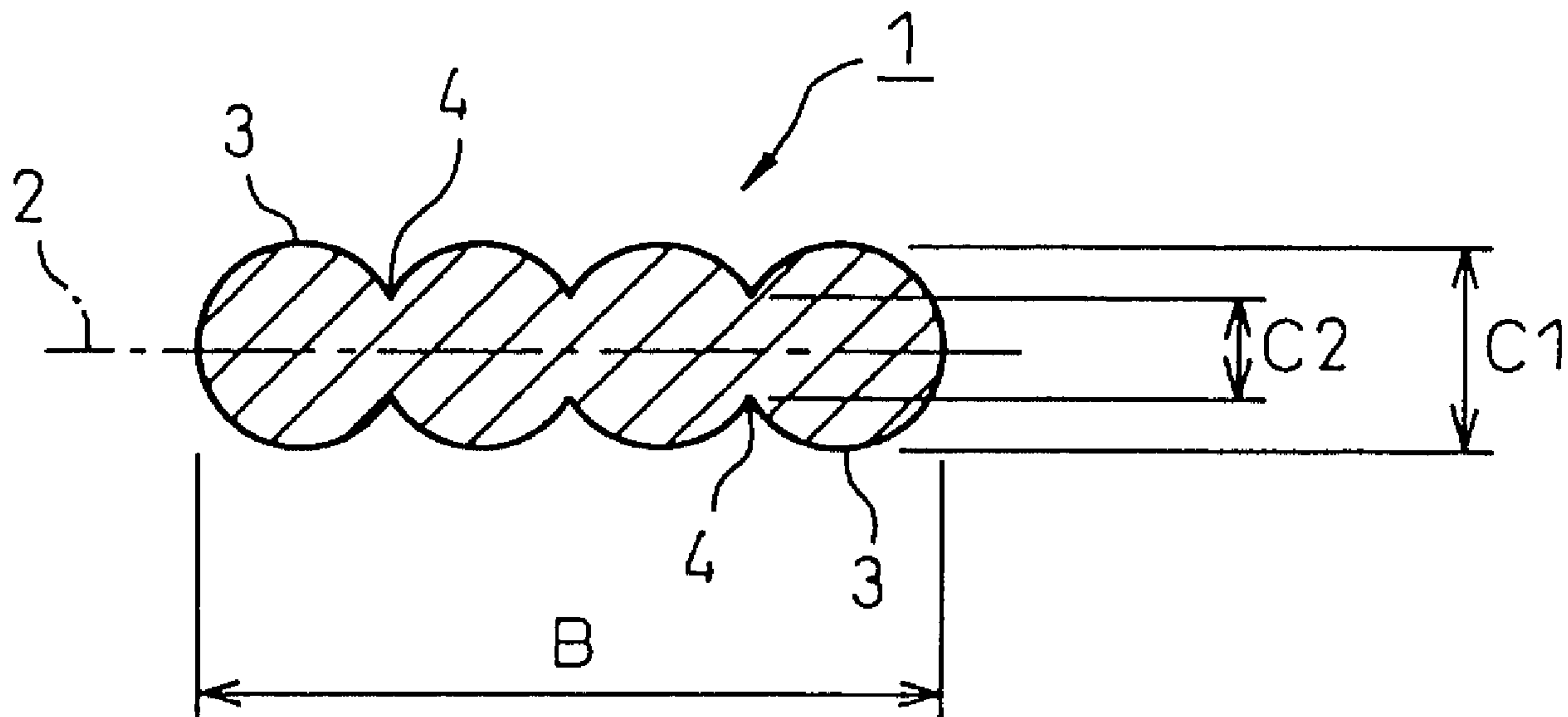




(86) Date de dépôt PCT/PCT Filing Date: 2003/07/22
(87) Date publication PCT/PCT Publication Date: 2004/01/29
(45) Date de délivrance/Issue Date: 2011/12/06
(85) Entrée phase nationale/National Entry: 2004/03/23
(86) N° demande PCT/PCT Application No.: JP 2003/009277
(87) N° publication PCT/PCT Publication No.: 2004/009889
(30) Priorités/Priorities: 2002/07/24 (JP2002-214953);
2002/07/25 (JP2002-216419);
2002/11/12 (JP2002-327949)

(51) Cl.Int./Int.Cl. *D03D 15/00* (2006.01),
D01D 5/253 (2006.01)
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(54) Titre : TEXTILE COMPRENANT DES FILS A FILAMENTS MULTIPLES ET PLATS
(54) Title: FLAT MULTIFILAMENT YARN WOVEN FABRIC



(57) Abrégé/Abstract:

A flat multifilament yarn woven fabric having a low air permeability and excellent vision through-preventing property and water- or perspiration- absorbing property includes, as warp and/or weft yarns, multifilament yarns formed from a plurality of artificial individual filaments having a flat cross-sectional profile in which, on both the sides of a longitudinal center line of the profile, 3 or more projections projecting outward from the longitudinal center line and 2 or more constrictions formed between the projections, per side of the profile are formed approximately in symmetry with respect to the longitudinal center line, and a degree of flatness of the profile represented by a ratio (B/C1) of a largest length B of the profile in the direction of the longitudinal center line to a largest width C1 of the profile in the direction of right angles to the longitudinal center line is 2 to 6, the woven fabric having a cover factor of 800 to 3500.



ABSTRACT

5 A flat multifilament yarn woven fabric having a low
air permeability and excellent vision through-preventing
property and water- or perspiration- absorbing property
includes, as warp and/or weft yarns, multifilament yarns
formed from a plurality of artificial individual
filaments having a flat cross-sectional profile in which,
on both the sides of a longitudinal center line of the
10 profile, 3 or more projections projecting outward from
the longitudinal center line and 2 or more constrictions
formed between the projections, per side of the profile
are formed approximately in symmetry with respect to the
longitudinal center line, and a degree of flatness of the
15 profile represented by a ratio $(B/C1)$ of a largest length
B of the profile in the direction of the longitudinal
center line to a largest width C1 of the profile in the
direction of right angles to the longitudinal center line
is 2 to 6, the woven fabric having a cover factor of 800
20 to 3500.

DESCRIPTION

FLAT MULTIFILAMENT YARN WOVEN FABRIC

5 TECHNICAL FIELD

The present invention relates to a flat multifilament yarn woven fabric. More particularly, the present invention relates to a woven fabric comprising multifilament yarns constituted from a plurality of
10 artificial individual filaments having a flat cross-sectional profile with two or more constrictions per side section, and exhibiting a soft hand, a practically high water absorption, abrasion resistance and vision through-prevention.

15 BACKGROUND ART

Currently, various types of poorly air-permeable woven fabrics are provided for sport cloths and uniform cloths. As the low air-permeability woven fabrics, high density woven fabrics formed from synthetic fibers, for
20 example, polyester or polyamide fibers, and coated woven fabric in which a resin coating layer is formed on a woven fabric, and calendered woven fabrics, are known.

However, the high density woven fabrics, surface-coated and calendered woven fabrics usually have a low
25 softness (a hard hand), and the surfaces of the fabrics exhibit a low resistance to abrasion (abrasion resistance, and thus these types of woven fabrics must be improved.

Synthetic fibers, for example, polyester and
30 polyamide fibers have excellent physical and chemical properties and thus are practically used in various uses such as clothing and industrial uses. Particularly, the polyester fibers exhibit excellent mechanical strength, dimensional stability and an easy-care property, and thus
35 various types of woven fabric formed from synthetic fibers, for example, polyester fibers, are used widely.

However, the woven fabrics formed from synthetic

fibers such as polyester fibers have, in addition to the above-mentioned advantageous properties, a high transparency. Thus, when the high transparency synthetic fibers are formed into a fabric and the fabric is used as an upper garment a problem such that a garment worn under the upper garment, namely an undergarment, can be seen occurs.

As a means for solving the above-mentioned problem, it is known that inorganic fine particles, for example, titanium dioxide particles are distributed into the synthetic fibers. This means can cause the resultant synthetic fibers to exhibit an increased opacity and thus an enhanced see through-preventing property. However, the woven fabric formed from the opaque synthetic fibers still must have an increased weave density to prevent the transmission of light through gaps formed between the yarns from which the woven fabric is formed. This increase in the weave density causes a problem that the resultant woven fabric exhibits a decreased softness.

In the case of woven fabric for interior material, for example, curtains, both the vision through-preventing property (namely a property of preventing vision through of an articles and movement of people in the room, and light transmission must be high. However, usually, those properties are incompatible with each other and thus are extremely difficult to realize together.

For this reasons, usually, a thin lace curtain is arranged on the window side and a thick drape curtain is arranged on the room side, and in nighttime the drape curtain is closed, and in daytime the lace curtain is closed to satisfy both the requirements of vision through-prevention and of lighting. However, generally speaking, the thick drape curtain has an excellent vision through-prevention and a poor light-transmitting property, and the thin lace curtain has an insufficient vision through-preventing property not only in nighttime but also in daytime. Accordingly, it is necessary to

5 solve this problem. To solve the problem, for example, a
light-blocking curtain formed from a combined weave
comprising polyester fiber yarns comprising a delustering
agent, for example, titanium dioxide and black colored
polyester fiber yarns containing a black-coloring pigment
and capable of reflecting and absorbing the light, is
disclosed in, for example, Japanese Patent No. 3167586; a
mirror curtain formed from a woven or knitted fabric on
both or one surface of which fabric sheen gloss yarns are
10 arranged, and having a high prevention property of vision
through from outside to inside of a room through the
curtain, due to scattered light generated when light is
irradiated to the sheen gloss surface of the fabric, and
satisfactory light-transmitting property and air-
15 permeability, is disclosed in, for example, Japanese
Unexamined Patent Publication No. 2000-237,036; and a
light-blocking fabric in which a black-colored light-
shielding layer is formed on a surface of a fabric is
disclosed in, for example, Japanese Unexamined Patent
20 Publication No. 62-133,787.

