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(54) IMPROVEMENTS IN OR RELATING TO TEXTILE RIBBONS FOR USE AS STRINGER TAPES FOR SLIDING CLASP FASTENERS

(71) We, LIGHTNING FASTENERS LIMITED, a British Company, of Kynoch Works, Witton, Birmingham 6, England, 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:—

The invention relates to stringer tapes for sliding clasp fasteners, which tapes are attached respectively to the rows of interlocking elements of the fasteners. Such rows of interlocking elements are for example constructed in helical or meander formation and attached to the stringer tapes symmetrically to the central axis of the fastener.

Individual stringer tapes are normally cut from lengths of stringer tape in which they lie in end to end relationship, and usually these are woven tapes with special interlocking and a regulated density of weave. Since each sliding clasp fastener incorporates two stringer tapes, the known fasteners may contain stringer tapes that have been made at different times and in many cases in different places (on different machines). Since the majority of sliding clasp fastener manufacturers but the lengths of stringer tape ready-made, it is impossible to be certain whether or not they were made at the same time or place or to sort them into groups of like origin (i.e., made on the same machine). The sliding clasp fasteners are consequently subject to manufacturing tolerances that have an adverse effect on performance.

The disadvantages of the use of the woven lengths of stringer tape are many. In the first place, the manufacture of lengths of stringer tape is fairly costly. Moreover, the mechanical properties (resilience, strength) of a length of stringer tape, both along its length and across its width, are variable. Since the pitch of the rows of interlocking elements in a sliding clasp fastener, on which its resistance to breaking open is dependent,

is wholly or partly determined by the stringer tapes to which the said rows are attached, the tolerances lead at once to a reduction in that resistance. Furthermore, because of the said tolerances sliding clasp fasteners incorporating stringer tapes that have been made at different times and in many cases in different places are no longer mechanically symmetrical about their central axis (even if the fastener geometrically is symmetrical) with a further adverse effect on resistance to breaking open. These disadvantages are significantly increased by the fact that to make a sliding clasp fastener the sewing machine used to attach the rows of interlocking elements to the stringer tapes must be fed, under individual guidance and handling, with two separate lengths of stringer tape, thereby occasioning additional manufacturing tolerances. In addition to these disadvantages, which reflect directly on the performance of the finished sliding clasp fastener, there is the manufacturing problem such as, viz., the cost of handling two lengths of stringer tape for the sewing process. By no means the least of the disadvantages is the consequent limitation on operating speeds during the sewing of the rows of interlocking elements to the lengths of stringer tape. Constant production controls must be maintained, and efforts to automate the process are significantly thwarted.

The disadvantages just described, in relation to woven lengths of stringer tape for sliding clasp fasteners, apply in even greater force to knitted lengths of stringer tape, because the resilience of the looped structure in knitted goods is influenced by the tension maintained during manufacture and the tolerances already referred to become even wider. Moreover, such lengths of stringer tape frequently and readily roll up transversely, causing additional difficulties in the stage of sewing the rows of interlocking elements to them. This combination of circumstances probably explains the almost com-

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and slip number 3

plete lack of sliding clasp fasteners with knitted stringer tapes in commerce, despite the fact that knitted lengths of stringer tape are usually cheaper to make than woven.

- 5 The object of the invention is to provide a fabric for use in the manufacture of sliding clasp fasteners without encountering the tolerance problems and manufacturing difficulties referred to above, and with the possibility of using high manufacturing speeds in the sewing of the rows of interlocking elements to the tapes.

- 10 According to the present invention, a fabric for providing individual stringer tapes of sliding clasp fasteners consists of a waled knitted structure comprising warp chain threads and transverse extending threads, formed as at least one pair of lengths of stringer tape with the lengths knitted at the same time side-by-side and connected to each other by one or more inlaid connecting threads which threads do not form part of the knitted structure, whereby the fabric is broader than each individual stringer tape length, and is capable of being separated into lengths of individual stringer tape with selvages by parting of the connecting threads.

- 20 This separation by parting of the connecting thread or threads is effected at the stage of attaching the rows of interlocking elements to the lengths of stringer tape, during or after the sewing operation when this method of attachment is used.

- 35 The above-mentioned tolerance problems are eliminated by manufacturing the interconnected lengths of stringer tape for given sliding clasp fasteners at the same time and place, provided that after making the lengths of stringer tape they are allowed to remain as a pair until such time as the rows of interlocking elements are or have been attached to them. In other words, the invention provides a fabric for the manufacture of stringer tapes consisting of at least two united lengths of stringer tape that remain together upto the stage of attaching the rows of interlocking elements to these lengths. It is directly within the scope of the invention to provide a fabric in which more than one pair of lengths of stringer tape are united. Such fabric can readily be made on flat (Tricot or Raschel) knitting machines, in such a way that when the connecting thread or threads is or are parted the fabric separates into individual lengths of stringer tape with selvages. It is also possible to adapt the construction of the lengths of stringer tape to special requirements that arise in sliding clasp fastener manufacture.

