the other end 84) of the main body part 4 to the center line of the left bag-shaped part 91a (the right bag-shaped part 91b) is 13 to 15 cm. However, it is preferable to set the joining positions of the bag-shaped parts 91 (the left bag-shaped part 91a and the right bag-shaped part 91b) as appropriate in view of the maximum elongation in the warp direction (the longitudinal direction L) of the main body part 4 and the first anchor part 5.

[0051] That is, the interval between a lower end of the left bag-shaped part 91a (the left reinforcing support member 100a) and a lower end of the right bag-shaped part 91b (the right reinforcing support member 100b) relative to the interval between an upper end of the left bag-shaped part 91a (the left reinforcing support member 100a) and an upper end of the right bag-shaped part 91b (the right reinforcing support member 100b) is not limited to the same, and may be different (wider or narrower). It is preferable to set such intervals as appropriate in view of the maximum elongation in the warp direction (the longitudinal direction L) of the main body part 4 and the first anchor part 5.

[0052] In particular, the reinforcing support member 100 enclosed in the bag-shaped parts 91 is a flexible plate-like body that can curve in a direction perpendicular to the main surface (hardly curve in a direction parallel to the main surface), so that when the wearer bends the knee joint, a force acts so as to restore the wearer's knee joint to its normal position by a restoring force of the reinforcing support member 100 that has been curved in the direction perpendicular to the main surface.

[0053] Note that since the bag-shaped parts 91 (the left bag-shaped part 91a and the right bag-shaped part 91b) are joined to the main body part 4 and the first anchor part 5 on the lining fabric side, the connection support part 9 (the reinforcing support members 100) is arranged on the inside (i.e., on the wearer's side) of the main body part 4 and the first anchor part 5 in a state of the supporter being worn.

This allows the upper and lower ends of the connection support part 9 (the bag-shaped parts 91, the reinforcing support members 100) to be pressed by the main body part 4 and the first anchor part 5, preventing the upper and lower ends of the connection support part 9 (the bag-shaped parts 91, the reinforcing support members 100) from protruding.

[0054] In particular, the upper end of the connection support part 9 (the bag-shaped parts 91) and the first anchor part 5 may be joined by folding the upper side 55 of the first anchor part 5 from the side of the upper side 55 of the first anchor part 5 toward the lining fabric side and sandwiching the upper end of the connection support part 9 (the bag-shaped parts 91) with the folded part of the first anchor part 5, thereby reinforcing the upper ends of the bag-shaped parts 91 and preventing damage to the upper ends of the bag-shaped parts 91 caused by the reinforcing support members 100.

[0055] Next, how to wear the supporter 300 shown in FIGS. 5A and 5B will be described with reference to FIGS. 6A to 6C.

In the following description, a case where the supporter 300 is worn on the right knee of a wearer will be described. In a case where the supporter 300 is worn on the left knee of the wearer, expressions “right knee,” “outer side of the lower leg,” and “inner side of the lower leg” should be read as “left knee,” “inner side of the lower leg,” and “outer side of the lower leg,” respectively.

[0056] As shown in FIG. 6A, the wearer fastens the first anchor part 5 to the thigh by aligning the one end 52 of the first anchor part 5 with the center of the thigh near the kneecap to press the one end 52 of the first anchor part 5 with the left hand, and winding the first anchor part 5 around the thigh with the right hand, and placing the first anchor part 5 in a stretched state on the thigh, and attaching by engagement the hook surface 56c of the second fastening part 56 located at the other end 53 of the first anchor part 5 to the loop surface 51 of the first anchor part 5.

[0057] In this case, the left connection support part 9 (the left bag-shaped part 91a, the left reinforcing support member 100a) is arranged between the patella and the sartorius muscle of the wearer, and the right connection support part 9 (the right bag-shaped part 91b, the right reinforcing support member 100b) is arranged between the patella 500 and the iliotibial band of the wearer.

[0058] Then, the wearer pulls the first support part 7 of the main body part 4 while gripping the one end 74 of the main body part 4 (the first support part 7) with the right hand, and places the first support part 7 of the main body part 4 in a stretched state on the right side from below a part corresponding to the patella of the right knee.

[0059] Then, as shown in FIG. 6B, the wearer attaches by engagement the hook surface 73 of the third fastening part 70 located at the one end 74 of the main body part 4 to the loop surface 51 of the first anchor part 5. In this case, the first support part 7 overlaps with the right connection support part 9 (the right bag-shaped part 91b, the right reinforcing support member 100b) and presses the right connection support part 9.