The above-mentioned light-blocking fabric having a
black-colored light-blocking layer formed on a fabric
surface and light-blocking curtain have a problem that as
the light-transmitting property is poor, the inside of
25 the curtained room is dark and an oppressive atmosphere
is created in the curtained room. Also, the light-
transmitting property of the mirror curtain is high.
However, the mirror curtain has a problem that the vision
through-preventing property of the mirror curtain,
30 particularly in night time, is insufficient, and the
sheeting gloss yarns cause a garish gloss, on the mirror
curtain, to be created.

As mentioned above, a woven fabric having both a
sufficient light-transmitting property and an excellent
35 vision through-preventing property and usable in
practice, has not yet been provided.

Further, the woven fabric made from synthetic fibers

is disadvantageous in that the water-absorbing properties, especially perspiration-absorbing property of the synthetic fiber woven fabric is poorer than that of the woven fabric made from natural fibers, for example, cotton fibers.

As a means for enhancing the water-absorbing property and perspiration-absorbing property of the synthetic fiber woven fabric, a water absorption-enhancing method in which a hydrophilicizing agent is applied to the woven fabric is known. Also, in the use of, for example, lining clothes, sport clothes and uniform clothes, further enhanced water and perspiration-absorbing properties are required.

Under the above-mentioned circumstances, there is a strong demand of an artificial fiber woven fabric, particularly a synthetic fiber woven fabric, having a soft hand, a high vision through-preventing property and an excellent water and perspiration absorbing property.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a flat multifilament yarn woven fabric exhibiting a hand with a high softness, a high water and perspiration-absorbing property, abrasion resistance, appropriate air permeability, light transmission and a high see through-preventing property.

Another object of the present invention is to provide a flat multifilament yarn woven fabric useful for constituting textile materials having an appropriate air permeability, textile materials having a high vision through-preventing property, textile materials having a high water and perspiration-absorbing property and/or textile materials having a high abrasion resistance.

The above-mentioned objects can be attained by the flat multifilament yarn woven fabric of the present invention.

The flat multifilament yarn woven fabric of the present invention comprises a plurality of multifilament

yarns comprising a plurality of artificial individual filaments comprising, as a principal component, an artificial fiber-forming polymer and having a flat cross-sectional profile,

5 wherein in both the side sections of a longitudinal center line of the flat cross sectional profile of each artificial individual filament, at least three projections per side section are projecting outward from the longitudinal center line and at least two
10 constrictions per side section formed between the projections are formed approximately in symmetry with respect to the longitudinal center line, and a degree of flatness of the cross-sectional profile represented by a ratio (B/C1) of a largest length (B) of the cross-
15 sectional profile in the direction of the longitudinal center line to a largest width (C1) of the cross-sectional profile in the direction at right angles to the longitudinal center line is 2 to 6, and the woven fabric has a cover factor of 800 to 3500.

20 In the flat multifilament yarn woven fabric of the present invention, the artificial fiber-forming polymer is preferably selected from polyesters, polyamides, polyvinylidene chloride, polypropylene, regenerated cellulose and cellulose acetates.

25 In the flat multifilament yarn woven fabric of the present invention, in the cross-sectional profile of the artificial individual filaments, a ratio (C1/C2) of the largest width (C1) to a smallest width (C2) is preferably in the range of from 1.05 to 4.00.

30 In the flat multifilament yarn woven fabric of the present invention, the total thickness of the multifilament yarns is preferably in the range of from 30 to 170 dtex and the thickness of the individual filaments is preferably in the range of from 0.5 to 5 dtex.

35 The flat multifilament yarn woven fabric of the present invention preferably has a weave structure selected from plain weave, twill weave and satin weave

structures.

5 In the flat multifilament yarn woven fabric of the present invention, the multifilament yarns comprising the artificial individual filaments having the flat cross-sectional profile is preferably contained in an amount of 10 to 100% by mass based on the mass of the woven fabric.

In an embodiment (1) of the flat multifilament yarn woven fabric of the present invention, the cover factor of the woven fabric is in the range of from 1500 to 3500.

10 In the embodiment (1) of the flat multifilament yarn woven fabric of the present invention, the multifilament yarn preferably has a number of twists of 0 to 2500 turns/m.

15 In the embodiment (1) of the present invention, the flat multifilament yarn woven fabric preferably has an air permeability of 5 ml/cm²·sec or less, determined in accordance with JIS L 1096-₁₉₉₈, 6.27.1, Method A (using a Frazir type tester).

20 In the embodiment (1) of the flat multifilament yarn woven fabric of the present invention, the air-permeability is preferably in the range of from 0.1 to 4.0 ml/cm²·sec.

25 In the embodiment (1) of the present invention, the flat multifilament yarn woven fabric preferably has a water absorption velocity of 40 mm or more, determined in accordance with JIS L 1096-₁₉₉₈, 6.26.1, (2) Method B (Byreck method).

30 In the embodiment (1) of the present invention, the flat multifilament yarn woven fabric preferably has an abrasion resistance of 50 abrasions, determined in accordance with JIS L 1096-₁₉₉₈, 6.171., (1) Method A-1 (flat surface method).

35 A low air permeability textile material of the present invention comprises a flat multifilament yarn woven fabric of the embodiment (1) of the present invention.

In an embodiment (2) of the flat multifilament yarn

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woven fabric of the present invention, the artificial individual filaments of the multifilament yarn contains 0.2% by mass or more of a delustering agent, and the cover factor of the woven fabric is in the range of from 1300 to 3000.

5 In the embodiment (2) of the flat multifilament yarn woven fabric of the present invention, the multifilament yarn preferably has a number of twists of 0 to 1500 turns/m.

10 In the embodiment (2) of the present invention, the flat multifilament yarn woven fabric preferably has a degree of vision through-prevention of the woven fabric represented, in a $L^*a^*b^*$ color system, by a difference $\Delta L (= L^*_w - L^*_b)$ between an L^* value of the woven fabric placed on a white plate, represented by L^*_w , and an L^*
15 value of the woven fabric placed on a black plate, represented by L^*_b , is 15 or less.

 In the embodiment (2) of the present invention, the flat multifilament yarn woven fabric preferably has a water absorption velocity of 40 mm or more, determined in
20 accordance with JIS L 1096-1998, 6.26.1, (2) Method B (Byreck method).

 A vision through-preventing, perspiration-absorbent textile material of the present invention comprises a flat multifilament yarn woven fabric of the
25 embodiment (2) of the present invention.

 In an embodiment (3) of the flat multifilament yarn woven fabric of the present invention, the artificial individual filaments of the multifilament yarn contains 0 to 0.2% by mass of a delustering agent and the cover factor
30 of the woven fabric is in the range of from 800 to 2000.

 In the embodiment (3) of the flat multifilament yarn woven fabric of the present invention, the multifilament yarn preferably has a number of twists of 0 to 1000 turns/m.

35 In the embodiment (3) of the present invention, the flat multifilament yarn woven fabric preferably has a degree of light transmittance of 10 to 70%, determined in

accordance with JIS L 1055-₁₉₈₇, 6.1. Method A, at a degree of illumination of 100000 lx.

5 A vision through-preventive textile material of the present invention comprises a flat multifilament yarn woven fabric of the embodiment (3) of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

10 Fig. 1 is an explanatory cross-sectional profile of an example of flat multifilaments usable for the flat multifilament yarn woven fabric of the present invention,

Fig. 2 is an explanatory cross-sectional profile of another example of flat multifilaments usable for the flat multifilament yarn woven fabric of the present invention, and

15 Fig. 3 is an explanatory cross-sectional profile of still another example of flat multifilaments usable for the flat multifilament yarn woven fabric of the present invention.

BEST MODE OF CARRYING OUT THE INVENTION

20 The inventors of the present invention have found that, in a woven fabric comprising, as warp and/or weft yarns, multifilament yarns each comprising a plurality of individual filaments comprising an artificial fiber-forming polymeric material and having a flat cross-sectional profile, in the case where the cross-sectional
25 profile of each of the individual filaments has projections projecting outward from a longitudinal center line of the flat profile in the number of 3 or more, preferably 4 or more, still more preferably 4 to 6, per
30 one side section of the flat profile with respect to the longitudinal center line of the flat profile, and constrictions formed between the projections, in the number of 2 or more, preferably 3 or more, still more preferably 3 to 5, per one side section of the flat
35 profile with respect to the longitudinal center line of the flat profile, the projections and constrictions being respectively formed approximately in symmetry with

respect to the longitudinal center line of the flat profile, and a flatness of the cross-sectional profile of the individual filament represented by a ratio (B/C1) of the largest length, in the longitudinal direction, of the flat profile to a largest width (C1); in the cross direction at right angles to the longitudinal direction, of the flat profile is controlled within the range of from 2 to 6, (1) the flat individual filaments in the flat multifilament yarns of the resultant woven fabric are closely contacted at flat peripheries thereof with each other, and at warp-weft yarn-intersecting portions of the woven fabric, the closely contacting flat individual filaments are easily slip-spread by the compressing pressure of the intersecting warp and weft yarns to each other, to form, in the woven fabric, broad, dense intersecting portions in which the gaps between the flat individual filaments become decreased, and (2) the flat peripheries of the flat individual filaments closely contacting each other have a plurality of projections and a plurality of constrictions and thus are roughened, and therefore, the frictional resistance between the flat individual filaments become decreased so that the warp-weft yarn-intersecting portions of the resultant flat multifilament yarn woven fabric exhibit a high softness (flexibility) and a low air permeability.

