

PATENT SPECIFICATION

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(54) SLIDING CLIP FASTENER STRINGER

(71) We, YOSHIDO KOGYO K. K., a corporation duly organized under the laws of Japan and existing at No. 1, Kanda Izumicho, Chiyoda-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention relates to a sliding clasp fastener stringer having a warp-knitted tape supporting a row of coupling elements thereon.

There have been heretofore proposed 15 various sliding clasp fastener stringers having warp-knitted tapes. They however have suffered from a common problem in that when sewn to a garment fabric, the sliding clasp fastener chain becomes 20 puckered or wavy due to shrinkage resulting from the sewing operation of the tape. Further, the prior sliding clasp fastener stringers tend to be split open when bent in the longitudinal direction and subjected to 25 a lateral pull, or tossed from beneath the sliding clasp fastener chain. Another disadvantage is that when sever lateral forces are applied to the fabric to which the stringers are attached, the knit stitches adjacent to the sewn seams are prone to shift 30 out of place.

According to the invention, there is provided a sliding clasp fastener stringer comprising: a tape of a warp-knitted structure 35 including a pair of edge portions and a web portion extending between said edge portions, each of said edge portions being formed with a first number equal to or greater than three of different kinds of 40 stitches, said web portion being formed with a lesser second number, equal to or greater than two, of different kinds of stitches, one of said edge portions including a reinforcing warp yarn laid in an intervale groove therein; and a row of fastener elements sewn to

said one of said edge portions by sewing threads passing through said warp yarn.

The invention will now be described by way of example, with reference to the accompanying drawings, wherein:—

Figure 1 is a diagrammatic view of a stringer tape constructed in accordance with a first embodiment of the invention;

Figure 2 is a transverse cross-sectional view of the stringer tape shown in Figure 1;

Figure 3 is a transverse cross-sectional view of the stringer tape of Figure 1 with a row of fastener elements mounted thereon;

Figures 4A to 4D are diagrams showing the guide bar movements for the knitting threads of the tape illustrated in Figure 1;

Figure 5 is a diagram illustrating the threading of the guide bars for the tape of Figure 1;

Figure 6 is a diagrammatic view of a stringer tape according to a second embodiment;

Figure 7 is a transverse cross-sectional view of the stringer tape shown in Figure 6 having a row of fastener elements mounted thereon;

Figures 8A to 8D are diagrams showing the guide bar movements for the knitting threads of the tape illustrated in Figure 6;

Figure 9 is a diagram illustrating the threading of the guide bars for the tape of Figure 6;

Figure 10 is a diagrammatic view of a stringer tape provided in accordance with a third embodiment;

Figure 11 is a transverse cross-sectional view of the stringer tape shown in Figure 10;

Figure 12 is a transverse cross-sectional view of the stringer tape of Figure 10 with a row of fastener element mounted thereon;

Figure 13 is a transverse cross-sectional view of a pair of coupled stringers of Figure 12;

Figures 14A to 14D are diagrams showing

ing the guide bar movements for the knitting threads of the tape shown in Figure 10;

Figure 15 is a diagram showing the threading of the guide bars for the tape illustrated in Figure 10;

Figure 16 is a diagrammatic view of a stringer tape according to a fourth embodiment;

Figures 17A to 17D are diagrams illustrating the guide bar movements for the knitting threads of the tape of Figure 16;

Figure 18 is a diagram showing the threading of the guide bars for the tape shown in Figure 16;

Figure 19 is a diagrammatic view of a stringer tape constructed in accordance with a fifth embodiment;

Figures 20A to 20D are diagrams showing the guide bar movements for the knitting threads of the tape illustrated in Figure 19;

Figure 21 is a diagram showing the threading of the guide bars for the tape of Figure 19;

Figure 22 is a plan view of a sliding clasp fastener stringer of the invention;

Figure 23 is a plan view of the coupled sliding clasp fastener stringers held under tension in the longitudinal direction thereof;

Figure 24 is a plan view of the sliding clasp fastener stringer of Figure 22 after being subjected to a post-treatment such as dyeing; and

Figure 25 is a plan view of the stringer of Figure 24 sewn to a garment fabric.

Figure 1 shows a sliding clasp fastener stringer tape 30 of a warp-knitted structure comprising a pair of element-carrying longitudinal edge portions 31, 32 and a central web portion 33 extending between the edge portions 31, 32. Each of the edge portions 31, 32 is formed with chain stitches 34, tricot stitches 35, and single cord stitches 36. Additionally, a pair of reinforcing warp yarns 37, 38 are laid in outer two grooves 39, 40 defined between a first or outermost wale 41 and an adjacent second wale 42, and between the second wale 42 and an adjacent third wale 43, respectively, on each of the tape edge portions 31, 32, these wales being provided by the chain stitches 34, tricot stitches 35, and single cord stitches 36.

