

SPECIFICATION

A separable slide fastener chain and a method of producing the same

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This invention relates to slide fastener stringers having a continuous length (commonly known as "fastener chains") and a method of making the same for use as a separable type of slide fastener.

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There are known two typical forms of the so-called separable slide fastener, one of which has a pin member on one stringer releasably engageable with a socket or box member on the other stringer at one end of the fastener, and the other has two sliders oppositely oriented so as to permit the fastener to be opened reversibly from both ends of the fastener.

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Such conventional separable fasteners are usually provided at the upper ends thereof with end stops and at the lower ends thereof with pin members, socket members or slider-lock members depending upon the particular purpose for which the fastener is used. The various members attached at the lower end of the separable fastener would necessarily restrict the form and application to which the fastener can adapt itself. It has been difficult according to the prior art teachings to provide for example a "loop" fastener using a single fastener stringer.

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According to a first aspect of this invention there is provided a separable slide fastener

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chain comprising: a pair of oppositely disposed stringers of continuous length, each having a support tape and a fastener element formed from a plastic monofilament into a continuous structure having coupling head portions and secured by stitches to a longitudinal inner edge of the respective tape, said fastener element being fused together over a predetermined length of the two coupled stringers at predetermined intervals; and a

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composite pin-forming structure located centrally of the fused length of the fastener element and cut to provide an aperture; characterized in that said aperture is a multi-form aperture having a pair of bay portions extending transversely of the fastener chain and

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oppositely disposed in point symmetry relation to each other, relative to an imaginary point in the centre of said aperture, and a pair of elongated canal portions extending longitudinally closely along the stitches; that said canal portions, at their respective end portions, are tapered and then continue in extended, narrow, parallel-sided portions which are curved or bent in opposite directions such that the

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two tapered end portions of said canal portions are oppositely disposed in point symmetry relation to each other, relative to the same said point; and that said composite pin-forming structure is divisible across said bay portions into two identical pairs of slider-lock pin

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members and inserting pin members.

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According to a second aspect of the invention there is provided a method of producing a separable slide fastener chain including a pair of oppositely disposed stringers of continuous length, each having a support tape and a fastener element formed from a plastic monofilament into a continuous structure having coupling head portions and secured by

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stitches to a longitudinal inner edge of the respective tape, which method comprises fusing a predetermined length of said fastener element integrally with said tape edge, forming a composite pin-forming structure centrally of the fused length of the fastener

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element, and cutting the composite pin-forming structure to provide an aperture therein; characterized in that said cutting of the composite pin-forming structure is such that said

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aperture is a multi-form aperture having a pair of bay portions extending transversely of the fastener chain and oppositely disposed in point symmetry relation to each other, relative to an imaginary point in the centre of the aper-

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ture, and a pair of elongated canal portions extending longitudinally closely along the stitches, said canal portions, at their respective end portions, tapering and then continuing in extended, narrow, parallel-sided portions which are curved or bent in opposite

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directions such that the two tapered end portions are oppositely disposed in point symmetry relation to each other, relative to the same said point, said composite pin-forming structure being divisible across the bay portions

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into two identical pairs of slider-lock pin members and inserting pin members.

By the pair of bay portions and the pair of tapered end canal portions being "oppositely disposed in point symmetry relation to each other", relative to the same point, is meant that imaginary rotation of one bay portion and one tapered end canal portion, relative to the other bay portion and tapered end canal portion, through 180° about an axis passing

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through the said point normal to the plane of the tape, would result in the two bay portions becoming completely superposed and the two tapered end canal portions becoming completely superposed.

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

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Figure 1 is a fragmentary plan view of a fastener chain provided in accordance with the invention;

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Figure 2 is a fragmentary plan view, on enlarged scale, of a pair of slide fastener stringers according to the invention with two oppositely directed sliders mounted thereon;

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Figure 3 is a cross-sectional view taken on the line III-III of Fig. 1;

Figure 4 is a cross-sectional view taken on part of the line IV-IV of Fig. 1;

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Figures 5a-5e, inclusive, are views utilized

to explain the manner of mounting a slider on one of the fastener stringers;

Figure 6 is a plan view of a loop fastener provided in accordance with the invention;

5 Figure 7 is a view similar to Fig. 1 but showing another embodiment of the invention;

Figure 8 is a cross-sectional view taken on the line VIII-VIII of Fig. 7; and

10 Figure 9 is a cross-sectional view taken on part of the line IX-IX of Fig. 7.

Referring now to the drawings and Fig. 2 in particular, there is shown for purposes of

15 illustration a portion of a separable slide fastener 10 provided in accordance with the invention. The fastener 10 comprises a pair of oppositely disposed stringers 11, 12 each having a support tape 13, (14) and a fastener element 15 (16) formed from a plastics mono-

20 filament into a row of interlocking coupling elements 17 (18) mounted on and along a longitudinal inner edge of the respective tape. The fastener element 15, (16) is formed from the plastics monofilament into a continuous

25 coil or alternatively a meandering structure, the element 15, (16) being shown in the illustrated embodiment to be a helically coiled structure consisting of a row of coupling elements in the form of a succession of elongated convolutions of loops 17, (18) each

30 having a coupling head portion 17a, (18a) at one end thereof, an upper leg 17b, (18b), a lower leg portion 17c, (18c) extending from the head 17a, (18a) in common direction and a connecting heel or turn portion 17d, (18d)

35 at the opposite end remote from the head 17a, (18a) connected to a next adjacent one of the successive loops 17, (18).

