SPECIFICATION

A woven fastener stringer

This invention relates to a sliding clasp fastener, and more pariticularly to a fastener stringer having a continuous plastic filament spirally formed and woven into an edge of a stringer tape during the weaving thereof by a needle loom.

There have been proposed a number of sliding clasp fasteners or zippers of the type described, which comprise a woven stringer tape and a plastic filament woven into a longitudinal edge of the tape, the filament being usually formed into a helical coil structure consisting of a succession of loops or elongated convolutions each having a coupling head, an upper and a lower leg and a connecting portion. A typical example of such fasteners is disclosed in DOS 2519829 wherein a preformed filament carrying a stuffer warp is inserted in the same manner as is the woven warp and interwoven with the weft into a longitudinal edge of a tape simultaneously as the latter is woven. Since the upper leg of each loop or convolution of the coiled filament in this prior art fastener stringer is not held in place by any weave thread, the result is that adjacent upper legs are prone to move out of the correct pitch, or the coupling filament on one stringer would often become disengaged from a corresponding filament on the other stringer when the fastener is subjected to bending stresses.

Another prior art example is disclosed in Japanese Laid-Open Publication No. 50–36250 wherein a warp thread is disposed over the upper legs of the coupling filament and interwoven in the spaces between adjacent filament loops with a weft thread. While this arrangement appears to provide secure anchorage of the coupling filament onto the tape, the warp thread extending over the filament tends to slip along the length of the loops and become shifted either toward the coupling head or the connecting portion under the influence of bends or twists, resulting in the failure to couple the two stringers, and the breakage of the warp thread in frictional contact with the slider.

Still another prior art fastener stringer is disclosed in Japanese Laid-Open Publication No. 50–85445 wherein additional warp and weft threads are used for binding the coupling filament onto the tape, such threads being interwoven with the filament and stuffer warp over the upper legs of the latter. The binding weft thread in this arrangement passes around the outsides of the connecting portions of the successive loops and hence extends laterally of the tape so far as to come into frictional engagement with the slider, which would in turn cause sluggish movement of the slider or torn tape threads.

According to the invention, there is provided, a woven fastener stringer comprising a woven stringer tape formed with foundation warp and weft threads and consisting of a web section constituting more than half the width of said tape and a woven filament section constituting a longitudinal edge portion of said tape; a row of successively interconnected elongate loops woven into said filament section, each of said loops having a coupling head at one end thereof, an upper leg and a lower leg extending from said head in a common direction, and a heel portion at the opposite end remote from said head connected to a next adjacent one of said successive loops; and a combination of binding threads comprising a plurality of binding warp threads extending in parallel relation over said upper legs and alternatively overlying and underlying said foundation weft and a binding weft thread interlaced with said binding warp threads substantially in a common plane defined by the upper surfaces of said upper legs and looping around said foundation weft at a position interiorly of said heel portion as seen in plan view.

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

Figure 1 is a plan view on enlarged scale of a portion of one of two identical fastener stringers provided in accordance with the invention; and

Figure 2 is a diagrammatic, partly sectional, perspective view on enlarged scale of a segment of the portion of the fastener stringer shown in Fig. 1.

A fastener stringer generally designated 10 constitutes one part of a pair or two identical stringers for a sliding clasp fastener. The stringer 10 consists of a generally flat web section *W* constituting more than half the width of a woven stringer tape 11 and a woven filament section *W*, constituting a longitudinal edge portion 12 into which a filament 13 of plastic material is woven. The filament 13 is formed from a linear blank of a suitable plastic material into a helically coiled structure having a succession of loops or elongate convolutions. This is done during the course of weaving of the tape 11, for example in the manner disclosed in Japanese Laid-Open Publication No. 50–36250.

Each loop or elongate convolution 14 in the filament 13 has a coupling head 14*a* at one end thereof, an upper leg 14*b* and a lower leg 14*c* extending from the head 14*a* in a common direction and a heel portion 14*d* at the opposite end remote from the head 14*a* connected to a next adjacent one of the successive loops 14. The coupling head 14*a* is dimensioned to releasably couple with a corresponding head of a loop 14 on a mating stringer to open and close the fastener in the well known manner. The upper and lower legs

14*b* and 14*c* are spaced apart in substantially superimposed relation to each other as shown in Fig. 1 and define therebetween a longitudinally extending "tunnel" or hollow conduit through which at least one stuffer warp formed as a string, cord or core 15 is inserted, two being shown.

The web section *W* of the tape 11 may be of any known design having foundation warp threads 16 and foundation weft thread 17 interwoven in a variety of patterns, which will required no further explanation as this has no direct bearing upon the invention.