- 60 Thus, the lengths of stringer tape may be formed from warp chain threads, transverse lapping threads and inlaid lapping threads. This affords the particular advantage that by regulating the thread gauges and the lays of

the warp chain threads and/or transverse lapping threads and/or inlaid lapping threads the properties of the individual stringer tapes obtained from the lengths of stringer tape can be controlled over a wide range. In this connection, it is preferred that the selvage threads of the stringer tapes are reinforced in the warp chain threads and/or the transverse lapping threads and/or the inlaid lapping threads. Reinforcement can be effected by doubling the threads concerned or including thicker threads. In any case, this offers the means of controlling the properties, for example the longitudinal and/or transverse stretch properties, of the knitted stringer tapes according to the functional and manufacturing requirements. A similar adaptation of the thickness distribution in each stringer tape can also be achieved by another feature of the invention, viz., that some of the inlaid lapping threads are omitted to make the centre of the stringer tape approximately the same thickness as its selvages. This procedure is particularly preferred when there are no special requirements as to the strength and stretch properties of the stringer tapes. In any case, it is preferred that the inlaid lapping threads extend over at least three and preferably four wales, which brings the tendency of the stringer tape to stretch in the transverse direction to a particularly low level. When the inlaid lapping threads extend over less than three wales the transverse stretching increases very substantially to undesirably high levels for the stringer tapes used in sliding clasp fasteners.

Again, there are several possible ways of laying the connecting threads that unite the lengths of stringer tape into a single broader fabric. The lengths of stringer tape should however always be so connected that they will withstand all the stresses arising prior to separation without mutual displacement between adjacent pairs. Thus, according to another feature of the invention, the connecting threads are laid as inlaid lapping threads, preferably in the lay 2—2/0—0. This lay (the rotation is specifically explained later in the description) enables the connecting threads to run effectively parallel to the inlaid lapping threads within the fabric, without however in any way disturbing the location of the loop-forming threads. After parting of the connecting threads, the separated pieces will remain in the individual stringer tapes without deleterious side effects, since they do not contribute to the looped structure.

Another possible way of arranging the connecting threads is to lay them as transverse lapping threads in the lay 2—0/0—2. This arrangement is particularly preferred when the transverse lapping and warp chain threads are reinforced in the stringer tape selvages as a means of reducing the tendency

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of the stringer tapes to stretch longitudinally. In principle, the connecting threads may consist of the same material as the other threads. It may however be preferred to use a material with a lower melting point than that used for the other threads, since in this case the connecting threads can be parted simply by heating, in order to separate the fabric into separate lengths of stringer tape with selvages. Another possible way of parting the connecting threads, other than mechanically consists in using materials for them which are easily attacked by chemicals, i.e., in dissolving the connecting threads out of the fabric.
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The lengths of stringer tape can be used in sliding clasp fasteners in which sewing is used to attach the rows of interlocking elements or in those in which the interlocking heads of the rows of interlocking elements are inserted in interstices between the loops of the textile structure of the stringer tapes.
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Knitted lengths of stringer tape display a distinctive structure because of the inter-
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wale grooves left between the individual wales. The parts of the lengths of tape forming the bases of the grooves consist solely of inlaid lapping threads and the transverse lapping threads, so that when sewing is used the attachment threads can be embedded in the grooves and protected from outside contact.
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The tape selvages on which the rows of interlocking elements are laid can consist of one or more wales, according to the width of the row. The sewing can then be protected in a groove in the tape selvedge. However, the breadth of the grooves in the very fine sliding clasp fasteners as now developed, with correspondingly finely knitted stringer tapes, is often less than the gauge of the sewing needle used. Accordingly, in the fabric it is preferred to displace a wale in one selvedge of the lengths of stringer tape in the direction of the selvedge of the adjacent length of stringer tape with the connecting threads
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strongly tensioned, thereby extending the endmost groove and providing space for insertion of the sewing needle into it. After parting of the connecting threads, the displaced wale moves back into place and thereby covers the sewing threads.
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For attachment of the rows of interlocking elements by insertion into holes in the stringer tapes, the holes are preferably in ladder-like formation in a loop-free zone of each length that only contains the transverse threads connecting one wide and one narrow longitudinal region of the length of stringer tape which regions contain warp threads as well as transversely extending threads. This and the like forms are particularly advantageous for knitted lengths of stringer tape because they do not contain any continuous longitudinal threads that might become displaced into the loop-free holes. By a suitable
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arrangement of lays for the warp chain. transverse lapping, and inlaid lapping threads, such ladder-like formations of loop-free zones can readily be produced. In order not to weaken each individual stringer tape with a ladder of large holes, which must be large enough to accommodate the rows of interlocking elements and at the same time to facilitate insertion of the rows in the fabric, it is preferred to displace the loop-forming threads in the narrow regions of the tapes towards each other so as to broaden the holes, with strong tensioning of the connecting threads. This has the further advantage that after parting of the connecting threads holding the lengths of stringer tape together the ladders of holes in the loop-free zones close up, wholly or in part, and thus more firmly secure the rows of interlocking elements.
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By means of the invention, there are eliminated the manufacturing tolerances otherwise occasioned when the stringer tapes in one sliding clasp fastener are made at different times and places. This in itself substantially improves the functional properties of the sliding clasp fasteners. Moreover, fewer manufacturing controls need be maintained, thereby greatly facilitating the problems of automation in sliding clasp fastener manufacture and in the final analysis permitting the use of higher operating speed. Moreover, the invention facilitates the use of knitted lengths of stringer tape for attaching the rows of plastics monofilament interlocking elements during the manufacture of sliding clasp fasteners, thereby lower-in the production costs because compared with woven lengths of stringer tape the knitted fabric is substantially cheaper to make.
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The invention will now be further described with reference to the accompanying drawings, which show several embodiments, purely by way of example. In the drawings:—
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Figure 1 shows the disposition of the threads in a fabric embracing one pair of lengths of stringer tape in its width;
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Figure 2 is a modification of Figure 1; and shows a fabric embracing more than one pair of lengths of stringer tape;
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Figure 3 is a modification of Figure 2;
Figure 4 shows details of the thread lays in the lengths of stringer tape of Figures 1 to 3;
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Figure 5 is another modification of Figure 1, with reinforcements near the selvages of the lengths of stringer tape;
Figure 6 shows a single tape-width as in Figure 1 with a reduced number of inlaid lapping threads, the connecting threads to an adjoining width being omitted;
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Figure 7 is a diagrammatic transverse section through a sliding clasp fastener with knitted stringer tapes to which rows of inter-

