

PATENT SPECIFICATION

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(54) SLIDE FASTENERS HAVING IMPROVED KNITTED CARRIER TAPES

(71) We, YOSHIDA KOGYO KABUSHIKI KAISHA, of No. 1, Kanda Izumi-cho, Chiyoda-ku, Tokyo, Japan: a corporation duly organized under the laws of 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 slide fasteners and has particular reference to fasteners comprising a pair of opposed carrier tapes generally of a warp knitted structure and rows of interlocking fastener elements attached along one or the inner longitudinal edges of the respective tapes.

Fasteners of the type described have found extensive use in the fields of garment attachments and the like for their many inherent advantages not available by fasteners made of woven fabric stringer tapes. However, they have suffered from reduced mechanical strength and less dimensional stability compared to woven fasteners. Attempts have been made to improve these factors for instance by employing different kinds of knitting yarns, or by laying warp threads in between wales of the knitted system. None of these attempts were successful. The use of two or three different kinds of yarns did not solve the problems of stretch both longitudinal and transverse of the carrier tape and positional instability of fastener elements relative to their supporting tape. The approach of laying warp threads in between wales was frustrated by the fact that the grooves defined between adjacent wales are limited in width as inherent in warp-knitted structures and are wide enough to receive only one or two warp threads and it is difficult to direct and position the sewing needle stably in such narrow grooves and to prevent the sewing stitches from moving laterally between the wales with the result that the fastener elements become displaced

from their properly aligned position on the fastener.

The present invention aims to eliminate the above-mentioned difficulties of the conventional knitted fasteners, and more specifically to provide an improved knitted slide fastener having a pair of warp-knitted carrier tapes which has a mechanical strength and a dimensional stability comparable to those of woven fabrics particularly at the longitudinal edge portion of the carrier tape along which fastener elements are secured, thereby maintaining the fastener elements in the properly aligned position on their respective carrier tapes during the opening and closing operation of the fastener.

According to the invention, there is provided, a slide fastener comprising a pair of opposed carrier tapes of a warp-knitted structure with rows of interlocking fastener elements mounted thereon, each of said tapes having wales formed by pillars of stitches connected coursewise by laid-in weft threads so that at least between more pairs of wales adjacent the respective longitudinal edges of said carrier tapes there is a groove greater in width than a single wale, a plurality of reinforcing warp threads which fill each said groove substantially wale-to-wale and a line of sewing stitches which serve said rows of fastener elements to said carrier tapes and which extend through the grooves adjacent the respective longitudinal edges of said carrier tapes.

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

Figure 1 is a magnified plan view of a segment of a knitted slide fastener embodying the present invention;

Figure 2 is a sectional view of the same; FIG. 3 is a magnified plan view of another embodiment of the invention;

FIG. 4 is a sectional view of the same; FIG. 5 is a magnified plan view of a

[Price 33p]

75p

further embodiment of the invention; and FIG. 6 is a sectional view of the same.

Referring to the drawings and FIGS. 1 and 2 in particular, there is shown a first embodiment which comprises a pair of opposed carrier tapes T, T' each having mounted thereon a row of interlocking fastener elements E. More specifically, the tape T or T' is of a warp-knitted structure substantially comprising wales W formed by warp stitches such as for example open-pillar stitches as shown and connected coursewise by laid-in weft threads 10. These wales W are alternated coursewise with longitudinal grooves 11. Importantly, the grooves 11 have a width y greater than a width y' of the wales W at least at one or inner longitudinal edge portion of the carrier tape T, (T') along which the fastener elements E are secured into position. These grooves 11 are provided with a plurality of warp threads 12 in a manner to cover the bottom wall of the grooves and fill the same substantially wale-to-wale as shown. This arrangement provides reinforcement particularly at an extreme inner edge region of the tape T defined between the first and second wales W₁, W₂ or corresponding to the innermost groove 11, which region would otherwise be coarse and mechanically weak in the absence of the filling warp threads 12. The fastener elements E shown as being interlocked are secured to the inner edge of the tape T by a line of sewing stitches S spanning between the leg portion Ea of the fastener element E and the innermost groove 11, running through a stiffening core 13 and the innermost groove 11 and extending longitudinally of the tape T. The groove 11 in particular is wider than adjacent wales W₁, W₂. This advantageously ensures that the sewing needle (not shown) is accepted and guided desirably within the longitudinal groove 11 without causing the needle to swerve onto the wale W₁ or W₂, thereby sewing the row or fastener elements E into correct, aligned position on the carrier tape T. Also advantageously, the reinforcing warp threads 12 which are intimately compacted together within the groove 11 serve to hold the sewing stitches S firmly in place under the tension of the warp threads 12 which are directed laterally towards each other. This will maintain the proper position and posture of the fastener elements E under sever stresses applied by a reciprocating slider 30 (shown in FIG. 4) or against lateral forces tending to pull apart the closed stringers.

