

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a slide fastener tape obtained by weaving or knitting and more particularly, to a slide fastener tape having a so-called positive pucker condition in which a fastener stringer, on which elements are mounted by strong stretching and various kinds of heat treatments, is slightly dented toward the element attachment side, and the slide fastener tape being integrated with object clothes by sewing such that the entire surface thereof is uniform and flat without weaving on its tape main body and its sewed surface by absorbing the aforementioned slight dent through contraction of the tape main body at the time of sewing.

2. Description of the Related Art

[0002] As for the slide fastener tape (hereinafter referred to as fastener tape), a plurality of elements, which are formed to mesh with mating elements, are mounted along a side edge thereof at an equal pitch and a slider is loaded on the element row. Then, upper and bottom stopper devices are attached to ends of the element row so as to produce a slide fastener of a predetermined length. After that, this slide fastener is sewed to clothes or various kinds of bags by sewing.

[0003] The fastener tape has a tape main body and an element attachment edge portion attached to a side edge of the tape main body. In this element attachment edge portion, a core thread having a larger diameter than other warp yarns is knitted together along the longitudinal direction of the tape at the same time when the tape is knitted or woven in order to not only stabilize the attachment condition of the respective elements but also increase their attachment strength.

[0004] Because of a difference in organization and structure between the tape main body and the element attachment edge portion, generally, the element attachment edge portion in which the core thread is disposed has a smaller heat shrinkage than the tape main body. As a result, the tape main body is contracted largely in the fastener tape after passing various of heat treatment processes, thereby likely producing an inverted pucker in which the element attachment edge portion is warped outwardly.

[0005] On the other hand, when metallic elements or synthetic resin elements are mounted, a large tension is applied to the fastener tape, particularly its element attachment edge portion in order to secure a specific attachment pitch for the elements and the elements are mounted with its element attachment edge portion and tape main body in a stretched condition. As a result, even after the tension is released, the portion having the

elements mounted thereon is not returned to its original length but the side of the element attachment edge portion of the fastener tape is jumped outward largely, so that the above-described inverted pucker condition is more likely to be intensified. This tendency is remarkable particularly in such a slide fastener demanded to have plasticity and contraction/expansion property.

[0006] To solve this fault, for example, Japanese Patent Application Publication No. 59-51807 (patent document 1) has proposed that a textured yarn is adopted as the constituent yarns for the tape main body in a fastener tape composed of double-sided knitting structure, and a core thread covered with a covering yarn continuous from the tape main body is disposed in the element attachment edge portion while the boiling water shrinkage ratio of the core thread is higher than that of the textured yarn.

[0007] Although such a structure puts the element attachment edge portion into a so-called positive pucker condition in which the element attachment edge portion is dented inward or curved because of a difference in thermal shrinkage ratio between the element attachment edge portion and the tape main body even after heat treatment. Even if the element attachment edge portion is contracted, the expansion and contraction property of the tape main body follows it and consequently, a fastener stringer capable of holding linearity after elements are mounted is obtained. As a result, this fastener tape can be sewed to a flexible object clothes having ample contraction and expansion property in a condition that it is adapted to the same object clothes.

[0008] On the other hand, when the yarn having contraction and expansion property used for ordinary fastener tape material is employed in a fastener tape constructed with ordinary weaving structure, if the pucker occurs in the fastener tape, the fastener stringer is incapable of correcting that pucker condition to a linear condition because the tape main body has no contraction and expansion property due to the weaving structure. Thus, when this fastener tape is sewed to clothes or the like, not only the sewing processing becomes complicated but also the slide fastener mounted on clothes after sewing is not flattened in the longitudinal direction, thereby providing waving condition, thus leading to increase in fault products.

[0009] To solve such a problem, for example, Japanese Patent Publication No. 2002-209613 (patent document 2) has disclosed a slide fastener tape comprising a tape main body produced by weaving and an element attachment edge portion in which a core thread is woven, wherein a foundation warp yarn used for the tape main body is composed of a textured yarn having a lower thermal shrinkage ratio than the other warp yarns, and the core thread has a multi-filament having a high boiling water shrinkage ratio while a warp yarn inside and adjacent the core thread is composed of a textured yarn whose boiling water shrinkage ratio is higher than that of the foundation warp yarn used in the tape main

body and lower than that of the core thread.

[0010] At the time when its weaving is completed, this fastener tape has an inverted pucker condition in which the element attachment edge portion is slightly jumped outward and curved because of a difference in weaving structure between the tape main body and the element attachment edge portion. If dry thermal setting is applied to the fastener tape having such a structure for a short time, the contraction amount of the element attachment edge portion and the contraction amount of the warp yarn disposed in the tape main body are hardly different and the contraction amount of the element attachment edge portion is slightly larger. Thus, the inverted pucker which is produced when weaving of the fastener tape is completed is eliminated so that entirely the fastener tape becomes linear.

[0011] Subsequently, the contraction amount in the fastener tape due to dyeing decreases in the order of the core thread, the warp yarn adjacent the core thread and the tape main body, so that the fastener tape turns into the positive pucker condition in which the side of the element attachment edge portion is dented inward like a bow. At the same time, bias occurs such that the tape main body turns into a waved condition. When the fastener elements are mounted under this condition, a large tension is applied to particularly the element attachment edge portion. Thus, although the element attachment edge portion is elongated by a tension at the time when the elements are mounted, that elongation is smaller than the contraction amount by heating, so that the element attachment edge portion becomes substantially linear. On the other hand, because no elongation occurs in the tape main body at the time when the elements are mounted, that bias condition is maintained.

[0012] By setting the boiling water shrinkage ratio of the core thread in the element attachment edge portion of the fastener tape larger than the boiling water shrinkage ratio of the warp yarn inside and adjacent the core thread, the difference in thermal shrinkage between the element attachment edge portion and the tape main body is changed in steps. Thus, no step-like contraction behavior is generated between the element attachment edge portion and the tape main body. Because the element attachment edge portion in the fastener stringer keeps linear when this slide fastener is sewed to object clothes, the sewing processing can be executed accurately, and consequently, a beautiful product can be obtained, in which no waved state occurs in a longitudinal direction in the slide fastener after the sewing.