The chain stitch 34 has a stitch pattern of 1-0/0-1 (Figure 4A), the tricot stitch 35 has a stitch pattern of 1-2/1-0 (under 1 over 1) (Figure 4B), each of the reinforcing warp yarns 37, 38 has a stitch pattern of 0-0/0-0 (Figure 4C), and the single cord stitch 36 has a stitch pattern of 0-1/4-3 (under 3 over 1) (Figure 4D).

The web portion 33 of the tape 30 includes the tricot stitches 35 and the single cord stitches 36, the web portion 30 being devoid of the chain stitches 34. Thus, the edge portions 31, 32 are made thicker in structure than the web portion 33 which is

relatively coarse in the absence of the chain stitches 34.

Each of the reinforcing warp yarns 37, 38 has a thickness or diameter that is substantially the same as the width of one of the interwale grooves 39, 40 so as to fill up the latter and be inserted in the knitted tape fabric between the adjacent wales and between upper and lower sinker loops of the tricot and single cord stitches for positional stability against displacement. The reinforcing yarns 37, 38 may be any bulky yarn such as multifilament yarn, textured yarn, spun yarn, or twisted yarn.

Figure 5 illustrates the threading of the guide bars for producing the knitted tape fabric depicted in Figure 1. A first guide bar for the chain stitches 34 is threaded 4 in, 4 out. A second guide bar for the tricot stitches 35 is threaded 11 in, 1 out. A third guide bar for the reinforcing warp yarns 37, 38 is threaded 2 in, 8 out, and makes no shogging movement during knitting operating. Finally, a fourth guide bar for the single cord stitches 36 is threaded 9 in, 3 out.

As illustrated in Figure 2, the reinforcing warp yarns 37, 38 swell somewhat beyond a flat face side 44 of the tape 30 which is free of the wales. A row of fastener elements 45 of the helically coiled type is sewn with threads 46 to the flat side 44 of the tape 30, the lower leg portions of the elements 45 being held in intimate pressed contact with the outermost reinforcing warp yarn 37 (Figure 3). The reinforcing warp yarn 38 next to the outermost warp yarn 37 is also held in contact with the lower leg portions or connecting portions of the elements. The sewing threads 46 pass through the outermost warp yarn 37 that is firmly supported in the tape fabric. The sewing threads 46 themselves are firmly secured to the warp yarn 37 and enable the fastener elements 45 to be fixed relatively to the tape fabric.

According to a second embodiment shown in Figures 6 to 9, a stringer tape 30a includes a pair of the reinforcing warp yarns 37, 38 mounted only on the element-supporting edge portion 31 (Figures 6, 7 and 9). To meet the requirements for tape edge strength an additional reinforcing warp yarn or yarns can be provided. Conversely, only one reinforcing warp yarn will suffice for the tape edge portion 31 to support relatively small-sized fastener elements.

Figures 10 to 13 illustrate a stringer tape 30b according to a third embodiment in which each of the outermost chain stitches 47 is made of a yarn, such as a stranded yarn, thicker than those for the remaining chain stitches, to thereby widen and reinforce the outermost wale 48, as shown especially in Figures 10, 11 and 15. An advantage of the

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widened wale 48 is that when the two opposed stringers 49, 50 are coupled together, a clearance or gap 51 between the confronting edges of the stringers can be held at a minimum (Figure 13). Accordingly, the coupled rows of fastener elements 52, 53 are protected from the reverse side of the stringer tapes 30b, 30c. Further, the outermost wales 48, 49 have an increased degree of strength such that the tape edge are prevented from being buckled or curled, thereby retaining the fastener elements 52, 53 in stabilized coupling condition. The fastener elements 52, 53 shown in Figure 13 are relatively large in size and are sewn to the tape edge portions with two rows of threads 54 that pass through the pair of reinforcing warp yarns 37, 38, respectively, the lower legs of the elements being pressed against the warp yarns 37, 38.