Further, the inventors of the present invention have found that the plurality constrictions formed on the peripheries of the flat individual filament causes a capillarity to liquids to be generated and thus the woven fabric of the present invention to exhibit excellent water and perspiration-absorption property.

Furthermore, the inventors of the present invention have found that the plurality of productions and constrictions formed in the peripheries of the flat individual filaments cause the frictional resistance of the peripheries of the flat individual filaments and thus the resultant woven fabric of the present invention to

exhibit an excellent abrasion resistance. Still
furthermore, the inventor of the present invention have
found that the plurality of projections and constrictions
formed in the peripheries of the flat individual
5 filaments in the woven fabric of the present invention
cause the peripheries to be roughened surfaces which
scatter light transmitting through the surface by
irregular reflections and reflections of the light and
thus contribute to decreasing the vision through property
10 of the woven fabric and to preventing seeing an article
through the woven fabric, without significantly decrease
the quantity of light transmitted through the woven
fabric (amount of light lighted through the woven
fabric).

15 Moreover, the inventors of the present invention
have found that by appropriately establishing the cover
factor of the flat multifilament yarn woven fabric of the
present invention in the range of from 800 to 3500, the
air permeability, water and perspiration-absorbing
20 property, abrasion resistance and vision through-
preventing property of the flat multifilament yarn woven
fabric of the present invention can be appropriately
controlled and, thereby, various types of textile
materials having the above-mentioned properties can be
25 provided.

The present invention is one completed on the basis
of the above-mentioned findings.

The flat multifilament yarn woven fabric of the
present invention comprises, as warp and/or weft yarns, a
30 plurality of multifilament yarns each comprising a
plurality of artificial individual filaments comprising,
as a principal component, a fiber-forming artificial
polymer and having a flat cross-sectional profile.

In the above-mentioned flat multi-filament yarn
35 woven fabric, for example, referring to Fig. 1, the
profile of a cross-section 1 of an individual filament is
in a flat form in which the width in the direction at

right angles to the longitudinal center line of the profile is relatively small in comparison with the longitudinal length of the profile.

5 In the cross sectional profile 1 shown in Fig. 1, in both side sections of the profile with respect to the longitudinal center line 2, 3 or more projections 3 (4 projections in Fig. 1) projecting outward from the longitudinal center line and two or more constrictions 4 (3 constrictions in Fig. 1) formed between the
10 projections are respectively formed per one side section of the profile, approximately in symmetry with respect to the longitudinal center line 2. In the cross-sectional profile of Fig. 1, a flatness of the cross-sectional profile represented by a ratio ($B/C1$) of a largest length
15 (B) of the profile in the direction of the longitudinal center line to a largest width ($C1$) of the profile in a direction at right angles to the longitudinal center line direction is in the range of from 2 to 6.

In the cross-sectional profile of each flat
20 individual filament, the 3 or more projections and 2 or more constrictions formed in one side section of the flat profile are approximately in symmetry, in shape and location with respect to the longitudinal center line of the flat profile, with the 3 or more projections and 2 or
25 more constrictions formed in the opposite side section of the flat profile, to the above-mentioned one side section.

In the above-mentioned cross-sectional profile of the flat individual filaments of the multifilament yarn,
30 the number of the projections is 3 or more, preferably 4 or more, still more preferably 4 to 6 per one side of the flat profile. Also, the number of constrictions is 2 or more, preferably 3 or more, still more preferably 3 to 5, per one side of the flat profile. Also, the flatness of
35 the cross-sectional profile is 2 to 6, preferably 3 to 5.

If the number of the projections is 2 or less, and the number of the constrictions is 1 or less, the

peripheries of the resultant individual filaments exhibit an increased frictional resistance, and thus the slip-spreading of the individual filaments in the warp-weft intersecting portions of the woven fabric in which portions a compressive presence of the warp and weft yarns is applied to each other, becomes insufficient, the air permeability of the resultant woven fabric becomes to be difficult to control, and the abrasion resistance of the resultant woven fabric becomes insufficient, and the decrease in the number of the constrictions causes the water and perspiration-absorbing property of the resultant woven fabric to be insufficient, and the light-scattering effect on the individual filament peripheries to be insufficient and thus the resultant wove fabric exhibits an unsatisfactory vision through-preventing property.

In the flat multifilament yarn woven fabric of the present invention, the cross-sectional flatness (B/C1) of the individual filaments of the flat multifilament yarn is 2 to 6, preferably 3 to 5. If the cross-sectional flatness is less than 2, the bending resistance (rigidity) of the individual filaments is too high, the resultant woven fabric exhibits an insufficient softness, and thus the target soft hand of the woven fabric cannot be obtained.

Also, when the cross-sectional flatness is less than 2, in the warp-weft intersecting portions of the woven fabric, the slip-spreading of the individual filaments in the multifilament yarn due to the compressive pressure of the warp and weft yarns to each other becomes insufficient, the gaps between the warp and weft yarns cannot be sufficiently small, the size of the spaces between the filaments cannot be sufficiently small, and thus the air permeability of the resultant woven fabric becomes difficult to control to a desired level.

Also, individual filaments having a cross-sectional flatness (B/C1) of more than 6 are difficult to produce.

In the cross-sectional profile of the flat individual filaments of the flat multifilament yarn usable for the woven fabric of the present invention, the ratio ($C1/C2$) of the largest width ($C1$) to the smallest width ($C2$) in the direction at right angles to the longitudinal center line of the flat profile is preferably in the range of from 1.05 to 4.00, more preferably 1.10 to 2.50. The ratio ($C1/C2$) as mentioned above is a parameter relating to a depth of the constrictions of the flat individual filaments. If the ratio ($C1/C2$) is less than 1.05, namely, the depth of the constriction is too small, the peripheral surfaces of the resultant flat individual filaments may exhibit too high a frictional resistance and the resultant woven fabric may exhibit too high an air permeability and insufficient abrasion resistance, vision through-preventing property, and water and perspiration-absorbing properties. Also, if the ratio ($C1/C2$) is more than 4.0, the depth of the constrictions of the flat individual filaments is too large, the effects of the constrictions is saturated, and the resultant woven fabric may be disadvantageous in that the filament-forming procedures may be unstable, the resultant individual filaments may be slit along the constrictions, and the uniformity in the cross-sectional profile of the individual filaments may be degraded.

In each of Figs. 2 and 3, another embodiment of the cross-sectional profile of the flat individual filaments usable for the flat multifilament yarn woven fabric of the present invention is shown.

The cross-sections of filament 1 shown in Fig. 2 has a profile having similar projections and constrictions formed in both side sections with respect to the longitudinal center line 2, to those in Fig. 1, except that the profile of the projections in Fig. 2 is in the form of an arc of an ellipse extending along the major axis of the ellipse and thus the form of the ellipse arc is more gentle than that of the circle arc form of the

projections of Fig. 1, and thus the depth of the constrictions in Fig. 2 is smaller than that in Fig. 2.

5 The cross-sectional profile of a filament 1 shown in Fig. 3 has projections and constrictions formed in both side sections of the flat profile with respect to the longitudinal center line and in the numbers of 4 and 3 per one side section of the flat profile, respectively. In Fig. 3, a projection 3a is smaller in width and height than the other 3 projections 3, and thus the depth of the
10 constrictions 4a formed in both sides of the projection 3a namely from the top of the projection 3a to the bottoms of constrictions 4a is smaller than that of the other constrictions 4.

15 The cover factor of the flat multifilament yarn woven fabric is in the range of from 800 to 3500, as mentioned above, can be appropriately established in response to the properties and performances necessary to the woven fabric.

20 The cover factor (CF) of a woven fabric is defined by the following equation.

$$CF = (DWp/1.1)^{1/2} \times NWp + (DWf/1.1)^{1/2} \times MWf$$

In the above-mentioned equation,

DWp represents a total thickness (dtex) of the warp yarns,

25 MWp represents a weave density (yarns/2.54 cm) of the warp yarns,

DWf represents a total thickness (dtex) of the weft yarns,

30 MWf represents a weave density (yarns/2.54 cm) of the weft yarns.

In the flat multifilament yarn woven fabric of the present invention, if the cover factor (CF) of the fabric is less than 800, the gaps between the warp and weft yarns is large and the air permeability of the woven
35 fabric is difficult to control to a desired value and also a woven fabric having a vision through-preventing property at a desired high level is difficult to produce.

Also, if the cover factor (CF) is more than 3500, the resultant woven fabric exhibits an insufficient softness and an unsatisfactory light transmission (lighting property).