[0013] When a slide fastener chain is sewed to object clothes, contraction occurs in the fastener tape to be sewed by tension of a sewing thread. Thus, no pucker occurs in the slide fastener before sewing as mentioned in the above patent documents 1 and 2. If the element row and the fastener tape are linear included in the same plane, the fastener tape is likely to be waved along its sewing line. Particularly if the object clothes has an ample plasticity particularly like a thin knit fabric or thin wo-

ven fabric, the product on which each of them is sewed is also waved thereby leading to drop in product value.

[0014] The present invention has been accomplished to solve such a problem and a specific object of the present invention is to provide a woven or knitted slide fastener tape capable of obtaining a beautiful sewed product regardless of which the sewed product is hard or soft.

10 SUMMARY OF THE INVENTION

[0015] The above-described object is achieved by a slide fastener tape comprising: a tape main body formed by weaving or knitting and an element attachment edge portion in which a core thread is woven or knitted, wherein constituent yarns extending in a warp direction outside and adjacent the core thread in the element attachment edge portion have an elongation recovery ratio R against a stretching, which is obtained according to JIS L1096 and is higher than that of all other constituent yarns and the core threads extending in the warp direction.

[0016] When weaving or knitting of this fastener tape is completed, its element attachment edge portion is kept substantially linear while the tape main body is slightly waved because of a difference in organization between the tape main body and the element attachment edge portion, and a difference in elongation recovery ratio R of constituent yarn between the tape main body and the element attachment edge portion. If the contraction amount of the element attachment edge portion and the contraction amount of the constituent yarns extending in a warp direction in the tape main body are hardly different from each other even when dry thermal setting and high-temperature dyeing are carried out under such a structure, the configuration produced when weaving or knitting thereof is completed is not changed largely.

[0017] When the fastener elements are mounted under this condition, the main body and element attachment edge portion in the fastener tape are pulled together strongly and particularly, the element attachment edge portion is pulled relatively strongly. The element attachment edge portion and the tape main body are elongated together by a tension at the time when the elements are attached. The element attachment edge portion approaches to its original length because the elongation recovery ratio R of the constituent yarns disposed outside the core thread in the element attachment edge portion is set larger than the elongation recovery ratio R of the constituent yarns extending in the warp direction of the tape main body. However, recovery of its tape main body is small, thereby providing a positive pucker condition in which the side of the element attachment edge portion is dented and curved like a bow while the tape main body is waved.

[0018] If the fastener tape section of the slide fastener having such a configuration is sewed to object clothes,

the tape main body is flattened due to contraction which occurs at the time of sewing, so that the fastener tape is sewed in a condition that it is well adapted to the object clothes. That is, a beautiful product which does not suffer waving in the longitudinal direction of the slide fastener after sewing is obtained.

[0019] The elongation recovery ratio R at this time can be obtained by measuring respective yarn lengths according to JIS L1096 and using the following equation (1). The elongation recovery ratio R of the constituent yarns disposed outside the core thread in the element attachment edge portion of the present invention is difficult to automatically determine because it is determined relative to that of the other constituent yarns. However, the elongation recovery ratio R is preferred to be 85% or higher because the elongation recovery ratio R of the constituent yarns disposed outside the core thread in the element attachment edge section is easier to set to be higher than the other materials. The elongation recovery ratio R of ordinary multi-filament or monofilament is at most 80% even if it reaches its maximum.

$$R = \{(L1 - L2)/(L1 - L0)\} \times 100 \quad (1)$$

where L0 is an original yarn length, L1 is a yarn length when pulled under a predetermined tension and L2 is a yarn length after recovery under no tension.

[0020] For measurement of the yarn length based on JIS L1096, a tension test machine or an apparatus having similar performance is used. With an end of a test piece fixed with a clamp, an initial load is applied to the other end and marks are made at a position 20 cmk from a bottom end of the clamp in the test piece. Next, a load of 14.7 N (1.5 kgf) is applied gently and after leaving for one hour, the interval between the marks is measured. Next, the load is removed and the initial load is applied 30 seconds after and one hour after and then the interval between the marks is measured. The elongation recovery ratio R is obtained according to the above-described equation (1) and three average values are calculated about 30 seconds after and one hour after.

[0021] The elongation recovery ratio R is preferred to be set smaller in the order of the constituent yarns in the element attachment edge portion extending in the warp direction outside and adjacent the core thread, the core thread and all the other constituent yarns extending in the warp direction in the tape main body. If the fastener tape is left under no load after it is stretched equally with such a structure, the constituent yarns in the element attachment edge portion extending in the warp direction outside and adjacent the core thread, the core thread and the tape main body try to return to their original lengths in this order. As a result, their elongation recovery behaviors are obtained without any difference in step among these yarns, thereby providing a positive pucker condition in which the element attachment edge portion is dented and curved like a bow. When the slide

fastener is sewed to object cloth, contraction at the time of sewing is absorbed by the waving state of the tape main body, so that the sewing work can be carried out easily and accurately and a beautiful product can be obtained after the sewing.

[0022] According to the present invention, preferably, the size of a single yarn having a high elongation recovery ratio R is set larger than the size of the single yarn in all the constituent yarns extending in the warp direction. If the size of the single yarn having the high elongation recovery ratio R is larger than the size of the single yarn in all the other constituent yarns extending in the warp direction, the recovery ratio after the elongation is increased. Even if the inverted pucker condition is conceivable until elements are mounted, it can be changed to a slight positive pucker condition securely after the elements are mounted.

