SLIDING CLASP FASTENER STRINGERS

Inventors: Christopher Frederic Austin, Sutton Coldfield; Philip Simpson Crowther, Sutton Coldfield; David Warren, Sutton Coldfield; David Howitt, Birmingham, all of England

Assignee: Lightning Fasteners Limited, Birmingham, England

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ABSTRACT

A slide fastener stringer comprises a knitted tape and a series of coupling elements secured thereto during knitting.

9 Claims, 11 Drawing Figures
SLIDING CLASP FASTENER STRINGERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to sliding clasp fastener stringers and to methods and machines for their manufacture.

2. Description of the Prior Art

A sliding clasp fastener comprises two stringers, each stringer comprising a series of coupling elements secured to a carrier tape. It is now well-known to provide a series of interconnected coupling elements formed from a length of plastics filament which is either wound into a coil shape, or formed into a meander configuration which is folded along its centerline into U-shape. A fastener having a coil-shape element construction will be referred to hereinafter as "coil fastener construction," and one having U-shaped elements will be referred to hereinafter as "meander fastener construction." Other forms of interconnected coupling elements have been proposed wherein the elements are produced by notching a tube of plastics material, or by moulding a series of elements having interconnecting portions formed integrally with the elements.

Hitherto, a series of coupling elements and its associated carrier tape of woven construction have usually been manufactured separately and then the series has been secured to the tape in a subsequent sewing operation.

Objects of the present invention are to reduce the number of operations required to manufacture a fastener stringer and to provide a tape construction which is more economic than that produced by weaving techniques.

SUMMARY OF THE INVENTION

According to the present invention, a method of making a sliding clasp fastener stringer comprises warp-knitting a carrier tape and, during the knitting, locating a series of interconnected coupling elements adjacent a longitudinal edge of the tape as it is knitted, and knitting at least one yarn in the tape during knitting so that at least one yarn passes at least partially around the series and is interlinked with other yarns of the tape in the vicinity of the series thereby to secure the series to the tape.

The series of coupling elements may be of known coil or meander fastener construction and each may comprise a cord or braid disposed between arms of the coupling elements and extending longitudinally of the series.

Coupling head portions of the coupling elements may be formed on the filament either before or after knitting the series of elements into the tape.

The series of coupling elements may be conveniently guided to its position adjacent an edge of the tape being knitted through a tubular guide, and a knitting yarn passed at least partially around the guide so that during casting off a portion of the yarn slips from the tube to a position between two adjacent coupling elements of the series so as to secure said elements to the tape.

The invention also provides a warp-knitting machine for making a sliding clasp fastener stringer, the machine having a knitting zone and comprising a row of knitting needles for knitting a carrier tap of the stringer, a plurality of guide bars each carrying yarn guides, and a tubular guide having a lower end disposed to guide a series of interconnected coupling elements to a predetermined position in the knitting zone and adjacent one end of the row of needles with at least one of the knitting needles being disposed on one side of the tubular guide and with the other needles on the other side when considered in the lapping direction, and at least one of the guide bars being disposed to swing and lap its yarn guides behind the tubular guide while at least one other guide bar is disposed to lap its yarn guides in front of the tubular guide and across needles disposed on each side of the tubular guide and to swing the yarn guides past the lower end of the tubular guide on each side thereof.

In one form of the invention, the tubular guide is operably connected to a guide bar mechanism of the machine whereby the tubular guide is caused to move in a swinging direction about a position beyond the lower end of the tubular guide and between knitting needles of the machine in synchronism with swinging movements of the yarn guides.

Conveniently the tubular guide is pivotally connected to a yarn guide of the machine.

In another form of the invention the tubular guide is supported in a fixed position relative to the plane of movement of the knitting needles and the guide bar of the at least one yarn guide is operable to move the yarn guide on a swinging and lapping motion around needles disposed on each side of the tubular guide while moving the yarn guide around the tubular guide.

The series of coupling elements may be knitted in with coupling head portions of the coupling elements aligned along an outer longitudinal edge of the stringer so that the head portions face away from the knitted tape. Alternatively, the coupling head portions may face in a direction towards the knitted tape so that when the tape of the stringer is folded back upon itself, there is provided a stringer for a concealed element type fastener, i.e., when a right-hand and a left-hand stringer are assembled together, the coupling elements of the fastener are concealed from view on one side of the fastener.

The invention also includes a stringer for a sliding clasp fastener when made by a method or with a machine as defined above.