locking elements are attached by sewing; and Figure 8 is a further modification of Figure 1 with loop-free zones.

5 The stringer tapes 7 which carry rows 2 of plastics monofilament interlocking elements (Figure 7) have a waled structure, wales 3 being formed by the knitting together of warp chain threads 4, transversely lapping threads 5, and inlaid lapping threads 6. The lengths of stringer tape 7 and 10 8, knitted simultaneously as a pair are connected together by means of one or more connecting threads 9 to form a correspondingly broad fabric 1. By parting the connecting 15 thread or threads 9 between adjacent tapes, the fabric 1 can be separated into the independent tapes 7 and 8 with selvages. Whereas the warp chain threads 4, the transverse lapping threads 5, and the inlaid lapping threads 6 forming the fabric can be all 20 of the same gauge, some or all of the various threads 4, 5 and 6 can be strengthened. Thus, the threads 4 and 5 bordering the selvages 10 of the lengths of stringer tape 7 and 8 in Figure 2 are shown strengthened. 25 This may be by the use of thicker threads, as indicated by the thicker lines; or it may be effected by providing two or more threads. On the one hand, reinforcement improves 30 the strength and elastic properties of the lengths of stringer tape 7 and 8, but on the other hand it also thickens the lengths of stringer tape 7 and 8 near the selvedge 10. Alternatively, uniform thickness over the 35 entire width can be obtained by omitting some of the inlaid lapping threads 6 near the middles of the lengths 7 and 8, as indicated in Figure 6.

40 The lay of the individual threads in the various Figures is shown by Figure 4 which also includes the threading pattern for the guide bars. The rotation used to describe the lays is interpreted as follows: The combination of digits describes the repeat pattern for 45 each thread lay, which repeats periodically. In the example given, the pattern covers two courses of loops. The pair of digits before the oblique stroke specifies how many wales are crossed over by the thread in the transverse direction of the fabric 1, moving in 50 both directions within one course of loops; the pair of digits after the oblique stroke specifies the corresponding thread lay in the next course of loops along the fabric. The fabric is preferably knitted with four guide 55 bars. The 1st guide bar works on the lay 4-4/0-0 and carries the inlaid lapping threads 6, while the 2nd works on the lay 2-2/0-0 and carries the connecting threads 9. The 3rd guide bar works on the lay 2-0/0-2, carrying the transverse lapping threads 5 and the 4th forms the warp chain threads 4 in the lay 0-1/1-0. The scope for varying the lay of the various threads can be seen 60 by comparing Figures 1, 2, 5, 6 and 8 in

which strengthened threads are throughout indicated by thicker lines. The lay 2-2/0-0 or 4-4/0-0 is preferred for the connecting threads 9, because they run so to speak parallel to the inlaid lapping threads 6 and are incorporated without difficulty in the fabric. It is however also possible to proceed as in Figure 2, where the connecting threads 9 are adapted as the loop-forming transverse lapping threads 5, in the lay 2-0/0-2.