[0023] Examples of a typical material for a yarn having a high elongation recovery ratio R include nylon and polycondensate of n-propanediol and terephthalic acid. If multi-filament yarn of polyester is employed for all the other constituent yarns extending in the warp direction in the tape main body except these yarns, it is preferable because a conceivable different can be provided to the elongation recovery ratio R between them. In the case of a fastener tape obtained by weaving, employing the textured yarn for all warps yarns used in the element attachment edge portion and tape main body is preferable because it prevents deviation in stitch. However, the knit fastener tape does not always need to be of a textured yarn because there is no fear that their stitches may be deviated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is an enlarged partial perspective view schematically showing a typical embodiment of a weaving structure of a fastener tape according to the present invention;

FIG. 2 is a sectional view taken along the line II-II of FIG. 1;

FIG. 3 is an explanatory diagram schematically showing changes in style in each processing step for the fastener tape;

FIG. 4 is a sectional view corresponding to FIG. 2 and showing a modification of the embodiment;

FIG. 5 is a sectional view corresponding to FIG. 2 and showing another modification of the embodiment;

FIG. 6 is a partial plan view schematically showing a typical embodiment of a knitting structure of the fastener tape according to the present invention; and

FIG. 7 is a partial plan view showing a modification of the embodiment.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0025] Hereinafter, illustrative embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0026] FIG. 1 shows an example of a woven fabric of a fastener tape according to a typical embodiment of the present invention. Although the weaving structure shown in this figure is expressed roughly for graphic representation, actually, this is composed of a tight structure.

[0027] The fastener tape 1 having this weaving structure is woven by means of a small-width weaving machine usually called needle weaving machine. As shown in FIG. 1, a yarn is reciprocated through an opening produced by the warp yarns, so that two yarns act as a pair of weft yarns 2 in a condition that they are doubled. Although in this figure, the pair of weft yarns 2 inserted laterally are expressed as a condition that yarns 2a, 2b doubled are set apart from each other in a vertical direction, actually, the yarns 2a, 2b keep in contact with each other. A loop end formed at a return end of the weft yarn 2 entangles with a loop end of a weft yarn (not shown) which is to be formed next time with a latch needle (not shown), so as to form an ear section at a side edge of the fastener tape 1. On an edge opposite to the ear section formed by entanglement of the weft yarns 2, fastener elements 3 are attached as indicated with a phantom line in FIG. 2.

[0028] That is, the fastener tape 1 is comprised of an element attachment edge portion 4 on which fastener elements 3 are to be attached and which is located on an edge portion opposite to the ear section (not shown) formed by entanglement of the loop ends of the weft yarns 2, and a tape main body 5 which is stretched from the element attachment edge portion 4 to the ear section (not shown) on the opposite side. As the yarns 2a, 2b which compose the weft yarns 2 of this embodiment, a fine textured yarn constituted of 330dTex polyester is employed.

[0029] As two warp yarns 6a, 6b to be disposed adjacent and outside the element attachment edge portion 4 in the indicated example, nylon multi-filaments thicker than the other warp yarns 6c, 6d, 6e, ... 6m, 6n are disposed and two core threads 7a, 7b are disposed inside and adjacent the two warp yarns 6a, 6b. Further, the polyester textured yarns composing two pairs of warp yarns 6c to 6f, each composed of two yarns, are disposed inside and adjacent the core threads, thereby constructing the element attachment edge portion 4.

[0030] Further, the multiple foundation warp yarns 6g, 6h, ... 6m, 6n are disposed in the tape main body 5 from its inside up to the ear section. These foundation warp yarns 6g, 6h, ... 6m, 6n are woven successively while each is composed of two yarns as a pair. Two narrow warp yarns 6o-1, 6o-2 disposed outside the two warp yarns 6a, 6b, disposed outside and adjacent the aforementioned element attachment edge portion 4, have a

function of holding the configuration of the edge of the element attachment edge portion 4. According to this embodiment, the entire organization except the core threads 7a, 7b is a plain weaving organization in which the warp and weft yarns are woven with two yarns of each as a pair.

[0031] The two warp yarns 6a, 6b having a high elongation recovery ratio R disposed in the element attachment edge portion 4 of the fastener tape 1 and outside of the attachment edge portion are composed of nylon multi-filament having a boldness of 470 Tex. The two core threads 7a, 7b are composed of polyester made multi-filament of 560 dTex of gray yarn as a core thread and knit yarns of 267 dTex covering the circumference of the former. The respective warp yarns 6c, 6d, ... 6m, 6n on the side of the tape main body of the element attachment edge portion 4 are composed of polyester textured yarns of 330 dTex. Further, the two warp yarns 6o-1, 6o-2 disposed most outside in the element attachment edge portion 4 are composed of polyester textured yarns of 235 dTex.

[0032] To prevent the inverted pucker from being generated at the time of producing the fastener stringer keeping the positive pucker condition in which the element attachment edge portion 4 is slightly dented so that the configuration is curved under the present invention, it is important that the warp yarns 6a, 6b disposed outside and adjacent the core threads 7a, 7b are not elongated by liquid pressure at the time of injection of the fastener element and in coloring process. The elongation recovery ratio R of the two warp yarns 6a, 6b having a high elongation recovery ratio R is 94.3%, the elongation recovery ratio R of the warp yarns 6c, 6d, ... 6m, 6n disposed in the tape main body is 67.0% and the elongation recovery ratio R of the core threads 7a, 7b is 73.1%. That is, the elongation recovery ratio R decreases gradually in the order of the two warp yarns 6a, 6b disposed outside and adjacent in the element attachment edge portion, the core threads 7a, 7b and the warp yarns 6c, 6d, ... 6m, 6n disposed in the tape main body.

[0033] Further, the above-mentioned core threads 7a, 7b have a boiling water shrinkage ratio of 15%, which is extremely larger than the other yarns, so that the thermal setting contraction is increased from conventional 5% to 7%. Meanwhile the elongation recovery ratio R of the two warp yarns 6o-1, 6o-2 disposed most outside in the element attachment edge portion 4 is equal to the elongation recovery ratio R of the warp yarns 6c, 6d, ... 6m, 6n disposed in the tape main body.