A stringer tape 30c according to a fourth embodiment illustrated in Figures 16 to 18 has a pair of element-carrying edge portions 55, 56 and a central web portion 57 disposed between the edge portions 55, 56. Each of the tape edge portions 55, 56 includes chain stitches 58 in the lay of 1-0/0-1 (Figure 17A), two-needle overlap tricot stitches 59 in the lay of 0-2/3-1 (under 1 over 2) (Figure 17B), a pair of reinforcing warp yarns 60, 61 in the lay of 0-0/0-0 (Figure 17c) inserted in the two outermost interwale grooves, and single cord stitches 62 in the lay of 4-3/0-1 (Figure 17D). The web portion 57 comprises the two-needle overlap stitches 59 and the single cord stitches 62, but is devoid of the chain stitches 58. The first guide bar is threaded 4 in, 3 out. The second guide bar for the two-needle overlap tricot stitches 59 is threaded 1 in, 1 out. The third guide bar is threaded 2 in, 7 out, and the fourth guide bar 8 in, 3 out.

According to a fifth embodiment illustrated in Figures 19 to 21, a pair of tape edge portions 63, 64 of a stringer tape 30d have the same knit fabric structure as that of the tape edge portions 31, 32 according to the third embodiment shown in Figure 10. However, a central web portion 65 comprises chain stitches 66 and single cord stitches 67, but is devoid of any tricot stitches.

Throughout all of the embodiments mentioned above, the single cord stitches 36, 62 and 67 may be laid in a 0-1/3-2 pattern (under 2 over 1).

The sliding clasp fastener stringer thus constructed is prevented from becoming wavy or puckered when sewn onto a garment fabric. More specifically, when sewing a row of fastener elements 68 onto an edge portion 69 of the stringer tape (Figure 22), the sewing needle (not shown) and sewing threads 70 penetrate the reinforcing warp yarn 37 (60) filled in the interwale groove of the tape fabric. The reinforcing

warp chain 37 (60) is then expanded where it receives the sewing needle and the sewing threads, and at the same time becomes tortuous. This permits the adjacent wales to be displaced sideways apart and the tape edge portion 69 of thickened structure including the triple-ply knitting loops to be contracted or shrink lengthwise. As a result, the stringer 71 becomes curved with its element-carrying edge portion 69 located inwardly, as shown in Figure 22. The extent of curvature of the stringer 71 is such that it will be substantially straightened out during post-treatments such as dyeing and thermosetting.

For such post-treatments, a pair of the stringers 71, 71 are coupled together and held under tension lengthwise thereof as illustrated in Figure 23. At this time, a central portion 72 and an element-free edge portion 73 of each of the tapes become slackened, since the element-carrying edge portions 69, 69 are shrinked lengthwise. Thus, greater tensile load is exerted to the element-carrying edge portions 69, 69 than to the element-free edge portions 73, 73. With the stringers 71, 71 held under tension, they are subjected to the post treatments such as dyeing and thermosetting. During such process, greater heat-shrinkage appears on the element-free edge portions 69, 69 than on the element-carrying edge portions 73, 73.

Accordingly, the extent to which the stringer 71 has been originally warped or curved (Figure 22) is reduced or somewhat rectified after the post-treatment, as shown in Figure 24.

When the stringer 71 thus treated is sewn onto a marginal edge 74 of a garment fabric 75, the sewing needle (not shown) and sewing threads 76 pass through the central portion 72 of the stringer tape where it is coarsely knitted. Since the coarse knit structure of the tape has therein knitting yarns held under less tension, it allows the sewing needle and sewing threads 76 to pierce therethrough relatively easily and can take up their sidewise pressing forces. The central tape portion 72 undergoes less contraction or shrinkage when the stringer 71 is sewn to the garment fabric 75. The slightly curved stringer 71 as shown in Figure 24 is therefore straightened out upon being attached to the garment fabric 75. With the fastener stringers according to the present invention, the stringer chain of the sliding clasp fastener attached to a garment is prevented from being wavy or puckered.

The tape knit structure of each of the fastener stringers described above is comprised of loop-forming threads without any weft or transverse inlaid threads. The thus formed knit tape has greater resistance to stretch. In particular, the use of the rein-

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forcing warp yarns 37 (38, 60, 61) adds to resistance to longitudinal stretch of the tape. Further, the element-supporting edge portion 69 (31, 32, 55, 56, 63, 64) is formed by the triple-ply loops including the chain stitches, tricot stitches or two-needle overlap tricot stitches, and single cord stitches, and additionally by the reinforcing warp yarns. The edge portion is relatively thick and is prevented from being bent sharply and stretched largely. Therefore, the fastener chain supported on the fastener stringers in accordance with the present invention is protected from split-opening when bent in the longitudinal direction thereof or tossed from therebeneath.