[0060] Then, the wearer grips the other end 84 of the main body part 4 (the second support part 8) with the left hand and places the second support part 8 of the main body part 4 in a stretched state on the left side while the second support part 8 intersects with the first support part 7 below the part corresponding to the patella 500 of the right knee.

[0061] Finally, as shown in FIGS. 6C and 6D, the wearer attaches by engagement the hook surface 83 of the first fastening part 80 located at the other end 84 of the main body part 4 to the loop surface 51 of the first anchor part 5 for completion. In this case, the second support part 8 overlaps with the left connection support part 9 (the left bag-shaped part 91a, the left reinforcing support member 100a) and presses the left connection support part 9.

[0062] Note that the above-mentioned how to wear the supporter 300 describes the case where the second support part 8 of the main body part 4 is arranged from the left side of the part

corresponding to the patella of the right knee after the first support part 7 of the main body part 4 is arranged from the right side of the part corresponding to the patella of the right knee, but the first support part 7 of the main body part 4 may be arranged from the right side of the part corresponding to the patella 500 of the right knee after the second support part 8 of the main body part 4 is arranged from the left side of the part corresponding to the patella 500 of the right knee.

[0063] As described above, the supporter 300 allows the main body part 4 (the first support part 7, the second support part 8) to fix the wearer's patella 500 (knee joint) by lifting it from below toward the thigh side from the lower leg side and wrapping it around and to support the medial collateral ligament and the lateral collateral ligament of the wearer, thereby making it possible to smoothly assist the movement of the quadriceps femoris muscle and to suppress side-to-side shaking of the knee joint to reduce the burden on the knee.

[0064] Further, the supporter 300 allows the main body part 4 (the first support part 7, the second support part 8) to sandwich and press the wearer's knee joint from either side and to restrict excessive stretching of the wearer's knee ligament (the medial collateral ligament and the lateral collateral ligament), thus making it possible to suppress wearing out of the cartilage of the knee joint and inflammation of the ligament and prevent damage to the knee joint.

[0065] In particular, the supporter 300 according to the present embodiment includes the connection support part 9, so that even in a state where the second anchor part 6 is pulled by the first support part 7 and the second support part 8, it is possible to sufficiently perform the function of pulling up the patella 500 by the intersection of the first support part 7 and the second support part 8 caused by that intersection being moved upward based on the stretching of the first support part 7 and the second support part 8, while maintaining the interval between the first anchor part 5 and the second anchor part 6 to prevent the second anchor part 6 from riding up.

[0066] Further, wearing a knee supporter having two belt-shaped support parts corresponding to the first support part 7 and the second support part 8 of the supporter 300 is effective as a method of supporting the knee joint of a wearer. In other words, wearing the knee supporter (for example, a supporter) by making the two belt-shaped support parts (for example, the first support part 7 and the second support part 8) intersect below the part corresponding to the wearer's patella 500, and then placed on the left and right sides so as to lift the patella 500 upward from below, allows the two belt-shaped support parts to sandwich the wearer's patella 500 from either side, and at the same time, the intersection of the two belt-shaped support parts to support the wearer's patella 500 so as to lift the patella upward from below as an acting point for the patella, thus achieving operational effects of smoothly assisting the movement of the quadriceps muscle and reducing the burden on the knee of the wearer.

[0067] Further, wearing a knee supporter having a belt-shaped anchor part with a loop surface corresponding to the first anchor part 5 of the supporter 300 attached to the knee supporter having the two belt-shaped support parts is even more effective as a method of supporting the

knee joint of a wearer. In other words, wearing the knee supporter by attaching by engagement respective one ends of the two belt-shaped support parts (for example, the first support part 7 and the second support part 8) to the loop surface of the belt-shaped anchor part (for example, the first anchor part 5) fixed to the thigh of the wearer so as to lift the patella 500 upward from below, allows the knee supporter to be reliably fixed to the position of the wearer's knee joint, thus more effectively achieving operational effects of the two belt-shaped support parts.

[0068] Further, the supporter 300 according to the present embodiment may be configured to have the main body part 4 formed using a Jacquard needle loom, and at that time, a product name, characters such as wearing sequence, and patterns such as symbols added thereto, as necessary.