The term "filament woven section W_f" is used to define a longitudinal edge portion of the tape 11 into which the filament 13 serving as a coupling element for a sliding clasp fastener is woven. In addition to the foundation warp and weft system in the filament woven section W_f there are provided a plurality of binding warp threads; two of such threads 18 and 19 being shown in the illustrated embodiment, and a binding weft thread 20 cooperating with the binding warp threads 18, 19 in securing the filament 13 firmly in place on the stringer tape 11.

Each of the successive loops 14 of the coupling filament 13 has its lower leg 14*c* secured by the foundation warp 16 and weft 17 onto the woven filament section W_f. To further securely anchor the lower leg 14*c* to the tape 11, the foundation weft 17 is interlaced with the binding warp threads 18 and 19 which are laid in parallel relation longitudinally of the tape and extend over the upper legs 14*b* of the loops 14. As better shown in Fig. 2, the binding warp threads 18 and 19 alternately extend over and under the foundation weft thread 17 in the spaces between adjacent loops 14 at the woven filament section W_f of the tape 11. The interlacing of the binding warp threads 18 and 19 with the foundation weft 17 also secures the upper leg 14*b* of each loop 14 against displacement, and this is strengthened by the insertion of the binding weft thread 20 which takes place substantially in a common plane defined by the upper surfaces of the upper legs 14*b* of the successive loops 14. The binding weft thread 20 extending substantially the entire length of the upper leg 14*b* of the loop 14, passes around the binding warp thread 18 over the upper leg 14*b* adjacent to the coupling head 14*a* and loops around the foundation weft 17 at a position interiorly (as seen in plan view, i.e. in Fig. 1) of the heel portion 14*d* which interconnects the upper leg 14*b* of one loop with the lower leg 14*c* of a next adjacent loop of the filament 13. The binding weft thread 20 on its return trip passes alternately over and under the two parallel binding warp threads 18 and 19 in the spaces between each adjacent pair of loops 14. It will be thus noted that the particular combination of binding warp threads 18, 19 and binding weft thread 20 employed in accordance with the invention provides increased positional stability of the coupling filament 13 on the tape 11 against displacement when the fastener stringer 10 is subjected to binding stresses particularly in the transverse direction. More specifically, since the binding warp threads 18 and 19 are interlaced with the binding weft thread 20 in close proximity to the common plane of the upper leg surfaces of the successive loops 14, the upper legs 14*b* are anchored firmly in place against external forces tending to disturb the proper pitch or alignment of the row of coupling filament loops 14. The binding warp threads 18 and 19 are also secured in place at the region between the coupling head 14*a* and the heel portion 14*d* as the binding weft thread 20 holding the threads 18, 19 down against the upper legs 14*b* is arranged to loop around or interweave with the foundation weft 17 interiorly (as seen in plane view, i.e. in Fig. 1) of the heel portion 14*d* and pass interlacingly around the binding warp thread 18 adjacent the coupling head 14*a*.

Since the joint of binding weft thread 20 and foundation weft 17 is located internally (as seen in plan view) of the heel or connecting portion 14*d*, not beyond the external surface of this portion, there is no thread behind the heel portion 14*d* which would otherwise interfer with the movement of the slider.

CLAIMS

1. A woven fastener stringer comprising a woven stringer tape formed with foundation warp and weft threads and consisting of a web section constituting more than half the width of said tape and a woven filament section constituting a longitudinal edge portion of said tape; a row of successively interconnected elongate loops woven into said filament section, each of said loops having a coupling head at one end thereof, an upper leg and a lower leg extending from said head in a common direction, and a heel portion at the opposite end remote from said head connected to a next adjacent one of said successive loops; and a combination of binding threads comprising a plurality of binding warp threads extending in parallel relation over said upper legs and alternately overlying and underlying said foundation weft and a binding weft thread interlaced with said binding warp threads substantially in a common plane defined by the upper surfaces of said upper legs and looping around said foundation weft at a position interiorly of said heel portion as seen in plan view.

2. A woven fastener stringer as defined in claim 1, including a stuffer warp which is inserted longitudinally of said tape between said upper and lower legs of said loops.

3. A woven fastener stringer as defined in

14*b* and 14*c* are spaced apart in substantially superimposed relation to each other as shown in Fig. 1 and define therebetween a longitudinally extending "tunnel" or hollow conduit through which at least one stuffer warp formed as a string, cord or core 15 is inserted, two being shown.