The coupling head 17a of the loop 17 on one stringer 11 is dimensioned to releasably couple with the corresponding head 18a of the loop 18 on the mating stringer 12 to open and close the fastener 10 in the well-known manner. The upper and lower legs

45 17b, 17c and 18b, 18c 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 a reinforcing

50 string, cord or core 33 is inserted. Designated at 19 is a sewn seam or stitching securing the row of coupling elements or loops 17, (18) to the respective tape 13, (14).

In accordance with the invention, some of the successive coupling elements or loops 17, (18) that have been coupled or meshed with each other are fused together over a predetermined length of the row of coupling elements or loops at one end of the fastener 10, as by

60 means of a supersonic process, and are cut closely along a longitudinal inner edge of each of the sewn seams 19 to provide a pair of integrated pin members 20 and 21 on opposed stringers 11 and 12, respectively. Fus-

65 ing the plastic monofilament fastener element

15, (16) causes its stock to melt and penetrate into the interstices of the fabric forming the sewn seam 19, reinforcing core 33 and support tapes 13, 14, with the results that all

70 of these parts of the fastener 10 are intimately united. The pin members 20 and 21 that result from cutting or removing portions of the fused region of the stringers 11, 12, of which portions a first portion 22 extends longitudinally closely along and substantially parallel to the inner edges of the respective sewn seams 19, with the coupling head portions 17a, (18a) of the fastener element 15, (16) completely removed. A second portion 23 of the

75 fused and cut region is tapered off with a plurality of coupling heads 17a of the successive loops 17 on the stringer 11 transferred to and anchored between adjacent ones of the successive coupling elements or loops 18 on the opposite companion stringer 12, or vice versa, as shown in Fig. 2. The cutting takes

80 place of the second portion 23 in such a manner that the first meshing or terminal coupling elements or loops 17', 18' remain undeformed. The coupling head 18a' in particular which has been transferred, in the cutting of the second portion 23 of the fused region from one stringer 12 to the other stringer 11 is fused integrally with the first

95 meshing or terminal coupling element or loop 17' on the stringer 11 so as to mechanically strengthen this element 17', which would otherwise be unstable, and further hold the same in the proper meshing position with respect to the mating first meshing or terminal

100 coupling element 18' on the stringer 12, so as to prevent "over-running" of one stringer 12 relative to the other stringer 11 when the second pin member 21 is inserted into a slider S as shown in Fig. 2. The correct intermeshing of the two opposed first coupling elements 17' and 18' thus provided ensures smooth coupling of the respective stringers 11, 12 without rupture or separation

110 of the element chains.

The pin member 20 is a slider-lock pin member 20 and includes a locking lug 24 which is formed integrally therewith at the lower-most end of the stringer 11 for locking engagement with the slider S. The locking lug 24 has a straight marginal edge 24a coextensive with the edge of the first cut-out portion 22 on the stringer 11, a curved peripheral portion 24b and a locking surface 24c extending transversely of the stringer 11 for abutting engagement with the end of one of the flanges 25, of the slider S. To provide effective locking of the locking lug 24 with the slider S, the width or transverse length e_1 of the lug 24 is calculated to be substantially equal to or slightly greater than the distance or spacing e_2 between one of the flanges 25, 25 and a diamond 26 of the slider S; more specifically between a flared flange portion

120 25' and an inclined diamond surface 26',

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defining therebetween one of the branched guide channels S' of the slider S, the arrangement being that when threading the stringer 11 through the slider S progressively from the

- 5 position of Fig. 5a, through the position of Fig. 5b to the position of Fig. 5c, the locking lug 24 undergoes slight elastic deformation in frictional contact with the flange 25 and diamond 26 of the slider S as the lug 24 is
10 moved into the slider S through rotation only in the plane of the fastener 10. The stringer 11 may be further threaded through another slider S in the manner shown in Figs. 5d and 5e in the case where the fastener 10
15 is desired to be reversibly opened and closed with use of two sliders S as is well known in the art.

- Each of the pin members 20, 21 is provided with a linear reinforcing guide portion 20', (21') formed by deformation of the heel or turn portions 17d (18d) simultaneously with the fusing of the element 15, (16), which guide portion 20', (21') facilitates the insertion of the stringer 11, (12) with least
25 frictional resistance through the slider S.