[0069] (Fourth Embodiment of the Present Invention)

A supporter 400 according to a fourth embodiment of the present invention will be described with reference to FIGS. 7A and 7B. Note that in these figures, the same reference numerals as those in FIGS. 5A and 5B and FIGS. 6A to 6D denote the same or corresponding parts, and the description thereof will be omitted.

[0070] As shown in FIGS. 7A and 7B, the supporter 400 according to the present embodiment is configured to include the reinforcing support member 200 according to the second embodiment as a connection support part 90. This connection support part 90 includes a cover part 93 that covers an area connecting back sides of the first anchor part 5 and the second anchor part 6 (more specifically, sewn to the first anchor part 5 and the second anchor part 6, opens the kneecap side of a wearer, and covers the popliteal region and both sides of the knee of the wearer), and is arranged in a stretched state from both sides of the part corresponding to the wearer's patella 500 to the wearer's popliteal region.

[0071] The reinforcing support member 200 is configured to be directly fixed to the first anchor part 5 by sewing, the second anchor part 6, and the cover part 93 at the fabric selvage sections 3 (31, 32) respectively arranged at the end edges in the arrangement direction of the bone bodies 14, 15 of the support part 1. That is, the reinforcing support member 200 is knitted with the polyester thread made of uncured fibers at the time of knitting the 3D fabrics 11, 12, 13 at a stage before the bone bodies 14, 15, 16 are subjected to a heat curing treatment, so that even if the bone bodies 14, 15, 16 have the characteristics as rigid bodies, the sewing process can be performed while maintaining the characteristics as knitted fabrics.

[0072] Note that the cover part 93 according to the present embodiment is formed of a rectangular fabric that overlaps with a region surrounded by the first anchor part 5, the second anchor part 6, and the reinforcing support members 200 (the left reinforcing support member 200a, the right reinforcing support member 200b), and is sewn on the lining fabric side of the supporter.

[0073] The supporter 400 according to the present embodiment includes the cover part 93 on the inside (i.e., on the wearer's side) of the first anchor part 5, the second anchor part 6, and the reinforcing support members 200, so that when the wearer bends the knee joint, the cover part

93 acts as a cushioning material, and a feeling of discomfort that may be caused by the first anchor part 5 and the second anchor part 6 approaching each other to pinch the skin of the popliteal region can be eased.

[0074] Further, the cover part 93 according to the present embodiment is, of the region overlapping with the first anchor part 5, sewn at the upper side 55 and both sides of the first anchor part 5 and not sewn at the lower side 54 of the first anchor part 5, and, of the region overlapping with the second anchor part 6, sewn at the lower side 6c and part of the lower sides of both sides of the second anchor part 6 and not sewn at the upper side 6d of the second anchor part 6.

[0075] Due to this sewing position, the cover part 93 having a different maximum elongation from the first anchor part 5 and the second anchor part 6 can suppress following the stretching movement of the first anchor part 5 and the second anchor part 6 as much as possible and suppress the occurrence of wrinkles in the cover part 93.

[0076] In particular, as shown in FIG. 7A, the supporter according to the present embodiment is configured by folding back the cover part 93 to the outer fabric side at the upper side 55 of the first anchor part 5 and joining it with the first anchor part 5, so that the cover part 93 curved at the upper side 55 of the first anchor part 5 can act as the cushioning material to prevent an edge end of the first anchor part 5 (the upper side 55) from directly contacting the bare skin on the back side of the thigh of the wearer, reducing the pressing force from the edge end of the first anchor part 5 (the upper side 55).

[0077] (Other Embodiments of the Present Invention)

Although the reinforcing support member in each of the first to fourth embodiments is configured of a knitted fabric by knitting, it is also possible to configure respective fabrics by weaving or braiding, and form 3D fabrics with ground thread containing heat-fusible resin fiber as is the case with the knitted fabric, and connect these 3D fabrics by a connection section made of uncured fiber, and then process the 3D fabrics with heat treatment into rigid bone bodies having an elastic force.