BRIEF DESCRIPTION OF THE DRAWINGS

Two embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings of which FIGS. 1 to 10 relate to a first embodiment and FIG. 11 relates to a second embodiment, and in which:

FIG. 1 is a diagrammatic view of parts of a warp-knitting machine considered in end elevation;

FIGS. 2 and 3 are an end elevation and schematic plan view respectively of knitting machine parts at one stage of a knitting cycle;

FIGS. 4 and 5 are views similar to FIGS. 2 and 3 at another stage of the knitting cycle;

FIGS. 6 to 10 are views similar to FIGS. 3 and 5 of further progressive stages in the knitting cycle, and

FIG. 11 is a perspective view of parts of a warp-knitting machine according to the second embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1 a five guide bar warp-knitting machine is used in the first embodiment for making a sliding clasp fastener stringer and the machine parts are represented as follows: numeral 10 designates a truss plate in which a row of latch needles 11 are slidably mounted. Yarn guides 12 are movable in controlled manner by the five guide bars 13 reciprocatably mounted in supports 14 secured to a bracket 15 which is keyed to a shaft 16. This shaft is caused to oscillate about its axis 17 by a crank 18 and connecting rod 19. This oscillating motion of the shaft 16 and thus of the bracket 15 effects swinging movements of the yarn guides 12 about axis 17. Yarns 20 are fed downwardly, in known manner for knitting machines, from spools (not shown) through the guides 12 to a tape 21 which is being knitted. In the present embodiment three series of yarn guides 12a, 12b and 12c are employed to knit the basic fabric structure of the tape 21.

A series of coupling elements 22 in the form of a coil of plastics filament and which is provided with an internal cord 23 is fed downwardly through a tubular guide 24, for example, by a ratchet operated toothed wheel (not shown). The tubular guide 24 is of telescopic construction and comprises an upper, larger diameter tubular guide 25 and a smaller diameter tubular guide 26 respectively. The upper tube 25 has a closed ended axially directed slot (not shown) to receive a projection on the lower tube 26 to control the lowermost position of the lower tube.
The lower end of the tube 26 is located at a predetermined position adjacent a longitudinal edge of the tape at the knitting zone and adjacent one end of the row of needles 11 so that one needle is disposed on one side of the tubular guide and the remaining needles are disposed at the other side when considered in the lapping direction. Means for imparting a movement to the tubular guide 24 in a swinging direction is conveniently a guide bar through a yarn guide 12d to which the upper tube 24 is operably connected by a pivot 27 and a U-shaped link 28. The tubular guide is thus enabled to move in an arc about a position near to but beyond the lower end of the lower tube 26. In the vicinity of the tubular guide 24 the disposition of the needles 11 allow the guide to pass between two needles during its oscillating motions. Also the conventional sinkers of the machine are removed which would otherwise lie in the path of the tubular guide.

The base fabric of the tape knitted by yarns passing through guides 12c to 12e is of any appropriate construction and the series of coupling elements 22 is lased to the tape by a yarn 20e which passes through guide 12e. The yarn 20c is fed from an independent letoff motion to permit the drawoff of a longer length of yarn compared with the remaining yarns 20.

Commenting at the arbitrary starting position shown in FIGS. 2 and 3, the knitting needles are in their raised position and the tubular guide 24 and yarn guide 12e are in their forward position of the needles. From this position the tubular guide and yarn guide 12e move rearwardly between needles to positions indicated in FIGS. 4 and 5, the yarn guide 12e swinging past the lower end of the tubular guide. The telescopic arrangement of the tubular guide 24 compensates for the varying distance between the pivot 27 and the lower end of the tube 26 during its movement. At this stage, the tubular guide 24 remains stationary and yarn guide 12e laps that the tubular guide and the needles to a position shown in FIG. 6.

The tubular guide 24 and yarn guide 12e then move forwardly between needles and so doing the yarn 20c is looped around the tubular guide as well as around two needles as indicated in FIG. 7. At this stage, the needles move downwardly and upwardly to knit one course, the yarn 20e slipping off the lower end of the tube 26 and between two convolutions, i.e., two coupling elements, of the coil so that the yarn lies partially around the cord 23 and the filament of the series of elements under appropriate tension controlled by the independent letoff motion.

The tubular guide 24 and yarn guide 12e now move rearwardly to occupy the positions shown in FIG. 8 and then, while the tubular guide remains stationary, the yarn guide laps between the tubular guide and the needles to the position indicated in FIG. 9. From these positions, the yarn guide move forwardly between needles and so doing the yarn 20e is looped around the tubular guide as well as around two needles as indicated in FIG. 10. At this stage the needles move downwardly and upwardly to knit another course and to slip a loop of the yarn 20e from the tube 26 to a position between two coupling elements of the series. The above movements of the yarn guide 12e are equivalent to the notation 0-4/4-0.