[0034] To block generation of the inverted pucker at the time of manufacturing the fastener stringer according to the present invention, it is important also to secure a high contraction in the core threads 7a, 7b and suppress the elongation of a tape on the side of the element attachment edge portion 4 to a small level after the fastener tape 1 passes coloring step in order to block the core thread from being elongated at the time of fastener element injection (not shown). For the reason, as for the

structure of the core threads 7a, 7b, the core threads are covered so as to surround a core material with a knit tube obtained by intersecting sinker loops each composed of multiple knitting yarns with each other like the core thread structure disclosed by, for example, Japanese Utility Model Application Publication No. 55-21605. According to this embodiment, gray yarn multi-filaments of polyester of $330 \text{ dTex} \times 2$ are employed as the core thread and its boiling water shrinkage is set to as high as 15%.

[0035] By adopting the above-described weaving structure and different kinds of the warp yarns of this embodiment, the configuration of the fastener tape 1 changes as indicated in FIGs. 3A to 3E each time when it passes a predetermined heat treatment process. Consequently, when elements are attached by injection under a high temperature, a fastener stringer 8 is configured into a positive pucker in which the side of the element attachment edge portion 4 is slightly dented to produce a curved shape. Its slight waving condition is eliminated by contraction in the fastener tape generated when it is sewed to mating clothes so that a beautiful sewing configuration can be obtained easily.

[0036] This will be explained with reference to FIG. 3. First, it is assumed that the fastener tape is woven with all the warp yarns 6o-1, 6o-2, 6a, 6b, ... 6m, 6n and core threads 7a, 7b under the same tension. In this case, although the warp yarns 6a, 6b having a high elongation recovery ratio R are substantially returned to their original length, the other warp yarns 6o-1, 6o-2, ... 6m, 6n and core threads 7a, 7b cannot return to their original length completely. Therefore, as shown in FIG. 3A, a positive pucker condition in which the side of the element attachment edge portion 4 is slightly dented is formed. However, on a stage when the weaving is completed, the element attachment edge portion 4 is substantially linear while only minute wave-like bias is generated in the tape main body 5.

[0037] Then, the fastener tape 1 obtained in this way is dyed. As for this dyeing, usually, the fastener tape 1 is wound around a dyeing beam (not shown) and that beam is dipped into dyeing solution circulated in a dyeing machine and then, the fastener tape 1 is dyed under high temperatures. Therefore, unless the fastener tape is wound around the beam uniformly, no uniform dyeing can be obtained. For the reason, the fastener tape 1 having the pucker condition just after weaving is completed is subjected to the thermal setting under a dry hot condition temporarily. At this time, a uniform tension is applied to the fastener tape 1 to execute linear thermal setting so that uniform winding around the beam is secured.

[0038] When this just woven tape is subjected to thermal setting under a dry hot condition of, for example, 180°C for a minute, as shown in FIG. 3B, although the core threads 7a, 7b are contracted, they are not contracted completely because the thermal setting processing time is short. Further, a difference in contraction between the element attachment edge portion 4 and the

tape main body 5 at the time of thermal setting is quite small and bias in the element main body hardly exists visibly.

[0039] Next, the fastener tape 1 is dipped into a high-pressure dyeing solution at 130°C and dyed for 40 minutes. Consequently, the element attachment edge portion 4 is contracted most and then, the core threads 7a, 7b are contracted next, so that a difference in contraction occurs between the element attachment edge portion 4 and the tape main body 5. As a result, as shown in FIG. 3C, a positive pucker condition becomes evident so that it is visually found that wave-like bias is generated in the tape main body 5 at the same time.

[0040] Fastener elements 3 are injection-molded under high temperatures subsequent to dyeing and then, are integrated with the element attachment edge portion 4 of the fastener tape 1. At this injection-molding time, the largest tension is applied to the element attachment edge portion 4 so that it is elongated. Although if the tension is released after the molding, the elongation in the element attachment section of the element attachment edge portion 4 is not recovered but that in the tape section between the elements is largely elongated or recovered. At this time, the recovery from the elongation in the core threads 7a, 7b and tape main body 5 is small and because of the difference in elongation recovery ratio R, the warp yarns 6a, 6b disposed outside and adjacent the core threads 7a, 7b, the core threads 7a, 7b, and the warp yarns 6c, 6d, ... 6m, 6n disposed in the tape main body try to return to their original lengths. Thus, the warp yarns 6a, 6b disposed outside and adjacent the core threads 7a, 7b are recovered to their original length most while the amount of the recovery in the warp yarns 6c, 6d, ... 6m, 6n in the tape main body is the smallest. As a result, after the manufacturing, the element attachment edge portion 4 in a fastener chain 9 becomes linear as shown in FIG. 3D so that the waving in the tape main body 5 is evident.

[0041] After the manufacturing, a slider is loaded on the fastener stringer 8 and upper and bottom stopper devices are mounted. When this slide fastener is sewed to object clothes, although usually its sewing section is waved due to contraction by sewing, the slide fastener of this embodiment fits to the object clothes regardless of which it is hard or soft at the time of sewing because the tape main body 5 is in the waving condition. Consequently, not only the slide fastener can be sewed easily but also as shown in FIG. 3E, a product after sewing 10 can be completed beautifully. Particularly, this slide fastener is preferable for a soft object clothes.

[0042] FIG. 4 shows a modification of the fastener tape 1 obtained by weaving in the same way as the above-described embodiment. This modification is achieved by modified hollow-weaving and although the organization of the core threads 7a, 7b to be woven into the element attachment edge portion 4 is the same as the above-described embodiment, the two warp yarns 6a, 6b having a high elongation recovery ratio R dis-

posed outside and adjacent the same core threads 7a, 7b are arranged in parallel in the direction of the front and rear sides of a tape surfaces and the two warp yarns 6o-1, 6o-2 having a small diameter disposed most outside in the element attachment edge portion 4 are excluded from this embodiment.