5 The fiber-forming artificial polymer usable for forming the flat multifilament yarns for the flat multifilament yarn woven fabric of the present invention may be selected from fiber-forming synthetic polymers, for example, polyester, polyamide polyvinylidene chloride
10 and polypropylene resins; fiber-forming semisynthetic polymers, for example, cellulose acetates and regenerated polymers, for example, regenerated celluloses, etc. In consideration of the ease or the difficulty in the production of the flat multifilament yarns, fiber-forming
15 thermoplastic polymers capable of being formed into fibers by a melt-spinning method, for example, polyesters, for example, polyethylene terephthalate, trimethylene terephthalate, etc.; polyamides, for example, nylon 6, nylon 66, etc., polyvinylidene chloride
20 and polypropylene, are preferably used.

 In the fiber-forming artificial polymer, an additive comprising at least one member selected from, for example, delustering agents (for example, titanium dioxide, etc.), fine pore-forming agents (for example,
25 organic sulfonate metal salts, etc.), cationic dye-dyeability-imparting agent (for example, a sulfonium isophthalate salt, etc.), antioxidants (for example, hindered phenol compounds, etc.), thermostabilizers, flame-retardants (for example, diantimony trioxide,
30 etc.), fluorescent brightening agents, coloring materials, antistatic agents, (for example, organic sulfonate metal salt, etc.), moisture-conditioning agents (for example, polyoxyalkyleneglycols, etc.), and anti-bacterial agents fine particles, etc.), may be mixed.

35 There is no limitation to the total thickness of the multifilament yarn and to the thickness of the flat individual filaments usable for the woven fabric of the

present invention, as long as the target woven fabric of the present invention can be obtained. Usually, the total thickness of the yarn is preferably 30 to 170 dtex, more preferably 50 to 100 dtex and the thickness of the individual filaments is preferably 0.5 to 5 dtex, more preferably 1 to 4 dtex.

Also, there is no limitation to the number of twists of the flat multifilament yarn usable for the flat multifilament yarn woven fabric of the present invention, as long as the target woven fabric of the present invention can be obtained.

Namely, the number of twists may be appropriately established in response to the use and the necessary properties of the target woven fabric. Usually, the number of twist is preferably 0 to 2500 turns/m, more preferably 0 to 600 turns/m.

The multifilament yarns usable for the woven fabric of the present invention may be textured yarns by false-twisting method, TASLAN method or air texturing method, for example, an air-interlacing method, as long as the target woven fabric of the present invention can be obtained.

In the woven fabric of the present invention, the warp and/or weft yarns from which the woven fabric is constituted must be constituted from the multifilament yarns comprising a plurality of individual filaments having the flat cross-sectional profile as mentioned above.

Namely, the flat multifilament yarns may be used as both the warp and weft yarns, or as either one of the warp and weft yarns, and the other either one of the warp and weft yarns may be constituted by yarns different from the flat multifilament yarns.

The different yarns may be selected from monofilament yarns, multifilament yarns and spun yarns. These different yarns may have a specific property, for example, an anti-static property, a sheening property

etc. Also, in the warp and/or weft yarns usable for the woven fabric of the present invention, a small amount of filaments or fibers different from the flat individual filaments may be used together with the flat
5 multifilament yarns, as long as the target woven fabric of the present invention can be obtained.

In the flat multifilament yarn woven fabric of the present invention, the content of the flat multifilament yarns is preferably 10 to 100% by mass, more preferably
10 20 to 100% by mass, still more preferably 40 to 100% by mass, based on the total mass of the woven fabric.

The flat multifilament yarns for the woven fabric of the present invention can be produced by using a spinneret for flat filaments, for example, a spinneret
15 provided with a plurality of spinning orifices having a cross-sectional profile as shown in Fig. 2-C appearing on page 5 of Japanese Unexamined Patent Publication No. 56-107,044.

The flat multifilament yarn woven fabric of the present invention can be produced a conventional weaving procedure in which the flat multifilament yarns produced as mentioned above are used as warp and/or weft yarns, and can be dyed and finished by a conventional dyeing and finishing procedures. In the case where the flat
20 multifilament yarns are flat polyester multifilament yarns, the resultant woven fabric may be subjected to a mass-reduction treatment with an alkali. Also, in the finishing procedures, the woven fabric may be subjected to one or more of water absorption-enhancing treatments
25 (by coating or impregnating with a water-absorbing agent, for example, an anionic hydrophilic polymeric compound), water-repellent treatments (by coating or impregnating with a water-repellent agent, for example, a water-repellent fluorine compound), ultraviolet ray-blocking
30 treatments (by applying a dispersion of ultrafine particles of a metal oxide), antistatic treatments, deodorant-applying treatments, mothproofing agent-

applying treatments and a light storage agent-applying treatments, successively or simultaneously.

5 In an embodiment of the flat multifilament yarn woven fabric of the present invention, the thickness of the warp and weft yarns and the weave density of the warp and weft yarns are controlled to an extent that the resultant woven fabric exhibits a cover factor (CF) in the range of from 1500 to 3500.

10 In the embodiment (1) of the present invention, the cover factor of the woven fabric is preferably 1500 to 3000 and preferably 1500 to 2500.

Also, in the embodiment (1) of the present invention, the flat multifilament yarn preferably has a number of twists of 0 to 2500 turns/m, more preferably 0 to 600 turns/m, still more preferably 0 turn/m, namely non-twisted.

20 In the embodiment (1) of the present invention, the flat multifilament yarn woven fabric preferably has an air permeability of 5 ml/cm²·sec or less, more preferably 4 ml/cm²·sec or less, still more preferably 0,1 to 3 ml/cm²·sec. The air permeability is determined in accordance with JIS L 1096-₁₉₉₈, 6.27.1, Method A (using a Frazir type tester).

25 In the embodiment (1) of the present invention, the flat multifilament yarn woven fabric preferably has a water absorption velocity of 40 mm or more, more preferably 50 to 70 mm, determined in accordance with JIS L 1096-₁₉₉₈, 6.26.1 (2) Method (B) (Byreck method) and an abrasion resistance of 50 abrasions or more, more preferably 80 abrasions or more, still more preferably 100 abrasions or more.

30 On the embodiment (1) of the present invention, if the cover factor (CF) of the woven fabric is less than 1500, the areas of gaps formed between the warp yarns and the weft yarns may be too large, the resultant woven fabric may exhibit too high an air permeability (of, for example, more than 5 ml/cm²·sec) and insufficient water

and perspiration-absorbing property and an insufficient abrasion resistance. Also, if the cover factor (CF) of the woven fabric is more than 3500, the warp and weft yarns in the resultant woven fabric may closely contact with each other, the resultant woven fabric may have an insufficient softness and too high a flexing resistance and thus the hand of the woven fabric may become unsatisfactory and the abrasion resistance of the woven fabric may be insufficient.

In the flat multifilament yarn woven fabric of the embodiment (1) of the present invention having a cover factor of 1500 to 3500, the flat multifilament yarns from which the warp and/or weft yarns of the woven fabric are constituted, are flattened and laterally spread due to the compressive pressure generated at the warp-weft intersecting portions of the fabric, under which compressive pressure, the flat individual filaments contacting each other, at the flat periphery thereof, slip laterally on each other to make the yarn flat. In this flattening of the yarn, the areas of the gaps between the warp and weft yarns decrease and thus-the resultant woven fabric exhibits a decreased air permeability. Therefore, the flat multifilament yarn woven fabric of the embodiment (1) of the present invention preferably exhibits a low air permeability of 5 ml/cm²·sec or less.

In the embodiment (1) of the present invention the flattening of the flat multifilament yarn causes the resultant woven fabric to exhibit a decreased flexing resistance an increased softness and a good soft hand. Also, in the woven fabric of the embodiment (1) of the present invention, each of the flat individual filaments in the multifilament yarns has 3 or more projections extending along the longitudinal direction of the periphery and 2 or more constrictions formed between the projections, per one side section of the flat profile, and thus the periphery of the flat individual filament is

roughened. Thus, when the individual filaments in the yarns are brought into contact with each other, particularly under a compressive pressure generated at the intersecting portions of the warp and weft yarns, the contact area of the individual filaments brought into contact with each other is relatively small, and thus the frictional resistance between the individual filaments is small. Therefore, the roughened peripheries of the individual filaments contributes to enhancing the softness of the resultant woven fabric. Further, in the periphery of each individual filament, the constrictions extending along the longitudinal direction of the periphery are not, or are substantially not, closed even when the peripheries of the individual filaments are brought into contact with each other. Therefore, water or perspiration can easily diffuse along the constrictions due to the capillary phenomenon, and thus the resultant woven fabric exhibits excellent water and perspiration-absorbing property.

The flat multifilament yarn woven fabric of the embodiment (1) of the present invention exhibits an excellent soft hand, a high water and perspiration-absorbing property and a high abrasion resistance and thus is useful as low air permeability textile materials for various clothes, for example, sport clothes and uniform clothes for men and women, and folk costumes (native dresses), for example, tabes, undergarments, lining clothes, hats caps and fabrics for umbrellas and parasols.

In an embodiment (2) of the flat multi-filament yarn woven fabric of the present invention, the multifilament yarns contain a delustering agent in a content of 0.2% by mass or more, preferably 0.4 to 3.5% by mass, more preferably 1.0 to 2.5% by mass, and the woven fabric has a cover factor (CF) of 1300 to 3000, preferably 1400 to 2500.