In Figure 7, in which the rows 2 of interlocking elements are shown attached to the knitted lengths of stringer tape 7 and 8 by sewing, the profile structure of the tapes is shown the individual wales 3 being separated one from the next by the intervale grooves 11. The sewing threads 12 pass through the grooves 11 nearest the tape selvedge 10. In this case, the wales 3 forming each of the tape selvages 10 is displaced in the direction of the selvedge of the adjacent length of stringer tape, to broaden the end grooves 11, with strong tensioning of the connecting threads 9, to provide space in the groove 11 for the insertion of a sewing needle. The sewing thread 12 is embedded in the groove 11, effectively out of external contact. Sewing within a groove 11 puts less resistance on the needle, since the groove 11 only contains transverse threads. After parting of the connecting threads 9, the wales 3 along the tape selvages 10 move back into place, thereby at least partially covering and protecting the sewing thread 12.

Figure 8 shows the lay pattern for a fabric 1 in which the lengths of stringer tape 7 and 8 comprises holes 15 for insertion of the rows 2 of interlocking elements, the holes being in ladder-like formation in a loop-free zone that only contains the transverse threads connecting one broad side 13 and one narrow side 14 of the lengths of stringer tape 7 or 8. These ladder-like holes 15 are formed by omitting the second warp chain thread 4 and the first transverse lapping thread 5 on opposing sides of the lengths connected by the threads 9. By strongly tensioning the connecting threads 9 the loop-forming threads are displaced towards the tape sides 13 and 14, thus broadening the holes 15 so that the rows 2 of interlocking elements can be inserted more easily into them. After parting of the connecting threads 9, the holes 15 closed up spontaneously and secure the inserted rows 2 of interlocking elements.

Reference is made herein to Specifications 25057/70 and 25064/70 Serial Nos. 1299912 and 1299920 of even data herewith.

WHAT WE CLAIM IS:—

1. A fabric for providing individual stringer tapes of sliding clasp fasteners consisting of a waled structure comprising warp chain threads and transversely extend-



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Reference is made herein to Specifications 25057/70 and 25064/70 Serial Nos. 1299912 and 1299920 of even data herewith.

WHAT WE CLAIM IS:—

1. A fabric for providing individual stringer tapes of sliding clasp fasteners consisting of a waled structure comprising warp chain threads and transversely extend-



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- ing threads, formed as at least one pair of lengths of stringer tape with the lengths knitted at the same time side-by-side and connected to each other by one or more
- 5 inlaid connecting threads, which threads do not form part of the knitted structures, where- by the fabric is broader than each individual stringer tape and is capable of being separated into lengths of individual stringer
- 10 tape with selvages by parting of the connecting thread.
2. A fabric as in Claim 1, wherein the lengths of stringer tape are formed from warp threads, transverse lapping threads, and
- 15 inlaid lapping threads.
3. A fabric as in Claim 2, wherein the selvage threads of the lengths of stringer tape are strengthened in the warp chain threads and/or transverse lapping threads
- 20 and/or the inlaid lapping threads.
4. A fabric as in Claim 2 or Claim 3, wherein some of the inlaid lapping threads are omitted to make the centres of the lengths of stringer tape approximately the same thick- ness as their selvages.
- 25 5. A fabric as in any one of Claims 1 to 4, wherein the inlaid lapping threads extend over at least three and preferably four of the wales.
- 30 6. A fabric as in any of Claims 1 to 5, wherein the connecting threads are laid as inlaid lapping threads.
7. A fabric as in Claim 6, wherein the inlaid lapping threads are in the lay 2-2/
- 35 0-0 or 4-4/0-0.
8. A fabric as in any one of Claims 1 to 5, wherein the connecting threads are transverse lapping threads in the lay 2-0/0-2.
9. A fabric as in any one of Claims 1 to 8, wherein a wale in one selvage of each 40 length of stringer tape is displaced in the direction of the selvage of the adjacent length of tape there being, strong tensioning threads, thereby extending the endmost inter- wale groove and providing space for insertion 45 of the sewing needle into it.
10. A fabric as in any one of Claims 1 to 8, wherein each length of stringer tape is punctuated by holes for insertion of the rows of interlocking elements, the holes being in 50 ladder-like formation in a loop-free zone that only contains transverse threads connecting one wide and one narrow longitudinal region of the length of stringer tape, which regions contain warp threads as well as transversely extend- 55 ing threads.
11. A fabric as in Claim 10, wherein the loop-forming threads in the narrow regions of the lengths of tape are displaced towards each other so as to broaden the holes with strong 60 tensioning of the connecting threads.

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