Reference Signs List

[0078]

1	Support section
1A	Outer fabric
1B	Lining fabric
2	Connection section
3	Fabric selvage section
4	Main body part
5	First anchor part
6	Second anchor part
7	First support part

70	Third fastening part
8	Second support part
80	First fastening part
9	Connection support part
91a	Left bag-shaped part
91b	Right bag-shaped part
93	Cover part
10	First ground thread
10a	Second ground thread
11, 12, 13	Three-dimensional (3D) fabric
11a, 12a, 13a	Outer fabric of 3D fabric
11b, 12b, 13b	Lining fabric of 3D fabric
14, 15, 16	Bone body
14a, 15a, 16a	Front side
14b, 15b, 16b	Back side
14c, 15c, 15d, 16c	Step part
20	Third ground thread
51	Loop surface
100, 200	Reinforcing support member

CLAIMS

1. A reinforcing support member comprising:
a support section in which both of an outer fabric and a lining fabric are knitted, woven, or braided with one ground thread, a knitted stitch, a woven stitch, or a braided stitch is joined between the outer fabric and the lining fabric with the one ground thread or another ground thread to arrange and form a plurality of elongated three-dimensional fabrics, and a plurality of bone bodies formed by fusing and solidifying the plurality of three-dimensional fabrics are arranged; and
a connection section that joins another stretchable ground thread to the one ground thread in the knitted stitch, the woven stitch, or the braided stitch at end edges of the plurality of three-dimensional fabrics between respective adjacent ones of the plurality of three-dimensional fabrics.
2. The reinforcing support member according to claim 1, wherein the connection section integrally forms the plurality of elongated three-dimensional fabrics by knitting, weaving, or braiding the other stretchable ground thread to the knitted stitch, the woven stitch, or the braided stitch at end edges in an arrangement direction in the outer fabric of one three-dimensional fabric and the lining fabric of the other three-dimensional fabric between the adjacent three-dimensional fabrics.
3. The reinforcing support member according to claim 1, wherein the one ground thread is formed to contain a heat-fusible resin fiber, and the other stretchable ground thread is formed as uncured fiber that is stable in fusion of the heat-fusible resin fiber.
4. The reinforcing support member according to claim 1, wherein the support section is formed such that the knitted stitch, the woven stitch, or the braided stitch at end edges in an arrangement direction in the outer fabric and the lining fabric of the plurality of three-dimensional fabrics is alternately shifted in the arrangement direction.
5. The reinforcing support member according to claim 1, further comprising a fabric selvage section that is arranged at end edges in an arrangement direction of three-dimensional fabrics located at both side edges of the plurality of three-dimensional fabrics and is knitted, woven, or braided with a ground thread made of an uncured fiber that is stable in fusion of the heat-fusible resin fiber.
6. The reinforcing support member according to claim 1, wherein the other ground thread contains a heat-fusible resin fiber and is fused and solidified by heating together with melting by heating of the one ground thread.

7. A supporter, wherein the reinforcing support member according to any one of claims 1 to 6 is arranged at a position corresponding to a bent part of a wearer.

8. A supporter using the reinforcing support member according to any one of claims 1 to 6, the supporter comprising:

- a first anchor part that is woven with a fabric having a loop surface of a hook-and-loop fastener and is fastened to a thigh of a wearer;

- a main body part comprising:

- a second anchor part that is a belt-shaped fabric and is arranged at least below a popliteal region of the wearer in a worn state;

- a first support part that is arranged on one side from below a part corresponding to a patella of the wearer in the worn state; and

- a second support part that is arranged on the other side of the part corresponding to the patella of the wearer so as to intersect with the first support part below the part corresponding to the patella of the wearer in the worn state; and

- a connection support part in which at least both ends of the reinforcing support member are joined to the first anchor part and the second anchor part to integrate the first anchor part and the main body part.

9. The supporter according to claim 8, further comprising:

- a first fastening part that is joined to an end of the second support part and has a hook surface of a hook-and-loop fastener that attaches/detaches to/from the loop surface of the first anchor part;

- a second fastening part that is joined to one end or the other end of the first anchor part and has a hook surface of a hook-and-loop fastener that attaches/detaches to/from the loop surface of the first anchor part; and

- a third fastening part that is joined to an end of the first support part and has a hook surface of a hook-and-loop fastener that attaches/detaches to/from the loop surface of the first anchor part,

- wherein the first support part is arranged on one end side of the main body part, the second support part is arranged on the other end side of the main body part, and the second anchor part is arranged between the first support part and the second support part.

10. The supporter according to claim 8, wherein the main body part is formed of a linear belt-shaped element of an equal width.

11. The supporter according to claim 8, wherein the reinforcing support member of the connection support part is directly fixed to the main body part by sewing.