

PATENT SPECIFICATION

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(54) IMPROVED WARP-KNITTED TAPE FOR SLIDING CLASP FASTENERS

(71) We, YOSHIDA 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:—

This invention relates to sliding clasp fasteners and particularly to stringer tapes of a warp-knitted structure for mounting thereon rows of interlocking fastener elements.

There are known various types of warp-knitted tapes for use in the field of sliding clasp fasteners. Warp-knitted tapes of the known type are basically constructed with longitudinally extending chain stitches which form a multiplicity of wales and transversely extending lapping threads laid in to connect the wales coursewise. However, due primarily to their structural characteristics, the knitted tapes are known to be inferior to woven fabric tapes in respect of the qualities of mechanical strength and dimensional stability; that is, they have the inherent problem of "stretch" which occurs warpwise or weftwise when they are subjected to external stresses exerted in normal use of the sliding clasp fastener.

Many attempts have been made to provide knitted tapes of a quality comparable to woven fabric tapes such that they can be readily used as sliding clasp fastener tapes for securely supporting thereon the rows of fastener elements against displacement or detachment. Such attempts have proven to be successful in so far as concerns the type of fastener elements arranged to be mounted on and secured to one and the same surfaces of the fastener tape. However, prior-art knitted fastener tapes have not been satisfactory for supporting the type of fastener elements designed to be mounted astride of a marginal edge of the tape.

According to this invention there is provided a warp-knitted tape adapted for use as a stringer tape of a type sliding clasp fastener in which fastener elements are astride a marginal edge of the tape, the tape comprising a web portion connected to a marginal edge portion, at least part of the web portion adjacent the marginal edge portion having pairs of back-to-back wales formed by chain stitches and two groups of transversely extending lapping threads which are laid in to interconnect the wales coursewise, the two groups of transversely extending lapping threads having their respective lapping points or U-turns disposed alternately in successive courses, said marginal edge portion comprising tricot stitches and being bulky and strong.

The invention will be described by way of examples with reference to the accompanying drawings which illustrate by way of example certain preferred embodiments and in which like reference characters refer to like parts throughout the different views, and wherein:

Figure 1 is a diagrammatic view illustrating the construction of a warp-knitted fastener tape provided in accordance with the invention;

Figure 2 is a transverse cross-sectional view of the tape of Figure 1 diagrammatically illustrating the manner in which an interlocking fastener element is mounted astride of an edge of the tape; and

Figure 3 is a transverse cross-sectional view of a modification of the warp-knitted tape of Figure 1.

Referring now to the drawings and Figure 1 in particular, there is shown a warp-knitted fastener tape 10 which substantially comprises a web portion 11 and adjoining marginal edge portion 12. The web portion 11 is constructed with chain stitches 13 which form a plurality of longitudinally extending wales W and with transversely extending lapping threads 14 which are laid in to interconnect the wales W coursewise.

An inspection of Figure 1 will show that

the chain stitch 13 has a closed lap 13a and an open lap 13b in each course of the knitted structure and that the lapping threads 14 consist of two different groups of lapping threads 14a and 14b having their respective lapping points or U-turns 14a' and 14b' disposed alternately in successive courses, the arrangement being that the resulting web portion 11 has a double-faced knit structure in which the wales W are in back-to-back pairs projecting symmetrically from both surfaces of the tape. This is better depicted in Figure 2, and this double-layer knit system renders the tape 10 physically rugged and dimensionally stable as required in the art of sliding clasp fasteners. Another important feature of the tape 10 resides in the provision of the marginal edge portion 12 to which the fastener elements E are to be secured and which is formed by tricot stitches 15 extending across and interknitted with wales W₁ to W₄. These tricot stitches are knitted by means of a double knitting needle arrangement so that a first group of tricot stitches 15a are knitted in the lay of 2—0/4—6 and a second group of tricot stitches 15b in the lay of 4—6/2—0. This knitting design is intended to render the marginal edge portion 12 bulky and strong, with the result that the portion 12 has substantially circular cross-section as seen in Figures 2 and 3. To this end, there may be used a reinforcing core member 16 inserted centrally between adjacent wales W₁ and W₂ and extending lengthwise of the tape 10 so as to cause the marginal edge portion 12 to become more swollen and projected uniformly on both sides of the tape 10.