[0043] According to this modification, a textured yarn composed of polycondensate constituted of n-propanediol having a high elongation recovery ratio R and terephthalic acid is employed for the warp yarns 6a, 6b having a high elongation recovery ratio R in the element attachment edge portion 4 like the above embodiment. A textured yarn of polyester having a smaller elongation recovery ratio R than the warp yarns 6a, 6b is employed for the warp yarns 6c, 6d, ... 6m, 6n in the tape main body 5 like the above embodiment. The elongation recovery ratio R of yarn (made by Asahi Chemical Industry Co., Ltd.) composed of polycondensate constituted of the aforementioned n-propanediol and terephthalic acid is 88% and the elongation degree is 36 to 37%, which are extremely larger than polyester and nylon 66.

[0044] FIG. 5 shows another modification of the above-described embodiment. According to this modification, the element attachment edge portion 4 is formed as hollow-woven section and a large core thread 7 is inserted in this hollow-woven section. Three warp yarns 6o, 6a, 6b composed of large nylon multi-filament having a higher elongation recovery ratio R than the other warp yarns 6c, 6d, ... 6m, 6n are disposed as yarns arranged most outside in the hollow-woven section. Polyester is used as material of the other warp yarns 6c, 6d, ... 6m, 6n like the above embodiments.

[0045] According to this modification also, the fastener stringer 8 after the elements 3 are mounted is formed to have a positive pucker condition in which the element attachment edge portion 4 is slightly dented, so that a product after the fastener stringer is sewed thereto can be finished beautifully. Further, two or three warp yarns 6a, 6b (6o) having a higher elongation recovery ratio R than the other warp yarns 6c, 6d, ... 6m, 6n are disposed most outside in the element attachment edge portion 4. Therefore, the behavior of the fastener stringer which tries to return to its original configuration is unlikely to be affected by its peripheral organization so that its predetermined recovery amount becomes easy to obtain and thus, the positive pucker condition can be obtained securely.

[0046] FIG. 6 shows a second embodiment of the present invention. A fastener tape 11 of this embodiment is a warp knit tape. Although this figure expresses the arrangement of the constituent yarns roughly, actually, they are knitted more tightly. Like the first embodiment described above, this fastener tape 11 is comprised of an element attachment edge portion 14 on which multiple elements 3 are to be attached at an equal pitch and a tape main body 15 to be sewed to object clothes (not shown). According to this embodiment, chain knitting yarns 16a, 16b, ... 16m, 16n are disposed on all wales

and a 0-0/3-3 weft yarn 12a is inserted into a needle loop of each of the chain knitting yarns 16a, 16b, ... 16m, 16n successively. One core thread 17 is disposed between the chain knitting yarns 16a and 16b in the element attachment edge portion 14 and the core thread 17 is knitted into and fixed in the element attachment edge portion 14 by intersecting this weft yarn 12a with the 3-3/0-0 weft yarn 12b on the front and rear surfaces.

[0047] A nylon-made multi-filament yarn 16p having a higher elongation recovery ratio R than the other composition knitting yarns 16a, 16b, ... 16m, 16n, which is a feature section of the present invention, is inserted longitudinally between the front and rear weft yarns 12a and 12b and at the same time, between the chain knitting yarn 16a and the core thread 17, the chain knitting yarn 16a being disposed outside the core thread 17 of the two chain knitting yarns 16a, 16b disposed in the element attachment edge portion 14. The total size of the nylon-made multi-filament yarn 16p used in the present invention is 470 dTex and its elongation recovery ratio R is 94%.

[0048] On the other hand, the core thread 17 is produced by covering a core material 17a of polyester-made multi-filament yarn of three gray yarns of 560 dTex with a covering section 17 which is hollow-woven with a single polyester-made multi-filament yarn of 267 dTex and its elongation recovery ratio R is 78.8%. A textured yarn composed of 330-dTex polyester-made multi-filament is employed for the chain knitting yarns 16a, 16b, ... 16m, 16n and the weft yarns 12a, 12b and its elongation recovery ratio R is 75.6%.

[0049] The chain knitting yarns 16a, 16b, ... 16m, 16n and the weft yarns 12a, 12b of this embodiment utilize a small size yarn and organized in a knitting structure. Accordingly, the fastener tape 11 after knitting has an extremely excellent plasticity and adapts itself to a knit fabric or thin woven cloth easily. Further, because the above-described structure is adopted, a fastener stringer (not shown) after the elements 3 are attached has a positive pucker condition in which the element attachment edge portion 14 is slightly dented like the first embodiment, so that it adapts itself to an object clothes well. At the same time, it can absorb a contraction generated at the time of sewing sufficiently and consequently, a beautiful sewing product is produced.

[0050] FIG. 7 shows a modification of the second embodiment. According to this modification, the nylon-made multi-filament yarn 16p of the second embodiment is excluded and a nylon-made multi-filament yarn having a high elongation recovery ratio is employed for the chain knitting yarn 16a disposed outside the core thread 17 of the two chain knitting yarns 16a, 16b disposed in the element attachment edge portion 14. The physical property at this time is substantially the same as the second embodiment. According to this modification, the chain knitting yarn 16a disposed most outside in the element attachment edge portion 14 is more than twice longer than the second embodiment. Thus, the

amount of returning to its original length after the chain knitting yarn 16a is stretched strongly when the elements are mounted is relatively larger than the other chain knitting yarns 16b, ... 16m, 16n, so that the positive pucker condition in which the element attachment edge portion 14 is dented and curved becomes evident.

