

SLIDE FASTENER STRINGER WITH VENT HOLES

The present invention relates to a venting slide fastener stringer for being attached to cushions, pillows, mats, etc. which require venting.

There have heretofore been known a variety of venting slide fasteners having vent holes in the fastener stringer tapes. One such slide fastener disclosed in U.S. Patent No. 4,125,911, patented (in the United States of America) November 21, 1978, includes a plurality of vent holes punched in stringer tapes of polymer film material as shown in Figure 4 of the accompanying drawings. When the slide fastener is transversely stretched under a lateral pull, however, the tapes are shrunk longitudinally and hence get puckered or wavy, with the results that the interdigitating rows of coupling elements are also undulated making a slider sluggish during the movement therealong to open or close the slide fastener. Garments with such slide fasteners attached are also subjected to puckering under the influence of shrinkage of the tapes. The slide fastener thus stretched is unsightly and has insufficient venting capability due to deformed vent holes. Woven and knitted slide fasteners having vents are shown, for example, in Japanese Utility Model Publications Nos. 51-135709 and 52-24161 published November 2, 1976 and June 1, 1977, respectively.

According to the invention there is provided a venting slide fastener stringer comprising:

- 5 (a) a warp-knit stringer tape including a pair of longitudinal warp-knit webs spaced transversely from each other, with a longitudinal wale-free region therebetween, and having a pair of marginal wales, respectively, confronting each other across said wale-free region, and a connecting thread having portions laid in said
- 10 marginal wales and substantially parallel portions spaced longitudinally of and extending transversely across said wale-free region in a direction substantially perpendicular to said marginal wales, thereby defining a plurality of substantially rectangular vent holes longitudinally along said wale-free region, each of said webs comprising foundation threads constituting a plurality of wales juxtaposed across said each web, said marginal wales being composed of threads that are more rigid than said foundation threads; and
- (b) a row of coupling elements mounted on one of said webs remotely from said wale-free region.

Many advantages and features of the present invention will become manifest to those versed in the art upon making reference to

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the detailed description and the accompanying drawings in which preferred structural embodiments of the present invention are disclosed by way of illustrative examples. In the drawings:-

5 Figure 1 is a fragmentary front elevational view of a venting slide fastener including a pair of slide fastener stringers according to the present invention;

Figure 2 is a diagram showing lapping movements for a warp-knit stringer tape according to an embodiment;

10 Figure 3 is a diagram showing lapping movements for a warp-knit stringer tape according to another embodiment; and

Figure 4 is a fragmentary perspective view of a conventional slide fastener.

The present invention is particularly useful when embodied in a venting slide fastener such as shown in Figure 1, generally indicated by the reference numeral 10. The venting slide fastener 15 10 comprises a pair of slide fastener stringers 11, 12 each including a warp-knit stringer tape 13 having a pair of longitudinally extending, parallel warp-knit webs 14, 15 for supporting coupling elements and for being attached to a garment, respectively, 20 and a longitudinal wale-free region 16 interposed between the webs 14, 15. The warp-knit webs 14, 15 include a pair of confronting marginal wales 17, 18 interconnected transversely by a connecting

thread 19 having ladder-like parallel portions 20 extending transversely across the wale-free region 16 in a direction substantially perpendicular to the marginal wales 17, 18, thereby providing a plurality of substantially square vent holes 21 longitudinally along the wale-free region 16.

The slide fastener stringers 11, 12 also include a pair of rows of coupling elements 22, 22, respectively, each in the form of a helically coiled monofilament, which are mounted on inner confronting beaded edges of the stringer tapes 13, 13. The slide fastener can be opened and closed by a slider 23 movable along the rows of coupling elements 22, 22 to take them into and out of interdigitating engagement with each other.

As shown in Figure 2, each of the warp-knit webs 14, 15 is composed of a first group of foundation threads 26 knitted as chain stitches in a pattern of 1-0/0-1, a second group of foundation threads 27 knitted as tricot stitches in a pattern of 1-2/1-0, and a third group of foundation threads 28 knitted in a pattern of 0-1/4-3, the foundation threads 26, 27, 28 thus knitted constituting a plurality of longitudinal wales 29 juxtaposed across the webs 14, 15. The wale-free region 16 is devoid of two wales. The connecting thread 19 is laid across the wale-free region 16 in a pattern of 0-0/1-1/0-0/4-4/3-3/4-4 so that the connecting thread 19 also includes portions 30 laid longitudinally only in the marginal wales 17, 18 and cooperating with the parallel portions 20 to connect the wales 17, 18 together.

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The confronting marginal wales 17, 18 comprise in part threads 31, 31', respectively, knitted as chain stitches in a pattern of 1-0/0-1. The threads 31, 31' are thicker and more rigid than the foundation threads 26, 27, 28 so that the marginal wales 17, 18 are more rigid than the wales 29 in the webs 14, 15. However, the threads 31, 31' may be made more rigid by being made of a plurality of paralleled yarns each having the same thickness as that of the threads 26, 27, 28. Outermost wales 32, 33 in the webs 14, 15 are also composed in part of threads 34, 35 respectively, which are thicker than the threads 26, 27, 28. However, of the outermost wales 32, 33 only the wale 32 in the element-supporting wale 14 may be composed in part of the thread 34.