The central portion 72 (33, 57, 65) of the stringer tape is a coarsely knitted structure in the absence of transverse inlaid threads, but including only two kinds of stitches, such that it is less movable or displaceable when subjected to severe lateral stresses after the stringers 71 are sewn to the garment fabric 75; that is, knit stitches around the sewing threads do not shift out of place. Therefore, sewn condition of the fastener stringers 71 is highly stable relatively to the fabric 75. Another advantage of the stringer tape thus knitted solely with the loop-forming threads is that it provides soft-touch feel and pleasing appearance. The element-carrying edge portion including the three kinds of stitches and the reinforcing warp yarns is dense and provide durable support for the fastener elements thereon.

Each fastener stringer described above includes a warp-knitted tape structure formed with three kinds of stitches and reinforcing warp yarns in the edge portions, the tape being greatly stretch-resistant while under tension in finishing processes such as thermosetting sewing, dyeing, and parts-assembling. There will be less possibility of the tape being set in stretched condition. Therefore, there will be a minimum of tape shrinkage when laundered.

WHAT WE CLAIM IS:

1. A sliding clasp fastener stringer comprising: a tape of a warp-knitted structure including a pair of edge portions and a web portion extending between said edge portions, each of said edge portions being formed with a first number of equal to or greater than three of different kinds of stitches, said web portion being formed with a lesser second number, equal to or greater than two, of different kinds of stitches, one of said edge portions including a reinforcing warp yarn laid in an interwale groove therein; and a row of fastener elements sewn to said one of said edge portions by sewing threads passing through said warp yarn.

2. A sliding clasp fastener stringer according to claim 1, the other of said edge por-

tions including a reinforcing warp yarn.

3. A sliding clasp fastener stringer according to claim 2, each said warp yarn being one of multifilament yarn, textured yarn, spun yarn, and twisted yarn.

4. A sliding clasp fastener stringer according to claim 1, said one of said edge portions including a further reinforcing warp yarn laid in an interwale groove therein adjacent the first-mentioned interwale groove.

5. A sliding clasp fastener stringer according to claim 4, said sewing threads passing through an outermost one of said warp yarns to thereby keep said elements in pressed contact with said outermost warp yarn, said elements being held in contact with the other reinforcing warp yarn.

6. A sliding clasp fastener stringer according to claim 4, said sewing threads passing through both said reinforcing warp yarns to thereby keep said elements in pressed contact with both said reinforcing warp yarns.

7. A sliding clasp fastener stringer according to claim 1, said first number of different kinds of stitches of each of said edge portions comprising chain stitches, tricot stitches, and single cord stitches, and the second number of different stitches of the web portion comprising tricot stitches and single cord stitches.

8. A sliding clasp fastener stringer according to claim 7, one of said chain stitches which is located outermost of said one of said edge portions is made of a yarn thicker than that of which the remaining chain stitches are made.

9. A sliding clasp fastener stringer according to claim 7 or 8, said chain stitches being in a 1-0/0-1 pattern, said tricot stitches in a 1-2/1-0 pattern, and said single cord stitches in a 0-1/4-3 pattern.

10. A sliding clasp fastener stringer according to claim 1, said first number of different kinds of stitches of each of said edge portions comprising chain stitches, two-needle overlap tricot stitches, and single cord stitches, and the second number of different kinds of stitches of the web portion comprising two-needle overlap tricot stitches and single cord stitches.

11. A sliding clasp fastener stringer according to claim 10, said chain stitches being in a 1-0/0-1 pattern, said two-needle overlap tricot stitches in a 0-2/3-1 pattern, and said single cord stitches in a 0-1/4-3 pattern.

12. A sliding clasp fastener stringer according to claim 1, said first number of different kinds of stitches of each of said edge portions comprising chain stitches, tricot stitches, and single cord stitches, and the second number of different kinds of stitches of the web portion comprising chain stitches and single cord stitches.

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forcing warp yarns 37 (38, 60, 61) adds to resistance to longitudinal stretch of the tape. Further, the element-supporting edge portion 69 (31, 32, 55, 56, 63, 64) is formed by the triple-ply loops including the chain stitches, tricot stitches or two-needle overlap tricot stitches, and single cord stitches, and additionally by the reinforcing warp yarns. The edge portion is relatively thick and is prevented from being bent sharply and stretched largely. Therefore, the fastener chain supported on the fastener stringers in accordance with the present invention is protected from split-opening when bent in the longitudinal direction thereof or tossed from therebeneath.