The web section *W* of the tape 11 may be of any known design having foundation warp threads 16 and foundation weft thread 17 interwoven in a variety of patterns, which will required no further explanation as this has no direct bearing upon the invention.

The term "filament woven section W_f" is used to define a longitudinal edge portion of the tape 11 into which the filament 13 serving as a coupling element for a sliding clasp fastener is woven. In addition to the foundation warp and weft system in the filament woven section W_f, there are provided a plurality of binding warp threads; two of such threads 18 and 19 being shown in the illustrated embodiment, and a binding weft thread 20 cooperating with the binding warp threads 18, 19 in securing the filament 13 firmly in place on the stringer tape 11.

Each of the successive loops 14 of the coupling filament 13 has its lower leg 14*c* secured by the foundation warp 16 and weft 17 onto the woven filament section W_f. To further securely anchor the lower leg 14*c* to the tape 11, the foundation weft 17 is interlaced with the binding warp threads 18 and 19 which are laid in parallel relation longitudinally of the tape and extend over the upper legs 14*b* of the loops 14. As better shown in Fig. 2, the binding warp threads 18 and 19 alternately extend over and under the foundation weft thread 17 in the spaces between adjacent loops 14 at the woven filament section W_f of the tape 11. The interlacing of the binding warp threads 18 and 19 with the foundation weft 17 also secures the upper leg 14*b* of each loop 14 against displacement, and this is strengthened by the insertion of the binding weft thread 20 which takes place substantially in a common plane defined by the upper surfaces of the upper legs 14*b* of the successive loops 14. The binding weft thread 20 extending substantially the entire length of the upper leg 14*b* of the loop 14, passes around the binding warp thread 18 over the upper leg 14*b* adjacent to the coupling head 14*a* and loops around the foundation weft 17 at a position interiorly (as seen in plan view, i.e. in Fig. 1) of the heel portion 14*d* which interconnects the upper leg 14*b* of one loop with the lower leg 14*c* of a next adjacent loop of the filament 13. The binding weft thread 20 on its return trip passes alternately over and under the two parallel binding warp threads 18 and 19 in the spaces between each adjacent pair of loops 14. It will be thus noted that the particular combination of binding warp threads 18, 19 and binding weft thread 20 employed in accordance with the invention provides increased positional stability of the coupling filament 13 on the tape 11 against displacement when the fastener stringer 10 is subjected to binding stresses particularly in the transverse direction. More specifically, since the binding warp threads 18 and 19 are interlaced with the binding weft thread 20 in close proximity to the common plane of the upper leg surfaces of the successive loops 14, the upper legs 14*b* are anchored firmly in place against external forces tending to disturb the proper pitch or alignment of the row of coupling filament loops 14. The binding warp threads 18 and 19 are also secured in place at the region between the coupling head 14*a* and the heel portion 14*d* as the binding weft thread 20 holding the threads 18, 19 down against the upper legs 14*b* is arranged to loop around or interweave with the foundation weft 17 interiorly (as seen in plane view, i.e. in Fig. 1) of the heel portion 14*d* and pass interlacingly around the binding warp thread 18 adjacent the coupling head 14*a*.

Since the joint of binding weft thread 20 and foundation weft 17 is located internally (as seen in plan view) of the heel or connecting portion 14*d*, not beyond the external surface of this portion, there is no thread behind the heel portion 14*d* which would otherwise interfer with the movement of the slider.

CLAIMS

1. A woven fastener stringer comprising a woven stringer tape formed with foundation warp and weft threads and consisting of a web section constituting more than half the width of said tape and a woven filament section constituting a longitudinal edge portion of said tape; a row of successively interconnected elongate loops woven into said filament section, each of said loops having a coupling head at one end thereof, an upper leg and a lower leg extending from said head in a common direction, and a heel portion at the opposite end remote from said head connected to a next adjacent one of said successive loops; and a combination of binding threads comprising a plurality of binding warp threads extending in parallel relation over said upper legs and alternately overlying and underlying said foundation weft and a binding weft thread interlaced with said binding warp threads substantially in a common plane defined by the upper surfaces of said upper legs and looping around said foundation weft at a position interiorly of said heel portion as seen in plan view.

2. A woven fastener stringer as defined in claim 1, including a stuffer warp which is inserted longitudinally of said tape between said upper and lower legs of said loops.

3. A woven fastener stringer as defined in

claim 1, said binding weft thread passing around one of said plurality of binding warp threads adjacent to said coupling head and over said upper leg and alternately overlying and underlying said plurality of binding warp threads in the spaces between each adjacent pair of said loops.

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