While the first embodiment described above is constructed to provide a dimensional stability particularly warp-wise of the tape T as this is critically important, the second embodiment shown in FIGS. 3 and 4

considers the dimensional stability both warp-wise and weft-wise of the tape. The fastener shown in FIGS. 3 and 4 is provided with a thickened, reinforced edge 15 extending longitudinally of the tape T and formed by wales W₁, W₂ and innermost groove 11 defined thereby, which groove is substantially wider than the remaining grooves 11 in the tape T. The reinforced edge or element-mounting edge 15 has more reinforcing warp threads 12 and more laid-in weft threads 10a than there are in the remaining portion or web 16 of the tape T, so that at least the said edge 15 of the tape T retains increased dimensional stability in both longitudinal and transverse directions and hence, the elements E mounted thereon are maintained stably in position against displacement relative to the tape under severe stresses applied by the slider 30, or against lateral forces tending to pull apart the closed stringers.

The third embodiment or modification of the fastener according to the invention shown in FIGS. 5 and 6 is intended to provide a thickened reinforced longitudinal edge 20 comprising a plurality of reinforcing warp threads 12a thicker than those warp threads 12 laid-in at the remaining web portion 16 of the tape T and intercrossed with a plurality of laid-in weft threads 10a. With this construction, the reinforced edge portion 20 of the tape T has the innermost groove 11 enlarged to a level nearly flush with the first and second wales W₁, W₂ and this simulates a woven fabric structure and thus has a mechanical strength and dimensional stability comparable thereto. Therefore, the fastener elements E when mounted on the fastener in a manner already described are securely held in position on the thickened, reinforced edge 20 against displacement by lateral forces or under severe stresses applied by the slider 30. To further stabilize the mounting position of the elements E, the innermost groove 11 in the reinforced edge 20 is wider than the remaining grooves 11 in the web portion 16 of the tape T in a manner similar to the second embodiment.

WHAT WE CLAIM IS:—

1. A slide fastener comprising a pair of opposed carrier tapes of a warp-knitted structure with rows of interlocking fastener elements mounted thereon, each of said tapes having wales formed by pillars of stitches connected coursewise by laid-in weft threads so that at least between those pairs of wales adjacent the respective longitudinal edges of said carrier tapes there is a groove greater in width than a single wale, a plurality of reinforcing warp threads which fill each said groove substantially wale-to-wale and a line of sewing stitches which secure said rows of fastener elements

further embodiment of the invention; and FIG. 6 is a sectional view of the same.

Referring to the drawings and FIGS. 1 and 2 in particular, there is shown a first embodiment which comprises a pair of
 5 opposed carrier tapes T, T' each having mounted thereon a row of interlocking fastener elements E. More specifically, the tape T or T' is of a warp-knitted structure
 10 substantially comprising wales W formed by warp stitches such as for example open-pillar stitches as shown and connected coursewise by laid-in weft threads 10. These wales W are alternated coursewise with
 15 longitudinal grooves 11. Importantly, the grooves 11 have a width y greater than a width y' of the wales W at least at one or inner longitudinal edge portion of the carrier tape T, (T') along which the fastener
 20 elements E are secured into position. These grooves 11 are provided with a plurality of warp threads 12 in a manner to cover the bottom wall of the grooves and fill the same substantially wale-to-wale as shown. This
 25 arrangement provides reinforcement particularly at an extreme inner edge region of the tape T defined between the first and second wales W₁, W₂ or corresponding to the innermost groove 11, which region
 30 would otherwise be coarse and mechanically weak in the absence of the filling warp threads 12. The fastener elements E shown as being interlocked are secured to the inner edge of the tape T by a
 35 line of sewing stitches S spanning between the leg portion Ea of the fastener element E and the innermost groove 11, running through a stiffening core 13 and the innermost groove 11 and extending
 40 longitudinally of the tape T. The groove 11 in particular is wider than adjacent wales W₁, W₂. This advantageously ensures that the sewing needle (not shown) is accepted and guided desirably within the longitudinal
 45 groove 11 without causing the needle to swerve onto the wale W₁ or W₂, thereby sewing the row or fastener elements E into correct, aligned position on the carrier tape T. Also advantageously, the reinforcing
 50 warp threads 12 which are intimately compacted together within the groove 11 serve to hold the sewing stitches S firmly in place under the tension of the warp threads 12 which are directed laterally towards each
 55 other. This will maintain the proper position and posture of the fastener elements E under sever stresses applied by a reciprocating slider 30 (shown in FIG. 4) or against lateral forces tending to pull apart
 60 the closed stringers.