The lapping threads 14c serving to connect the marginal edge portion 12 with the web portion 11 are preferably stronger and greater in denier than the remaining lapping threads 14.

In order to facilitate the manufacture of warp-knitted fastener tapes 10 according to the invention, there may be used a connecting thread 17 for separably connecting adjacent ones of a plurality of tapes 10 widthwise. This connecting thread 16 may be for example dissolvable in water so that the tapes 10 may be separated to individual widths when they are treated with water as in dyeing process at the finishing stage of the sliding clasp fastener manufacture.

Figure 1 does not show actual lapping movement but a developed imaginary structure which has been used for clarity of illustration. The warp knit fabric shown can only be produced on two needle bars, or double knitting needle arrangement. Thus, if the bottom-most course in Figure 1 is formed on a front needle bar, then the next upper one is formed on a back needle bar. The third course to the bottom is produced

again on the front needle bar. Threads for the chain stitches 13 are carried by a single guide bar. A second guide bar carries the laid-in yarns 14a, shown in solid lines, and is shogged to lay the yarns 14a in loops formed by the back needle bar. Likewise, the laid-in yarns 14b, in dotted lines are laid by a third guide bar in loops formed by the front needle bar. With this arrangement, the wales W project symmetrically from both surfaces of the fabric.

The term "double-faced" fabric is commonly used in the art. It means a double cloth which is reversible, either side being employable as the face. It is made on a machine having two beds of needles, each part knitting independently of the other. The fabric has two interconnected layers, which are back-to-back.

The marginal edge portion 12 is made by the front and back needle bars, and a pair of guide bars carrying yarns for the first group of tricot stitches 15a and yarns for the second group of tricot stitches 15b. Again, the bottom-most course is formed on the front needle bar and the next upper course is formed on the back needle bar. The core member 16 is inserted between the two groups of tricot stitches by another guide bar which effects no shogging movement.

Figure 3 illustrates a modification of the warp-knitted fastener tape 10 which has been described with reference to Figures 1 and 2. This modification is characterised by the provision of a double-layer knit structure only at a limited area 18 of the web portion 11 immediately adjacent the swollen marginal edge portion 12, while the remaining web area is constructed with a single-layer knit wherein the wales W are formed only on one surface of the tape 10.

With respect to the structure shown in Figure 3, production of the web portion 11 requires a pair of guide bars, one of which is for the double-faced limited area 18 and the other being used for the remainder of the web portion. When making this remainder, one of the two needle bars is held at rest.

Advantageously, the warp-knitted fastener tape 10 in either of the two embodiments disclosed can allow the fastener elements E to be clamped fast thereon with their upper and lower legs Ea and Eb mounted astride of the marginal edge portion 12 in the properly aligned position and in parallel to the plane of the tape web. Being thus firmly anchored into position on the marginal edge portion 12 of the tape 10, the fastener elements E can maintain their proper operative posture over extended lengths of time against severe stresses applied to the sliding clasp fastener in use.