The connecting thread 19 may be more rigid than the foundation threads. Connecting thread 19 may be made of twisted yarns (for example, of 500 denier) which are several times thicker than the threads 26, 27, 28 or of paralleled yarns each having the same thickness as that of the threads 26, 27, 28.

A warp-knit stringer tape 36 (Figure 3) constructed according to another embodiment is substantially the same as the stringer tape 13 illustrated in Figure 2 except that the two connecting threads 37, 38 are laid across a wale-free region 41 in symmetrical patterns of 0-0/1-1/0-0/1-1/0-0/4-4/3-3/4-4/3-3/4-4 and 4-4/3-3/4-4/3-3/4-4/0-0/1-1/0-0/1-1/0-0, respectively, and one 40 of webs 39, 40 which is to be attached to a garment is devoid of some threads constituting chain stitches. Each of the connecting threads 37, 38 has portions 42 laid in confronting wales 43,

and substantially parallel portions 45 spaced longitudinally of and extending transversely across the wale-free region 41 in a direction substantially perpendicular to the wales 43, 44, thereby defining a plurality of longitudinally arranged rectangular vent holes 46. With several chain stitches thus omitted, the web 40 is relatively flexible to take up stresses applied and hence prevent the vent holes 46 from becoming deformed or otherwise adversely affected by such stresses.

With the arrangement described above, a lateral pull applied across the slide fastener 10 is borne at the wale-free region 16, 41 by the parallel portions 20; 45 of the connecting thread 19; 37, 38 which run transversely across the wale-free region 16, 41 in a direction substantially perpendicular to the wales 17, 18; 43, 44. Accordingly, the slide fastener 10 is resistant to being transversely stretched or deformed under lateral stresses, and hence is free from longitudinal shrinkage and becoming wavy or puckered in the longitudinal direction. Since the vent holes 21; 46 are defined by the lateral thread portions 20; 45 of the connecting thread 19; 37, 38 and the rigid wales 17, 18; 43, 44 they are relatively dimensionally stable instead of becoming deformed for reliable venting operation when subject to a lateral pull. Furthermore, the connecting thread 19; 37, 38 is interlaced only with the wales 17, 18; 43, 44 and structurally independent of the webs 14, 15; 39, 40, with the result that the vent holes 21; 46 are less adversely affected dimensionally by the webs 14, 15; 39, 40. Preferably, the vent holes 21, 46 has substantially a size ranging from 0.5 mm x 0.5 mm to 1 mm x 1 mm and a size ranging from 0.5 mm x 1 mm to 1 mm x 2 mm, respectively.

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CLAIMS

1. A venting slide fastener stringer comprising:

- (a) a warp knit stringer tape including a pair of longitudinal warp-knit webs spaced transversely from each other, with a longitudinal wale-free region therebetween, and having a pair of marginal wales respectively, confronting each other across said wale-free region, and a connecting thread having portions laid in said marginal wales and substantially parallel portions spaced longitudinally of and extending transversely across said wale-free region in a direction substantially perpendicular to said marginal wales, thereby defining a plurality of substantially rectangular vent holes longitudinally along said wale-free region, each of said webs comprising foundation threads constituting a plurality of wales juxtaposed across said each web, said marginal wales being composed of threads that are more rigid than said foundation threads; and
- (b) a row of coupling elements mounted on one of said webs remotely from said wale-free region.

2. A venting slide fastener stringer according to claim 1, said connecting thread being more rigid than said foundation threads.





3. A venting slide fastener stringer according to claim 1 or 2, said connecting thread being laid across said wale-free region in a pattern of 0-0/1-1/0-0/4-4/3-3/4-4.
4. A venting slide fastener stringer according to claim 1, including an additional connecting thread extending symmetrically with the first-mentioned connecting thread across said wale-free region and having portions laid in said marginal wales and substantially parallel portions spaced longitudinally of and extending transversely across said wale-free region along said first-mentioned substantially parallel portions.
5. A venting slide fastener stringer according to claim 4, said connecting threads being laid across said wale-free region in patterns of 0-0/1-1/0-0/1-1/0-0/4-4/3-3/4-4/3-3/4-4 and 4-4/3-3/4-4/3-3/4-4/0-0/1-1/0-0/1-1/0-0, respectively.
6. A venting slide fastener stringer according to claim 1, said wale-free region having a width corresponding substantially to that of two wales.
7. A venting slide fastener stringer according to claim 1, each of said vent holes having substantially a size ranging from 0.5 mm x 1 mm to 1 mm x 2 mm.
8. A venting slide fastener stringer according to claim 1, each of said vent holes having substantially a size ranging from 0.5 mm x 0.5 mm to 1 mm x 1 mm.