[0051] As evident from the above description, the elongation recovery ratio R of the core thread composing the element attachment edge portion and the constituent yarns adjacent the inside of the same core thread and that of the constituent yarns and core thread extended in the other warp direction, material of those constituent yarns and core thread and their knitting/weaving structure are not restricted to the above-described configuration and as well understood, may be modified in various ways within a technical scope mentioned by the present invention.

Claims

1. A slide fastener tape (1, 11) comprising: a tape main body (5) formed by weaving or knitting; and an element attachment edge portion (4, 14) in which a core thread (7a, 7b, 17) is woven or knitted,

being **characterized in that** at least part of constituent yarns (6o, 6a, 6b, 16a, 16p) extending in a warp direction outside and adjacent the core thread (7a, 7b, 17) in the element attachment edge portion (4, 14) has a higher elongation recovery ratio R, which is expressed by a following equation (1) based on a length of yarn measured according to JIS L1096, than that of all other constituent yarns (6c to 6n, 6o-1, 6o-2, 16a to 16n) and the core threads (7a, 7b, 17) extending in the warp direction in the tape main body (5, 15):

$$R = \{(L1 - L2)/(L1 - L0)\} \times 100 \quad (1)$$

where L0 is an original length of yarn, L1 is a length of yarn when pulled under a predetermined tension and L2 is a length of yarn when no tension is applied.

2. The slide fastener tape according to claim 1, **characterized in that** the elongation recovery ratio R of the yarns (6o, 6a, 6b, 16a, 16p) having the high elongation recovery ratio R is 85% or more.

3. The slide fastener tape according to claim 1 or 2, **characterized in that** the elongation recovery ratio R is set to be smaller in an order of the constituent yarns (6o, 6a, 6b, 16a, 16p) extending in the warp direction outside and adjacent the core thread (7a, 7b, 17) in the element attachment edge portion (4, 14), the core threads (7a, 7b, 17) and all the other constituent yarns (6c to 6n, 6o-1, 6o-2, 16a to 16n)

extending in the warp direction.

4. The slide fastener tape according to claim 2 or 3, **characterized in that** a size of the yarns (6o, 6a, 6b, 16a, 16p) having the high elongation recovery ratio R is set to be larger than that of a single yarn of the constituent yarns (6c to 6n, 6o-1, 6o-2, 16a to 16n) extending in the warp direction of the tape main body (5).
5. The slide fastener tape according to claim 1, **characterized in that** the yarns (6o, 6a, 6b, 16a, 16p) having the high elongation recovery ratio R are composed of nylon-made multi-filament yarn while all the other constituent yarns (6c to 6n, 6o-1, 6o-2, 16b to 16n) extending in the warp direction are composed of polyester-made multi-filament yarn.
6. The slide fastener tape according to claim 3, **characterized in that** the yarns (6o, 6a, 6b, 16a, 16p) having the high elongation recovery ratio R are multi-filament yarn composed of polycondensate of n-propanediol and terephthalic acid while all the other constituent yarns (6c to 6n, 6o-1, 6o-2, 16b to 16n) extending in the warp direction are polyester-made multi-filament yarn.