There is no limitation to the composition and type

of the delustering agent contained in the multifilament yarn of the flat multifilament yarn woven fabric of the embodiment (2) of the present invention, as long as the target woven fabric of the present invention can be
5 obtained. Usually, the delustering agent may comprise at least one type of fine inorganic particles, for example, titanium dioxide and barium sulfate. If the content of the delustering agent is less than 0.2% by mass, on the basis of the total mass of the multifilaments, the
10 resultant multifilament yarn may exhibit an insufficient reflectance and thus the resultant woven fabric may be not able to exhibit a satisfactory vision through-preventing property. It should be noted that if the content of the delustering agent exceeds 7% by mass, the
15 fiber-forming property of the resultant polymer composition may become unstable.

If the cover factor (CF) of the woven fabric of the embodiment (2) of the present invention is less than 1300, the gaps between the warp and weft yarns may be too
20 large, and the resultant woven fabric may exhibit an unsatisfactory vision through-preventing property. Also, if the cover factor (CF) is more than 3000, the resultant woven fabric may exhibit an insufficient softness and an unsatisfactory hand.

25 In the case where the woven fabric of the embodiment (2) of the present invention has a plain weave structure, the cover factor of the plain weave fabric preferably in the range of from 1400 to 1800, more preferably from 1500 to 1700.

30 In the case where the woven fabric of the embodiment (2) of the present invention has a twill weave structure, the resultant twill weave fabric preferably has a cover factor (CF) of 1900 to 2400, more preferably 2000 to 2300.

35 There is no specific limitation to the number of twists of the multifilament yarns usable for the woven fabric of the embodiment (2) of the present invention, as

long as the target woven fabric of the present invention can be obtained. However, in order to fully ensure the freedom of movement of the individual filaments in the yarn, relative to each other, the number of twists of the flat multifilament yarn is preferably 0 to 1500 turns/m, more preferably 0 to 600 turns/m. Still more preferably, the number of twists is 0 turn/m, namely, non-twisted.

In the embodiment (2) of the present invention, the flat multifilament yarn woven fabric preferably has a degree of vision through-prevention, represented, in a $L^*a^*b^*$ color system, by a difference $\Delta L (= L^*_w - L^*_b)$ between an L^* value of the woven fabric placed on a white plate, represented by L^*_w , and an L^* value of the woven fabric placed on a black plate, represented by L^*_b , is 15 or less, more preferably 10 to 13. If the degree ΔL of the vision through prevention is more than 15, the vision through preventing property of the resultant woven fabric may be insufficient, in practice.

The flat multifilament yarn woven fabric of the embodiment (2) of the present invention, preferably has a water absorption velocity of 40 mm or more, more preferably 45 mm or more, still more preferably 50 to 70 mm, determined in accordance with JIS L 1096-1998, 6.26.1, (2) Method B (Byreck method). If the water absorption velocity is less than 40 mm, the resultant woven fabric may exhibit insufficient water and perspiration-absorbing property in practice.

In the flat multifilament yarn woven fabric of the embodiment (2) of the present invention, the cross-sectional profile of individual filaments from which the flat multifilament yarn is constituted is flat. In this flat cross-sectional profile, three or more projections and two or more constrictions between the projections per one side section of the flat profile are formed. Thus the peripheries of the individual filaments brought into contact with each other exhibit a low frictional

resistance to each other and can easily slip on each other. When a compressive pressure is applied to the multifilament yarns, the individual filaments can easily move relative to each other along the contacting peripheries, so that the multifilament yarn is flattened and laterally spread. Also, the individual filaments closely contact at the flat peripheries with each other, to cause the gaps between the yarns arranged in the woven fabric to be reduced, and the quantity of light transmitted through the woven fabric to decrease. Also, the delustering agent contained in a content of 0.2% by mass in the individual filaments causes the light transmittance through the resultant woven fabric to reduce and the light irradiated toward the woven fabric to irregularly reflect on the woven fabric. Further, the plurality of the projections and constrictions formed on the peripheries of the individual filaments cause the peripheries of the individual filaments to be roughened to scatter the incident light and to prevent vision through the woven fabric. At the intersecting portions of the warp and weft yarns of the woven fabric, the flattening and spreading of the multifilament yarns can cause the intersecting portions to be softened and the hand of the resultant woven fabric to be soft.

Further, the constrictions extending along the longitudinal axis of the individual filament can cause a capillary phenomenon to water and perspiration to be generated and the resultant woven fabric to exhibit a high water and perspiration absorption velocity.

Thus, the flat multifilament yarn woven fabric of the embodiment (2) of the present invention are useful as a textile material for a use in which high vision through-preventing property and water and perspiration-absorbing property are necessary, for example, lining clothes, sport clothes and uniform clothes.

In an embodiment (3) of the flat multifilament yarn woven fabric of the present invention, the artificial

individual filaments of the multifilament yarn contains a delustering agent in a small content of 0 to 0.2% by mass and the woven fabric has a cover factor (CF) in the range of from 800 to 2000.

5 In the flat multifilament yarn woven fabric of the embodiment (3) of the present invention, the content of the delustering agent in the artificial individual filaments are 0 to 0.2% by mass, preferably 0 to 0.1% by mass. More preferably, no delustering agent is contained
10 in the individual filaments. The delustering agent for the present invention may be selected from conventional delustering agents, for example, titanium dioxide and barium sulfate. If the content of the delustering agent is more than 0.2% by mass, in the preferable use of the
15 woven fabric of the embodiment (3) of the present invention, for example, curtains, the resultant woven fabric may exhibit an insufficient light transmittance and thus an unsatisfactory lightening property.

 In the flat multifilament yarn woven fabric of the
20 embodiment (3) of the present invention, the multifilament yarn preferably has a number of twists of 0 to 1000 turns/m, more preferably 0 to 200 turns/m, still more preferably no twist.

 The cover factor (CF) of the flat multifilament yarn
25 woven fabric of the embodiment (3) of the present invention is in the range of from 800 to 2000, preferably from 900 to 1800, more preferably from 1000 to 1800.

 If the cover factor (CF) is less than 800, in the preferable use of the flat multifilament yarn woven
30 fabric of the embodiment (3) of the present invention, for example, curtains, the gaps between the warp and weft yarns in the woven fabric may be too large, and the resultant woven fabric may exhibit an insufficient vision through-preventing property. Also, if the cover factor
35 is more than 2000, the resultant woven fabric may exhibit an insufficient lighting property.

 The flat multifilament yarn woven fabric of the

embodiment (3) of the present invention, preferably exhibits a degree of light transmittance of 10 to 70%, more preferably 20 to 50%, determined in accordance with JIS L 1055-₁₉₈₇, 6.1. Method A, at a degree of
5 illumination of 100000 lx. The light transmittance in % is calculated by subtracting a light-blocking rate in % of the woven fabric from 100%. If the light transmittance is less than 10%, in the preferable use of the woven fabric, for example, curtains, the lighting
10 property of the resultant woven fabric may be insufficient. Also, if the light transmittance is more than 70%, the resultant woven fabric may exhibit an insufficient vision through-preventing property.

The flat multifilament yarn woven fabric of the
15 embodiment (3) of the present invention preferably is non-colored or dyed into a light or moderate color. The type and amount of the dye used for dyeing may be established in view of the use and necessary properties of the resultant dyed woven fabric.

20 In the flat multifilament yarn woven fabric of the embodiment (3) of the present invention, the flat multifilaments are laterally spread and flattened at the warp-weft-intersecting portions of the woven fabric due to a compressive pressure generated in the intersecting
25 portions, the individual filaments are, at flat peripheries thereof, closely contacted with each other, to form a dense structure. In this dense structure, the gaps between the warp and weft yarns are small, and the quantity of the light passing through the gaps is
30 reduced. A small amount of the light passing through the gaps is diffracted in the small gaps and transmitting light rays through the small gaps adjacent to each other interfere with each other, to enhance the vision through-preventing effect of the woven fabric. Also, the
35 specific cross-sectional profile of the flat individual filaments in the multifilament yarn causes the irregular reflection of the incident light on the peripheries of

the individual filaments and the refraction of the light transmitted through the filaments are increased in comparison with filaments having a flat cross-sectional profile and provided with smooth peripheries, filaments having a circular cross-sectional profile, and filaments having a triangular cross-sectional profile. Thus, the resultant woven fabric exhibits an excellent vision through-preventing effect without reducing the lighting property thereof.

The flat multifilament yarn woven fabric of the embodiment (3) of the present invention exhibits good soft hand, a low flexing resistance, a low air permeability and a high abrasion resistance, similar to those of the embodiments (1) and (2).

For the reasons as mentioned above, the flat multifilament yarn woven fabric of the embodiment (3) of the present invention is useful for vision through-preventing textile materials for interior, for example, curtains, roll blinds (shades) and partitions.

EXAMPLES

The present invention will be further illustrated by the following examples which are not intended to limit the scope of the present invention in any way.