The central portion 72 (33, 57, 65) of the stringer tape is a coarsely knitted structure in the absence of transverse inlaid threads, but including only two kinds of stitches, such that it is less movable or displaceable when subjected to severe lateral stresses after the stringers 71 are sewn to the garment fabric 75; that is, knit stitches around the sewing threads do not shift out of place. Therefore, sewn condition of the fastener stringers 71 is highly stable relatively to the fabric 75. Another advantage of the stringer tape thus knitted solely with the loop-forming threads is that it provides soft-touch feel and pleasing appearance. The element-carrying edge portion including the three kinds of stitches and the reinforcing warp yarns is dense and provide durable support for the fastener elements thereon.

Each fastener stringer described above includes a warp-knitted tape structure formed with three kinds of stitches and reinforcing warp yarns in the edge portions, the tape being greatly stretch-resistant while under tension in finishing processes such as thermo-setting sewing, dyeing, and parts-assembling. There will be less possibility of the tape being set in stretched condition. Therefore, there will be a minimum of tape shrinkage when laundered.

WHAT WE CLAIM IS:

1. A sliding clasp fastener stringer comprising: a tape of a warp-knitted structure including a pair of edge portions and a web portion extending between said edge portions, each of said edge portions being formed with a first number of equal to or greater than three of different kinds of stitches, said web portion being formed with a lesser second number, equal to or greater than two, of different kinds of stitches, one of said edge portions including a reinforcing warp yarn laid in an interwale groove therein; and a row of fastener elements sewn to said one of said edge portions by sewing threads passing through said warp yarn.

2. A sliding clasp fastener stringer according to claim 1, the other of said edge por-

tions including a reinforcing warp yarn.

3. A sliding clasp fastener stringer according to claim 2, each said warp yarn being one of multifilament yarn, textured yarn, spun yarn, and twisted yarn.

4. A sliding clasp fastener stringer according to claim 1, said one of said edge portions including a further reinforcing warp yarn laid in an interwale groove therein adjacent the first-mentioned interwale groove.

5. A sliding clasp fastener stringer according to claim 4, said sewing threads passing through an outermost one of said warp yarns to thereby keep said elements in pressed contact with said outermost warp yarn, said elements being held in contact with the other reinforcing warp yarn.

6. A sliding clasp fastener stringer according to claim 4, said sewing threads passing through both said reinforcing warp yarns to thereby keep said elements in pressed contact with both said reinforcing warp yarns.

7. A sliding clasp fastener stringer according to claim 1, said first number of different kinds of stitches of each of said edge portions comprising chain stitches, tricot stitches, and single cord stitches, and the second number of different stitches of the web portion comprising tricot stitches and single cord stitches.

8. A sliding clasp fastener stringer according to claim 7, one of said chain stitches which is located outermost of said one of said edge portions is made of a yarn thicker than that of which the remaining chain stitches are made.

9. A sliding clasp fastener stringer according to claim 7 or 8, said chain stitches being in a 1-0/0-1 pattern, said tricot stitches in a 1-2/1-0 pattern, and said single cord stitches in a 0-1/4-3 pattern.

10. A sliding clasp fastener stringer according to claim 1, said first number of different kinds of stitches of each of said edge portions comprising chain stitches, two-needle overlap tricot stitches, and single cord stitches, and the second number of different kinds of stitches of the web portion comprising two-needle overlap tricot stitches and single cord stitches.

11. A sliding clasp fastener stringer according to claim 10, said chain stitches being in a 1-0/0-1 pattern, said two-needle overlap tricot stitches in a 0-2/3-1 pattern, and said single cord stitches in a 0-1/4-3 pattern.

12. A sliding clasp fastener stringer according to claim 1, said first number of different kinds of stitches of each of said edge portions comprising chain stitches, tricot stitches, and single cord stitches, and the second number of different kinds of stitches of the web portion comprising chain stitches and single cord stitches.

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stantially as herein described with reference to and as illustrated in Figures 1, 2, 3, 4A to 4D inclusive, and 5 of the accompanying drawings.

5 14. A sliding clasp fastener stringer substantially as herein described with reference to and as illustrated in Figures 6, 7, 8A to 8D inclusive, and 9 of the accompanying drawings.

10 15. A sliding clasp fastener stringer substantially as herein described with reference to and as illustrated in Figures 10, 11, 12, 13, 14A to 14D inclusive, and 15 of the accompanying drawings.

16. A sliding clasp fastener stringer substantially as herein described with reference to and as illustrated in Figures 16, 17A to 17D inclusive, and 18 of the accompanying drawings.

17. A sliding clasp fastener stringer substantially as herein described with reference to and as illustrated in Figures 19, 20A to 20D inclusive, and 21 of the accompanying drawings.

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