FIG. 1

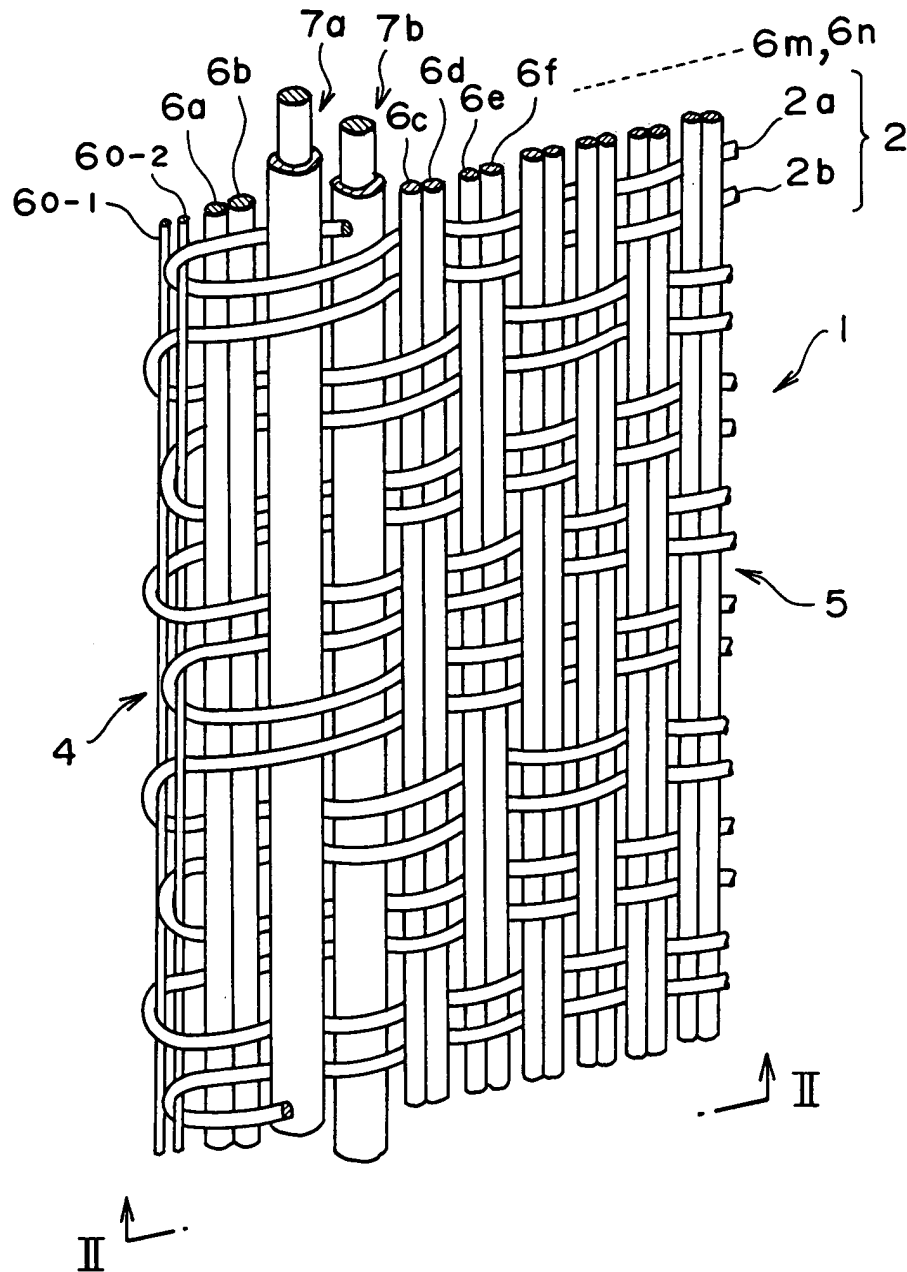


FIG. 2

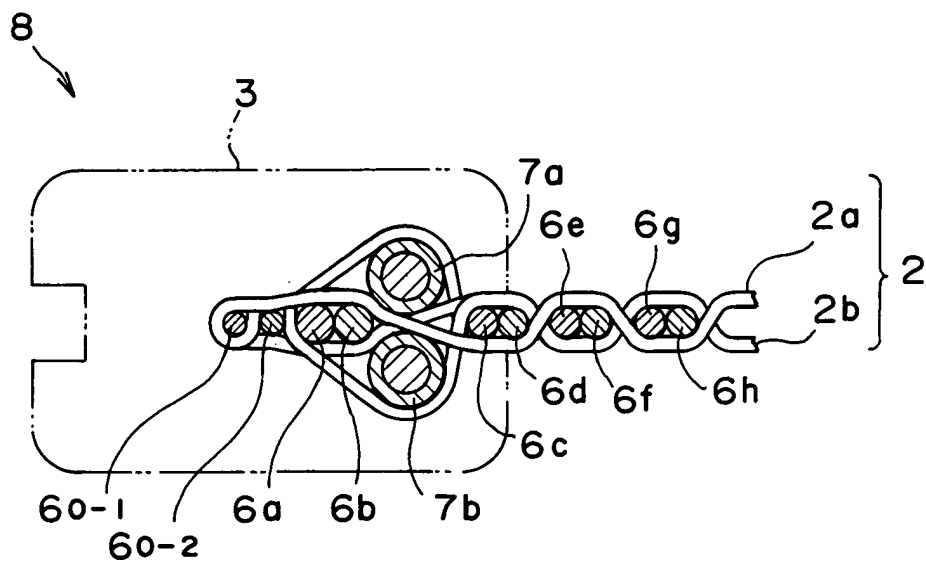


FIG. 3

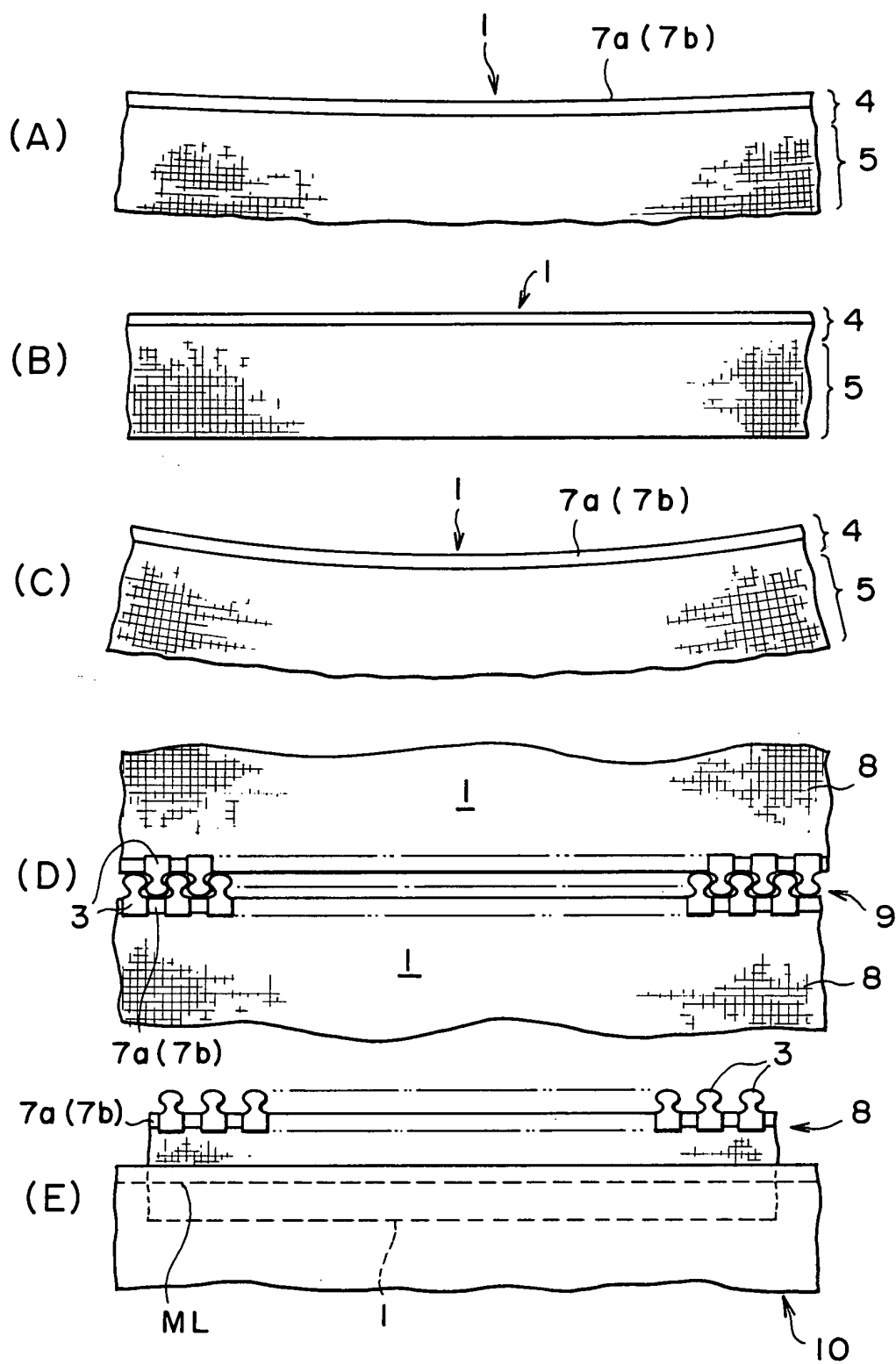


FIG. 4

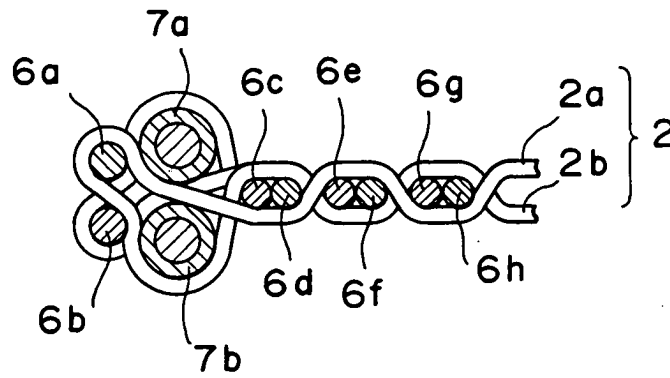


FIG. 5

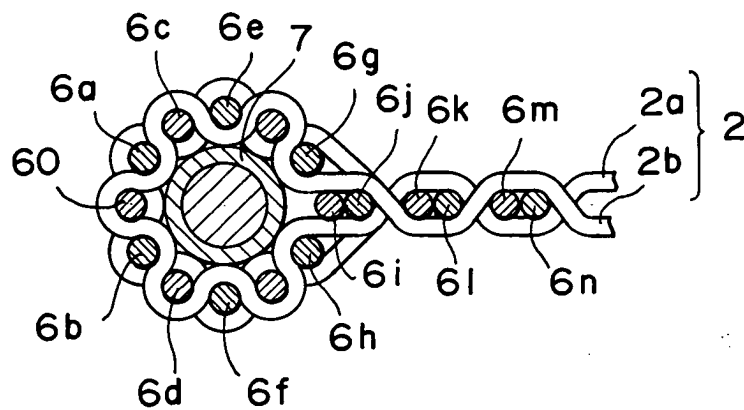


FIG. 6