Example 1

A polyethylene terephthalate resin was melt-extruded at a temperature of 300°C through 30 melt-spinning orifices formed in a melt-spinneret and having a hole shape corresponding to the cross-sectional profile of a filament shown in Fig. 1, which profile has 4 circular arc-shaped projections and 3 constrictions formed between the projections, per one side section of the profile, formed on both the sides of a longitudinal center line of the profile. The extruded filamentary melt streams were taken up at a taking up speed of 4000 m/minute, while cool-solidifying the melt streams. The resultant undrawn multifilaments were, without winding up, directly drawn at a temperature of 97°C at a draw ratio of 1.3, to

prepare a drawn multifilament yarn having a yarn count of 84 dt/30 filaments. The individual filaments of the multifilament yarn had a cross-sectional profile as shown in Fig. 1, a flatness of the cross-sectional profile of 3.2, and a filament width ratio C1/C2 was 1.2.

The flat multifilament yarns, which were kept non-twisted, were used as warp and weft yarns to produce a plain weave having the following warp and weft densities.

Warp density: 101 warps/2.54 cm

10 Weft density: 90 wefts/2.54 cm

In the resultant plain weave, a content of the flat multifilament yarn was 100%. The plain weave was finished by scouring and dyeing. The finished plain weave had a cover factor (CF) of 1782.

15 The finished plain weave was subjected to the following tests.

(1) Air permeability

The air permeability of the woven fabric was determined in accordance with JIS L 1096-1998, 6.27.1, Method A (using a Frazir type tester).

(2) Abrasion resistance

The abrasion resistance of the woven fabric was determined in accordance with JIS L 1096-1998, 6.17.1, (1) Method A-1 (flat surface method).

25 (3) Water-absorbing property

A water-absorption velocity of the woven fabric was determined in accordance with JIS L 1096-1998, 6.26.1, (2) Method B (Byreck method).

(4) Hand

30 The hand of the woven fabric was evaluated, by touching with a hand, into the following five classes.

<u>Class</u>	<u>Hand</u>
5	Very high softness, Excellent good hand
4	High softness, Good hand
3	Sufficient softness, Satisfactory hand
2	Slightly insufficient softness, Slightly unsatisfactory hand
1	Insufficient softness, Unsatisfactory hand

(5) General evaluation.

The general evaluation results of the tested woven fabric were shown in the following four classes.

<u>Class</u>	<u>General evaluation</u>
4	Excellent
3	Good
2	Slightly unsatisfactory
1	Bad

5

The test results are shown in Table 1.

Example 2

A plain weave of flat multifilament yarns was produced and tested by the same procedures as in Example 1, with exceptions as shown below.

In the cross-sectional profile of the flat individual filaments, the number of the circular arc-shaped projections was changed from 4 to 3, and the number of the constrictions was changed from 3 to 2, per one side of the longitudinal center line of the flat profile.

The flatness (B/C1) of the flat cross-sectional profile was 3.2, the ratio (C1/C2) was 1.2, and the cover factor of the plain weave was 1782.

The test results are shown in Table 1.

Comparative

Example 1

20

A plain weave of flat multifilament yarns was produced and tested by the same procedures as in Example 1, with exceptions as shown below.

5 In the flat cross-sectional profile of the individual filaments, no constrictions were formed.

The flatness (B/C1) of the flat cross-sectional profile was 3.2, the ratio (C1/C2) was 1.0, and the cover factor of the plain weave was 1782.

The test results are shown in Table 1.

10 Comparative

Example 2

A plain weave of multifilament yarns was produced and tested by the same procedures as in Example 1, with exceptions as shown below.

15 The flat cross-sectional profile of the individual filaments was changed to a circular cross-sectional profile.

The cover factor of the resultant plain weave was 1782.

20 The test results are shown in Table 1.

Table 1

Item Example No.		Cross-sectional profile			Cover factor (CF)	Air permeability (ml/cm ² ·s)	Abra-sion resistance (Abra-sion number)	Water-absorp-tion veloci-ty (mm)	Hand	Gene-ral eva-lua-tion
		Constric-tion number (per one side)	Ratio (B/C1)	Ratio (C1/C2)						
Example	1	3	3.2	1.2	1782	0.74	110	55	5	4
	2	2	3.2	1.2	1782	0.92	82	50	5	4
Compara-tive Example	1	0	3.2	1.0	1782	2.75	56	20	4	2
	2	Circular			1782	5.55	45	22	2	1

Example 3

25 A polyethylene terephthalate resin containing 2.5% by mass of a delustering agent consisting of titanium dioxide was melt-extruded at a temperature of 300°C through 30 melt-spinning orifices formed in a melt-spinneret and having a hole shape corresponding to the cross-sectional profile of a filament shown in Fig. 1,

which profile has 4 circular arc-shaped projections and 3 constrictions formed between the projections, per one side section of the profile, formed on both the sides of a longitudinal center line of the profile. The extruded
5 filamentary melt streams were taken up at a taking up speed of 4000 m/minute, while cool-solidifying the melt streams. The resultant undrawn multifilaments were, without winding up, directly drawn at a temperature of 97°C at a draw ratio of 1.3, to prepare a drawn
10 multifilament yarn having a yarn count of 84 dt/30 filaments. The individual filaments of the multifilament yarn had a cross-sectional profile as shown in Fig. 1, a flatness of the cross-sectional profile of 3.2, and a filament width ratio C1/C2 was 1.2.

15 The flat multifilament yarns, which were kept non-twisted, were used as warp and weft yarns to produce a plain weave having the following warp and weft densities.

Warp density: 101 warps/2.54 cm

Weft density: 84 wefts/2.54 cm

20 In the resultant plain weave, a content of the flat multifilament yarn was 100%. The plain weave was finished by scouring and dyeing. The finished plain weave had a cover factor (CF) of 1700.

25 The resultant woven fabric was subjected to the following tests.

(1) Degree of vision through-prevention

The degree of vision through prevention of the woven fabric subjected to the test was represented, in a L*a*b* color system, by a difference $\Delta L (= L^*_w - L^*_b)$
30 between an L* value of the woven fabric placed on a white plate, represented by L^*_w , and an L* value of the woven fabric placed on a black plate, represented by L^*_b .

(2) Water-absorbing property

35 The water absorption velocity of the woven fabric was determined in accordance with JIS L 1096-1998, 6.26.1, (2) Method B (Byreck method), as in Example 1.

(3) Hand

The hand of the woven fabric was evaluated, by touching with a hand, into the following five classes, as in Example 1.

<u>Class</u>	<u>Hand</u>
5	Very high softness, Excellent good hand
4	High softness, Good hand
3	Sufficient softness, Satisfactory hand
2	Slightly insufficient softness, Slightly unsatisfactory hand
1	Insufficient softness, Unsatisfactory hand

5 (5) General evaluation.

The general evaluation results of the tested woven fabric were shown in the following four classes, as in Example 1.

<u>Class</u>	<u>General evaluation</u>
4	Excellent
3	Good
2	Slightly unsatisfactory
1	Bad

10 The test results are shown in Table 2.

Example 4

A plain weave of flat multifilament yarns was produced and tested by the same procedures as in Example 3, with exceptions as shown below.

15 In the cross-sectional profile of the flat individual filaments, the number of the circular arc-shaped projections was changed from 4 to 3, and the number of the constrictions was changed from 3 to 2, per one side of the longitudinal center line of the flat
20 profile.

The flatness (B/C1) of the flat cross-sectional profile was 3.2, the ratio (C1/C2) was 1.2, and the cover

factor of the plain weave was 1700.

The test results are shown in Table 2.

Comparative

Example 3

5 A plain weave of flat multifilament yarns was produced and tested by the same procedures as in Example 3, with exceptions as shown below.

In the flat cross-sectional profile of the individual filaments, no constrictions were formed.

10 The flatness (B/C1) of the flat cross-sectional profile was 3.2, the ratio (C1/C2) was 1.0, and the cover factor of the plain weave was 1700.

The test results are shown in Table 2.

Comparative

Example 4

15 A plain weave of multifilament yarns was produced and tested by the same procedures as in Example 3, with exceptions as shown below.

20 The flat cross-sectional profile of the individual filaments was changed to a circular cross-sectional profile.

The cover factor of the resultant plain weave was 1700.

The test results are shown in Table 2.

25

Table 2

Item Example No.		Cross-sectional profile			Cover factor (CF)	Degree of vision through- prevention (Δ L)	Water- absorp- tion veloci- ty (mm)	Hand	Gene- ral eva- lua- tion
		Constric- tion number (per one side)	Ratio (B/C1)	Ratio (C1/C2)					
Example	3	3	3.2	1.2	1700	12.5	55	5	4
	4	2	3.2	1.2	1700	12.4	50	5	4
Compara- tive Example	3	0	3.2	1.0	1700	13.4	20	4	2
	4	Circular			1700	15.0	22	2	1

Example 5

A polyethylene terephthalate resin containing no delustering agent was melt-extruded at a temperature of

300°C through 30 melt-spinning orifices formed in a melt-spinnert and having a hole shape corresponding to the cross-sectional profile of a filament shown in Fig. 1, which profile has 4 circular arc-shaped projections and 3 constrictions formed between the projections, per one side section of the profile, formed on both the sides of a longitudinal center line of the profile. The extruded filamentary melt streams were taken up at a taking up speed of 4000 m/minute, while cool-solidifying the melt streams. The resultant undrawn multifilaments were, without winding up, directly drawn at a temperature of 97°C at a draw ratio of 1.3, to prepare a drawn multifilament yarn having a yarn count of 84 dt/30 filaments. The individual filaments of the multifilament yarn had a cross-sectional profile as shown in Fig. 1, a flatness of the cross-sectional profile of 3.2, and a filament width ratio C1/C2 was 1.2.