WHAT WE CLAIM IS:—

1. A warp-knitted tape adapted for use as a stringer tape of a type of sliding clasp



the chain stitch 13 has a closed lap 13a and an open lap 13b in each course of the knitted structure and that the lapping threads 14 consist of two different groups of lapping threads 14a and 14b having their respective lapping points or U-turns 14a' and 14b' disposed alternately in successive courses, the arrangement being that the resulting web portion 11 has a double-faced knit structure in which the wales W are in back-to-back pairs projecting symmetrically from both surfaces of the tape. This is better depicted in Figure 2, and this double-layer knit system renders the tape 10 physically rugged and dimensionally stable as required in the art of sliding clasp fasteners. Another important feature of the tape 10 resides in the provision of the marginal edge portion 12 to which the fastener elements E are to be secured and which is formed by tricot stitches 15 extending across and interknitted with wales W₁ to W₄. These tricot stitches are knitted by means of a double knitting needle arrangement so that a first group of tricot stitches 15a are knitted in the lay of 2—0/4—6 and a second group of tricot stitches 15b in the lay of 4—6/2—0. This knitting design is intended to render the marginal edge portion 12 bulky and strong, with the result that the portion 12 has substantially circular cross-section as seen in Figures 2 and 3. To this end, there may be used a reinforcing core member 16 inserted centrally between adjacent wales W₁ and W₂ and extending lengthwise of the tape 10 so as to cause the marginal edge portion 12 to become more swollen and projected uniformly on both sides of the tape 10.

The lapping threads 14c serving to connect the marginal edge portion 12 with the web portion 11 are preferably stronger and greater in denier than the remaining lapping threads 14.

In order to facilitate the manufacture of warp-knitted fastener tapes 10 according to the invention, there may be used a connecting thread 17 for separably connecting adjacent ones of a plurality of tapes 10 widthwise. This connecting thread 16 may be for example dissolvable in water so that the tapes 10 may be separated to individual widths when they are treated with water as in dyeing process at the finishing stage of the sliding clasp fastener manufacture.

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With respect to the structure shown in Figure 3, production of the web portion 11 requires a pair of guide bars, one of which is for the double-faced limited area 18 and the other being used for the remainder of the web portion. When making this remainder, one of the two needle bars is held at rest.

Advantageously, the warp-knitted fastener tape 10 in either of the two embodiments disclosed can allow the fastener elements E to be clamped fast thereon with their upper and lower legs Ea and Eb mounted astride of the marginal edge portion 12 in the properly aligned position and in parallel to the plane of the tape web. Being thus firmly anchored into position on the marginal edge portion 12 of the tape 10, the fastener elements E can maintain their proper operative posture over extended lengths of time against severe stresses applied to the sliding clasp fastener in use.

WHAT WE CLAIM IS:—

1. A warp-knitted tape adapted for use as a stringer tape of a type of sliding clasp



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fastener in which fastener elements are
astride a marginal edge of the tape, the tape
comprising a web portion connected to a
marginal edge portion, at least part of the
web portion adjacent the marginal edge
portion having pairs of back-to-back wales
formed by chain stitches and two groups of
transversely extending lapping threads
which are laid in to interconnect the wales
coursewise, the two groups of transversely
extending lapping threads having their
respective lapping points or U-turns disposed
alternately in successive courses, said
marginal edge portion comprising tricot
stitches and being bulky and strong.
2. A warp-knitted tape as claimed in claim
1 wherein the entire web portion has pairs of
back-to-back wales formed by said chain
stitches and said two groups of transversely
extending lapping threads.
3. A warp-knitted tape as claimed in claim
1 or 2 wherein the tricot stitches of the
marginal edge portion are in two groups of
which one group is in the lay of 2—0/4—6
and of which the other group is in the lay of
4—6/2—0.

4. A warp-knitted tape as claimed in any
preceding claim wherein a core member is
incorporated in said marginal edge portion.

5. A warp-knitted tape as claimed in any
preceding claim wherein said web portion is
connected to said marginal edge portion by
lapping threads which are thicker and
stronger than the remaining lapping threads
in said web portion.

6. A warp-knitted tape substantially as
described with reference to and as
illustrated in Figures 1 and 2 of the ac-
companying drawings.

7. A warp-knitted tape substantially as
described with reference to and as
illustrated in Figure 3 of the accompanying
drawings.

8. A sliding clasp fastener comprising a
stringer tape formed by a warp-knitted tape
as claimed in any preceding claim and
fastener elements astride said marginal edge
of the tape.

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