While the above description has described the passage of the yarn 20c, the knitting of the basic fabric structure proceeds in known manner so that, for instance, at the position shown in FIGS. 7 and 10, the normal yarns 20 of the tape 21 are lapped around the needles 11.

Since the needles 11 which knit the yarn 20c at each side of the series of elements 22 are also employed for knitting the base fabric structure of the tape, the series of elements thus becomes secured to the tape by virtue of the yarn 20c being interlaced with other yarns of the tape 21 to provide a stringer of a coil fastener construction.

In a typical sliding clasp fastener employed for dresses, the lapping of the yarn 20c is so arranged that three courses of the tape are knitted to each pitch of the coupling elements the yarn 20e lapping the tubular guide twice in every three courses so that two loops of the yarn 20c are formed between every two coupling elements.

In a second embodiment, FIG. 11, a four guide bar warp-knitting machine is employed, with parts similar to those in the first embodiment denoted by the same reference numbers. In the second embodiment, a tubular guide 30 is fixedly mounted in a bar 31 secured between end frames of the machine. The lower end of the tubular guide 30 is located a predetermined position adjacent a longitudinal edge of the tape 21 at the knitting zone and the guide is inclined forwardly of the machine. The guides 12a, 12b and 12c are employed for the knitting of the basic structure of the tape 21. To the front of the tubular guide 30 a yarn guide holder 32 carries a single yarn guide 33 which is directed rearwardly of the machine. In use, the yarn guide 33 swings forwardly and rearwardly of the machine at each side of the tubular guide 30 and laps a yarn around a needle 11 at each end of a lapping motion across the front of the guide 30.

In a modification of either of the above embodiments, a series of coupling elements without an internal cord is knitted in, in which case the yarn from guide 12e is engaged directly with parts of the filament which interconnect successive coupled elements of the series.

While the above embodiments have been described in relation to coil fastener constructions, it will be apparent that other fastener constructions, such as meander fastener constructions, for example, may also be made by the present invention.

The above embodiments have been described in relation to machines employing latch-type knitting needles but the invention may also be performed with machines using bearded type or compound type needles.

We claim:

1. A method of making a sliding clasp fastener stringer comprising warp-knitting a carrier tape, locating a series of interconnected coupling elements adjacent a longitudinal edge of the tape as it is being knitted, and securing the series of elements to the tape during knitting by knitting at least one yarn in the tape and passing said yarn at least partially around elements of the series and interlinking said yarn with other yarns of the tape in the vicinity of the series.

2. A method according to claim 1 wherein the series of coupling elements is of coil fastener construction.

3. A method according to claim 1 wherein the series of coupling elements is of meander fastener construction.

4. A method according to claim 2 wherein a cord or braid is disposed between arms of the coupling elements and extends longitudinally of the series of elements.

5. A method according to claim 1 wherein the series of coupling elements is guided to its position adjacent an edge of the tape being knitted through a tubular guide and a knitting yarn is passed at least partially around that during casting off a portion of the yarn slips from the tubular guide to a position between two adjacent coupling elements of the series so as to secure said two elements to the tape.

6. A warp-knitting machine for making a sliding clasp fastener stringer, the machine having a knitting zone and comprising a row of knitting needles for knitting a carrier tape of the stringer, a plurality of guide bars each carrying yarn guides, and a tubular guide having a lower end disposed to guide a series of interconnected coupling elements to a predetermined position in the knitting zone adjacent one end of the row of knitting needles with at least one of the knitting needles being disposed on one side of the tubular guide and with the other needles on the other side when considered in the lapping direction, and at least one of the guide bars being disposed to swing and lap its yarn guides behind the tubular guide while at least one other guide bar is disposed to lap at least one yarn guide in front of the tubular guide and across needles disposed on each side of the tubular guide and to swing the yarn guide past the lower end of the tubular guide on each side thereof.

7. A machine according to claim 6 wherein the tubular guide is operably connected to a guide bar mechanism of the machine whereby the tubular guide is caused to move in a swinging direction about a position beyond the lower end of the tape.
the tube guide and between knitting needles of the machine in synchronism with swinging movements of the yarn guides.

8. A machine according to claim 7 wherein the tubular guide is pivotally connected to a yarn guide of the machine.

9. A machine according to claim 6 wherein the tubular guide is supported in a fixed position relative to the plane of movement of the knitting needles and the guide bar of the at least one yarn guide is operable to move the yarn guide on a swinging and lapping motion around needles disposed on each side of the tubular guide while moving the yarn guide around the tubular guide.

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