The flat multifilament yarns, which were kept non-twisted, were used as warp and weft yarns to produce a plain weave having the following warp and weft densities.

Warp density: 63 warps/2.54 cm

Weft density: 52 weft/2.54 cm

In the resultant plain weave, a content of the flat multifilament yarn was 100%. The plain weave was finished by scouring and dyeing. The finished plain weave had a cover factor (CF) of 1000.

The resultant woven fabric was subjected to the following tests.

(1) Light transmittance

The woven fabric was subjected to a measurement of a light blocking rate in accordance with JIS L 1055-₁₉₈₇, 6.1, Method A at a degree of illumination of 100,000 lx, and the light transmittance through the woven fabric was calculated in accordance with the following equation.

$$\text{Light transmittance (\%)} = 100 - \text{Light blocking rate (\%)}$$

(2) Vision through-preventing property

Vision through-preventing property in the daytime

5 In a room lighted at an illumination of 700 lx
 by using a 80W fluorescent lamp for a room, an article
 (color: red, form: rectangular parallelepiped,
 dimensions: 15 cm x 7 cm x 7 cm) to be seen through a
 woven fabric was placed at a location of 20 cm far from a
 surface of the woven fabric, and the naked eye of an
 10 observer was positioned outside of the room at a location
 of 30 cm away from the opposite surface of the woven
 fabric and at an illumination of 100,000 lx of sunlight,
 to allow the observer to see the article through the
 woven fabric.

15 The degree of the vision through-prevention of
 the woven fabric in the daytime was evaluated in the
 following four classes.

<u>Class</u>	<u>Degree of vision through prevention</u>
4	Completely not able to recognize the article
3	Slightly able to recognize the article
2	Approximately able to recognize the contours of the article
1	Clearly able to recognize the article

Vision through-preventing property in the nighttime

20 The vision through-presenting property of the
 woven fabric in the nighttime was tested by the same
 method as that for the daytime, except that the observer
 for the article was positioned outside the room in the
 nighttime at an illumination of 0.2 lx.

25 The degree of the vision through-prevention of
 the woven fabric in the nighttime was evaluated in the
 same four classes as those in the daytime.

The test results are shown in Table 3.

Example 6

A plain weave of flat multifilament yarns was produced and tested by the same procedures as in Example 5, with exceptions as shown below.

5 The weave structure of the plain weave was changed to that having a warp density of 55 warps/2.54 cm and a weft density of 36 wefts/2.54 cm, and the cover factor (CF) of the resultant plain weave was 880.

The test results are shown in Table 3.

10 Example 7

A plain weave of flat multifilament yarns was produced and tested by the same procedures as in Example 5, with exceptions as shown below.

15 The weave structure of the plain weave was changed to that having a warp density of 112 warps/2.54 cm and a weft density of 74 wefts/2.54 cm, and the cover factor (CF) of the resultant plain weave was 1800.

The test results are shown in Table 3.

Example 8

20 A plain weave of flat multifilament yarns was produced by the same procedures as in Example 5, with exceptions as shown below.

25 The flat multifilament yarn was twisted at a number of twists of 200 turns/m, and the resultant plain weave exhibited a cover factor (CF) of 1000.

The test results are shown in Table 3.

ComparativeExample 5

30 A plain weave of flat multifilament yarns was produced and tested by the same procedures as in Example 5, with exceptions as shown below.

35 The flat cross-sectional profile of the individual filaments of the multifilament yarn had no constrictions. (Flatness of the flat profile: 3.2, Ratio (C1/C2): 1.0).

The resultant woven fabric had a cover factor (CF) of 1000.

The test results are shown in Table 3.

Comparative

Example 6

5 A plain weave of flat multifilament yarns was produced by the same procedures as in Example 5, with exceptions as shown below.

The flat cross-sectional profile of the individual filaments of the multifilament yarn was changed to a triangular cross-sectional profile.

10 The resultant woven fabric had a cover factor of 1000.

The test results are shown in Table 3.

Comparative

Example 7

15 A plain weave of flat multifilament yarns was produced by the same procedures as in Example 5, with exceptions as shown below.

20 The flat cross-sectional profile of the individual filaments of the multifilament yarn was changed to a circular cross-sectional profile.

The resultant woven fabric had a cover factor of 1000.

The test results are shown in Table 3.

Comparative

25 Example 8

A plain weave of flat multifilament yarns was produced by the same procedures as in Example 6, with exceptions as shown below.

30 The flat cross-sectional profile of the individual filaments of the multifilament yarn was changed a triangular cross-sectional profile.

The resultant woven fabric had a cover factor of 880.

The test results are shown in Table 3.

35 Comparative

Example 9

A plain weave of flat multifilament yarns was

produced by the same procedures as in Example 7, with exceptions as shown below.

The flat cross-sectional profile of the individual filaments of the multifilament yarn was changed to a triangular cross-sectional profile.

The resultant woven fabric had a cover factor of 1800.

The test results are shown in Table 3.

Table 3

Item		Cross-sectional profile			Cover factor (CF)	Light transmittance	Vision through-preventing property	
		Number of constrictions per one side	Ratio B/C1	Ratio C1/C2			Daytime	Nighttime
Example No.						(%)		
Example	5	3	3.2	1.2	1000	35	4	3
	6	3	3.2	1.2	880	40	3	3
	7	3	3.2	1.2	1800	25	4	4
	8	3	3.2	1.2	1000	38	3	3
Comparative Example	5	0	3.2	1.0	1000	30	2	2
	6	Triangular cross section			1000	25	2	1
	7	Circular cross section			1000	30	2	2
	8	Triangular cross section			880	30	2	1
	9	Triangular cross section			1800	15	3	2

INDUSTRIAL APPLICABILITY OF THE INVENTION

In the flat multifilament yarn woven fabric of the present invention, the specific flat cross-sectional profile of the individual filaments in the multifilament yarn enables the individual filaments to easily slip on each other due to a compressive pressure generated at the intersecting portions of the warp and weft yarns to cause the multifilament yarn to be flattened and laterally spread, and the gaps between the yarns to become narrow. Therefore, the air permeability of the woven fabric can be appropriately controlled. The resultant woven fabric of the present invention exhibits a high abrasion resistance and an excellent water and perspiration absorbing property, and can scatter the incident light by diffraction and irregular reflection of the light, to reduce the vision through property of the woven fabric,

without significantly decreasing the light transmittance of the woven fabric. Accordingly, the flat multifilament yarn woven fabric of the present invention is useful as a low air permeability textile material, a vision through-
5 preventing textile material, a water and perspiration-absorbing textile material and lighting, vision through-preventing textile material.

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CLAIMS:

1. A flat multifilament yarn woven fabric for clothing materials or interior materials, comprising a plurality of multifilament yarns comprising a plurality of artificial individual filaments comprising, as a principal component, as artificial fiber-forming polymer and having a flat cross-sectional profile, wherein:

(1) in both the side sections of a longitudinal center line of the flat cross sectional profile of each artificial individual filament, at least three projections per side section project outwardly from the longitudinal center line and at least two constrictions per side section formed between the projections are formed approximately in symmetry with respect to the longitudinal center line, and a degree of flatness of the cross-sectional profile represented by a ratio $(B/C1)$ of a largest length (B) of the cross-sectional profile in the direction of the longitudinal center line to a largest width (C1) of the cross-sectional profile in the direction at right angles to the longitudinal center line is 2 to 6;

(2) the woven fabric has a cover factor of 800 to 3500; and

(3) the multifilament yarns each have a total thickness of 170 dtex or less.

2. The flat multifilament yarn woven fabric as claimed in claim 1, wherein the artificial fiber-forming polymer is a polyester, polyamide, polyvinylidene chloride, polypropylene, regenerated cellulose or cellulose acetate.

3. The flat multifilament yarn woven fabric as claimed in claim 1, wherein in the cross-sectional profile of the artificial individual filaments; a ratio $(C1/C2)$ of the largest width (C1) to a smallest width (C2) is in the range of from 1.05 to 4.00.

4. The flat multifilament yarn woven fabric as claimed in claim 1, wherein the total thickness of the

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multifilament yarns is in the range of from 30 to 170 dtex and the thickness of the individual filaments is in the range of from 0.5 to 5 dtex.

5. The flat multifilament yarn woven fabric as claimed in claim 1, having a weave structure in the form of a plain weave, twill weave or satin weave structure.

6. The flat multifilament yarn woven fabric as claimed in claim 1, wherein the multifilament yarns comprising the artificial individual filaments having the flat cross-sectional profile is contained in an amount of 10 to 100 by mass based on the mass of the fabric.

7. The flat multifilament yarn woven fabric as claimed in claim 1, wherein the cover factor of the woven fabric is in the range of from 1500 to 3500.

8. The flat multifilament yarn woven fabric as claimed in claim 7, wherein the multifilament yarn has a number of twists of 0 to 2500 turns/m.

9. The flat multifilament yarn woven fabric as claimed in claim 7, having an air permeability of 5 ml/cm²·sec or less, determined in accordance with JIS L 1096-₁₉₉₈, 6.27.1, Method A using a Frazir type tester.