While the first embodiment described above is constructed to provide a dimensional stability particularly warp-wise of the tape T as this is critically important, the
 65 second embodiment shown in FIGS. 3 and 4

considers the dimensional stability both warp-wise and weft-wise of the tape. The fastener shown in FIGS. 3 and 4 is provided with a thickened, reinforced edge 15
 70 extending longitudinally of the tape T and formed by wales W₁, W₂ and innermost groove 11 defined thereby, which groove is substantially wider than the remaining grooves 11 in the tape T. The reinforced edge or element-mounting edge 15 has
 75 more reinforcing warp threads 12 and more laid-in weft threads 10a than there are in the remaining portion or web 16 of the tape T, so that at least the said edge 15 of the tape T retains increased dimensional stability in
 80 both longitudinal and transverse directions and hence, the elements E mounted thereon are maintained stably in position against displacement relative to the tape under
 85 severe stresses applied by the slider 30, or against lateral forces tending to pull apart the closed stringers.

The third embodiment or modification of the fastener according to the invention shown in FIGS. 5 and 6 is intended to
 90 provide a thickened reinforced longitudinal edge 20 comprising a plurality of reinforcing warp threads 12a thicker than those warp threads 12 laid-in at the remaining web
 95 portion 16 of the tape T and intercrossed with a plurality of laid-in weft threads 10a. With this construction, the reinforced edge portion 20 of the tape T has the innermost groove 11 enlarged to a level nearly flush with the first and second wales W₁, W₂ and
 100 this simulates a woven fabric structure and thus has a mechanical strength and dimensional stability comparable thereto. Therefore, the fastener elements E when mounted on the fastener in a manner
 105 already described are securely held in position on the thickened, reinforced edge 20 against displacement by lateral forces or under severe stresses applied by the slider 30. To further stabilize the mounting
 110 position of the elements E, the innermost groove 11 in the reinforced edge 20 is wider than the remaining grooves 11 in the web portion 16 of the tape T in a manner similar to the second embodiment.
 115

WHAT WE CLAIM IS:—

1. A slide fastener comprising a pair of opposed carrier tapes of a warp-knitted structure with rows of interlocking fastener elements mounted thereon, each of said
 120 tapes having wales formed by pillars of stitches connected coursewise by laid-in weft threads so that at least between those pairs of wales adjacent the respective longitudinal edges of said carrier tapes there
 125 is a groove greater in width than a single wale, a plurality of reinforcing warp threads which fill each said groove substantially wale-to-wale and a line of sewing stitches which secure said rows of fastener elements
 130



to said carrier tapes and which extend through the grooves adjacent the respective longitudinal edges of said carrier tapes.

5 2. A slide fastener according to Claim 1, wherein the groove in each said knitted carrier tape which is nearest said longitudinal edge is greater in width than the remaining grooves in the web portion of the tape.

10 3. A slide fastener according to Claim 1 or Claim 2, wherein said longitudinal edge of each tape is thickened by thicker reinforcing warp threads than the remainder of the tape.

4. A slide fastener according to any preceding claim, wherein said wales are formed by open-pillar stitches.

5. A slide fastener substantially as herein described with reference to the accompanying drawings. 20

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