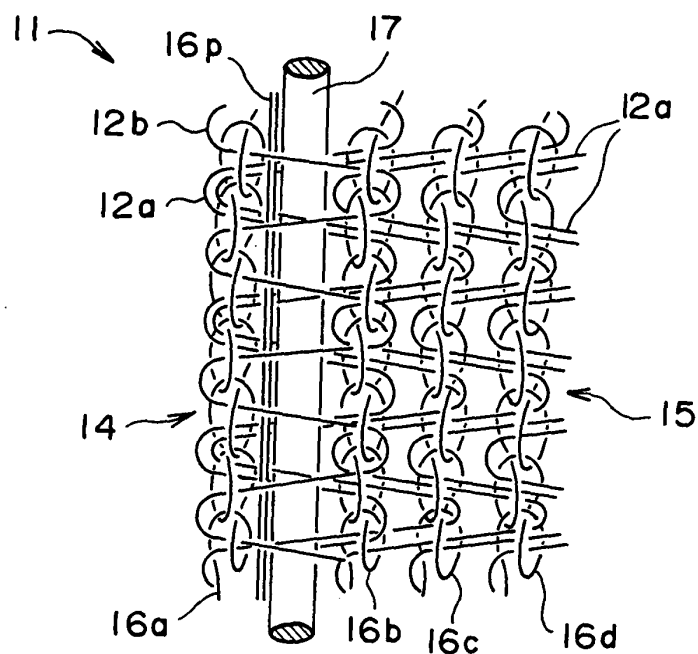
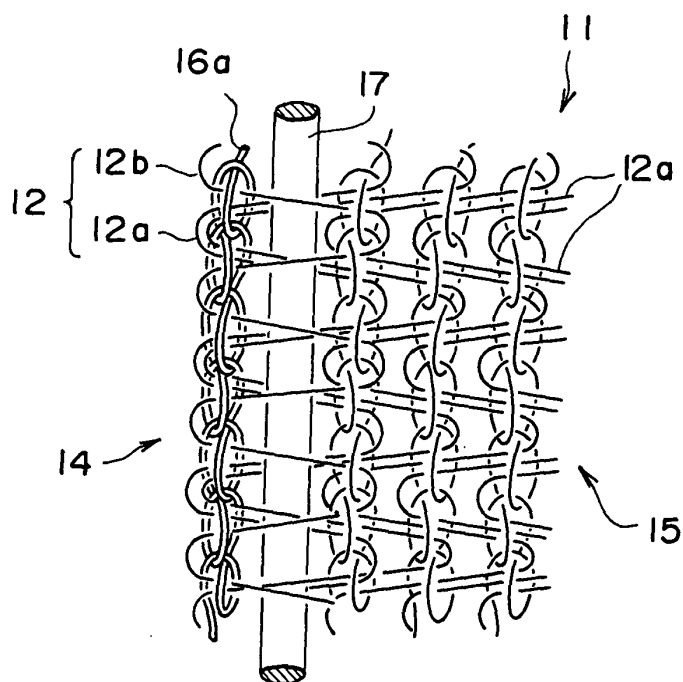


FIG. 7





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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 4 May 2004	Examiner Horubala, T
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