10. The flat multifilament yarn woven fabric as claimed in claim 9, wherein the air-permeability is in the range of from 0.1 to 4.0 ml/cm²~sec.

11. The flat multifilament yarn woven fabric as claimed in claim 7, having a water absorption velocity of 40 mm or more, determined in accordance with JIS L 1096-₁₉₉₈, 6.26.1, (2) Method B.

12. The flat multifilament yarn woven fabric as claimed in claim 7, having an abrasion resistance of 50 or

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more abrasions, determined in accordance with JIS L 1096-¹⁹⁹⁸, 6.17.1; (1) Method A-1.

13. A low air permeability textile material comprising a flat multifilament yarn woven fabric as claimed in any one of claims 7 to 12.

14. The flat multifilament yarn woven fabric as claimed in claim 1, wherein the artificial individual filaments of the multifilament yarn contains 0.2% or more by mass of a delustering agent and the cover factor of the woven fabric is in the range of from 1300 to 3000.

15. The flat multifilament yarn woven fabric as claimed in claim 14, wherein the multifilament yarn has a number of twists of 0 to 1500 turns/m.

16. The flat multifilament yarn woven fabric as claimed in claim 14, having a degree of vision through-prevention of the woven fabric represented, in a $L^*a^*b^*$ color system, by a difference ΔL , wherein $L = L_w^* - L_b^*$ between an L^* value of the woven fabric placed on a white plate, represented by L_w^* , and an L^* value of the woven fabric placed on a black plate, represented by L_b^* , which is 15 or less.

17. The flat multifilament yarn woven fabric as claimed in claim 14, having a water absorption velocity of 40 mm or more, determined in accordance with JIS L 1096-¹⁹⁹⁸, 6.26.1, (2) Method B.

18. A vision through-preventive, perspiration-absorbent textile material comprising a flat multifilament yarn woven fabric as claimed in any one of claims 14 to 17.

19. The flat multifilament yarn woven fabric as claimed in claim 1, wherein the artificial individual filaments of the multifilament yarn each contains 0 to 0.2%

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by mass of a delustering agent and the cover factor of the woven fabric is in the range of from 800 to 2000.

20. The flat multifilament yarn woven fabric as claimed in claim 19, wherein the multifilament yarn has a number of twists of 0 to 1000 turns/m.

21. The flat multifilament yarn woven fabric as claimed in claim 19, having a degree of light transmittance of 10 to 70%, determined in accordance with JIS L 1055-₁₉₈₇, 6.1. Method A, at a degree of illumination of 100000 lx.

22. A vision through-preventive textile material comprising a flat multifilament yarn woven fabric as claimed in any one of claims 19 to 21.

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Fig.1

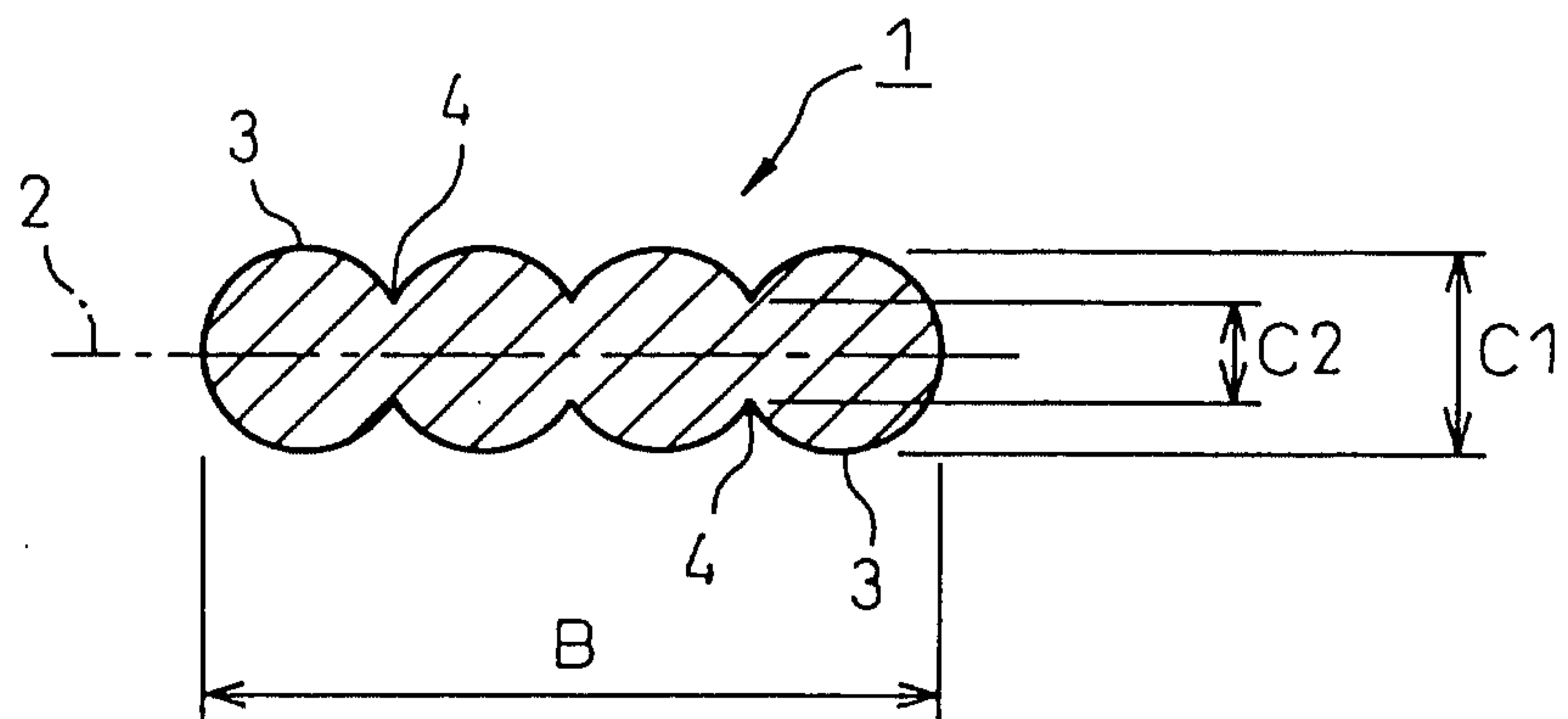


Fig.2

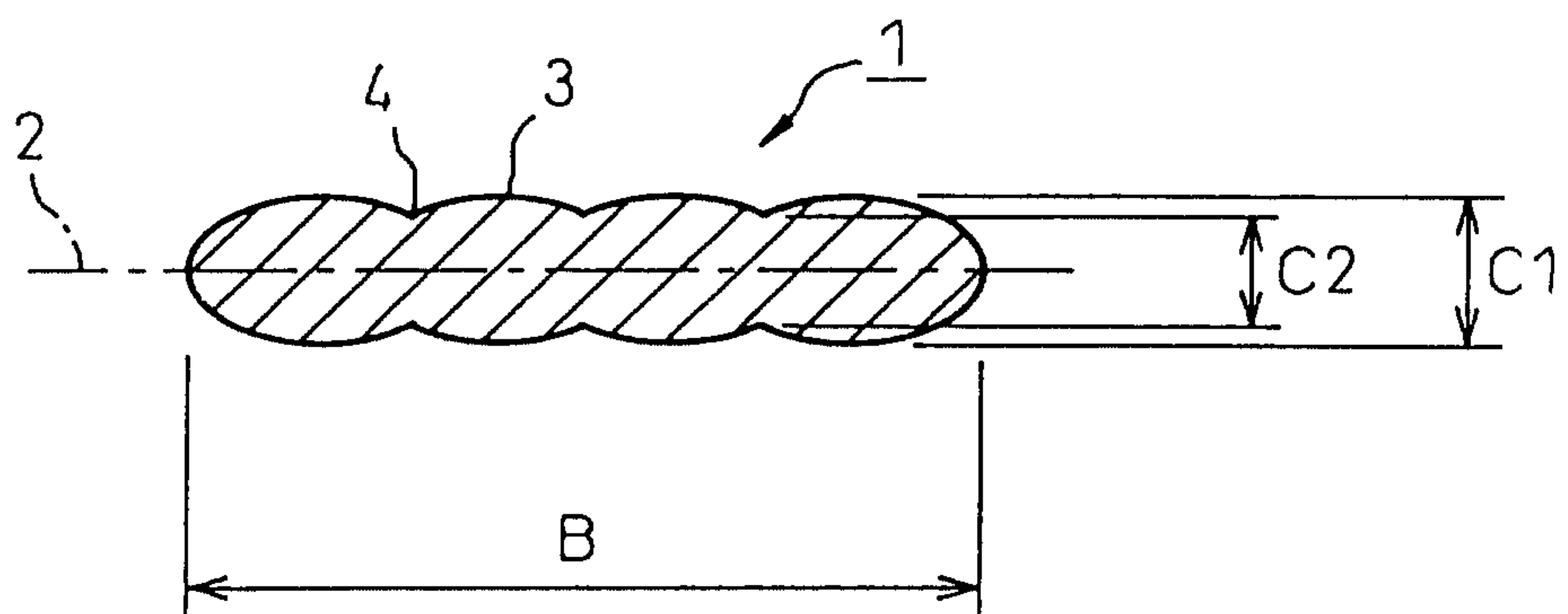


Fig.3