- The other pin member 21 is an inserting pin member and has a rounded inner peripheral surface 21a engageable with the diamond 26 of the slider when the stringer 12 is
30 threaded through the latter, in which position the first meshing loop 18' on the stringer 12 is brought into engagement with the first meshing loop 17' on the mating stringer 11 in the space between the loops 17' and the
35 next adjacent one of the successive loops 17.

- Designated at 27 is a reinforcing plastics film, enveloping the lower end portions of the respective stringers 11, 12 and serving to prevent fraying of the threads of sewn seams
40 19, support tapes 13, 14 and reinforcing core and at the same time to facilitate finger-gripping of the stringers 11, 12 when threading the latter through the slider S.

- Referring now to Fig. 1, the description
45 proceeds with the method of manufacture of the above-described separable slide fastener, in which a continuous length of coupled stringers or a fastener chain F is subjected to a supersonic process whereby the fastener chain F is fused, shaped and cut out over a
50 predetermined length W of successive fastener elements 15, 16. Upon thermal fusion of the rows of successive coupling elements or loops 17, 18 while in intermeshed condition, the thermoplastics material constituting the elements 17, 18 is molten and united
55 integrally with the fabric material constituting the longitudinal edge portion of each of the support tapes 13, 14 to which the loops 17, 18 are secured. The fused length or region W of the fastener chain F is shaped by means of a suitable die (not shown) so that the heel or turn portions 17d, 18d of the successive
60 loops 17, 18 are merged together and shaped into the linear reinforcing guide portions 20',
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21'. At the same time, there is formed a composite pin-forming structure 28 located centrally of the fused region W and contiguous to the shaped guide portions 20', 21'.

- 70 The structure 28 is then cut out to produce a multi-form aperture 29 having an imaginary centre point 30, relative to which the slider-lock pin member 20 and the inserting pin member 21 on one stringer 11 are oppositely
75 disposed in point-symmetry relation to similar slider-lock and inserting pin members on the other stringer 12. The multi-form aperture 29 has a pair of horizontally extending (transversely of the fastener) bay portions
80 29a, 29a disposed oppositely in point symmetry relation to each other relative to the centre point 30 and a pair of vertically extending (longitudinally of the fastener) elongated canal portions 29b, 29b defined by substantially
85 parallel marginal edge lines 31, 32 extending closely along the sewn seams 19 of the respective stringers 11, 12. The ends of the paired canal portions 29b, 29b opposite to the centre point 30 taper and then continue in
90 extended, narrow, parallel-sided portions which are curved or bent in opposite directions as at 29b', 29b', so that the two tapered end portions 29b', 29b' of the paired canal portions 29b, 29b are also oppositely
95 disposed in point symmetry relation to each other, relative to the centre point 30.

- Hence, if the left-hand bay portions 29a and upper tapered end canal portion 29b' are both imaginarily rotated through 180° about
100 an axis through point 30 normal to the plane of tapes 13, 14, that is, normal to the plane of Fig. 1, they will become respectively completely superposed upon the right-hand bay portion 29a and lower tapered end canal
105 portion 29b'.

- The fastener chain F is then severed along a line extending transversely of each of the support tapes 13, 14 in registry with the bay portions 29a, 29a thereby subdividing the
110 composite structure 28 into two identical pairs of slider-lock pin members 20 and inserting pin members 21 at the respective severed ends of the stringers 11, 12, each of the pin members 20 and 21 having the form and
115 function which has been already described in connection with Figs. 2 through 4.

Fig. 6 is illustrative of one way in which the invention may be readily applied to a so-called loop fastener.

- 120 Figs. 7 to 9 inclusive are illustrative of another embodiment of the invention which is the same except that the fastener element 15, (16) is in the form of a meandering or zig-zag structure.

- 125 Reference is directed to our co-pending Patent Application No. 7934656 (Serial No. 2032998).

CLAIMS

- 130 1. A separable slide fastener chain com-



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- 5 position of Fig. 5a, through the position of Fig. 5b to the position of Fig. 5c, the locking lug 24 undergoes slight elastic deformation in frictional contact with the flange 25 and diamond 26 of the slider S as the lug 24 is
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55 18 are secured. The fused length or region W of the fastener chain F is shaped by means of a suitable die (not shown) so that the heel or turn portions 17d, 18d of the successive loops 17, 18 are merged together and shaped
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CLAIMS

- 130 1. A separable slide fastener chain com-

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prising: a pair of oppositely disposed stringers of continuous length each having a support tape and a fastener element formed from a plastic monofilament into a continuous structure having coupling head portions and secured by stitches to a longitudinal inner edge of the respective tape, said fastener element being fused together over a predetermined length of the two coupled stringers at predetermined intervals; and a composite pin-forming structure located centrally of the fused length of the fastener element and cut to provide an aperture; characterized in that said aperture is a multi-form aperture having a pair of bay portions extending transversely of the fastener chain and oppositely disposed in point symmetry relation to each other, relative to an imaginary point in the centre of said aperture, and a pair of elongated canal portions extending longitudinally closely along the stitches; that said canal portions, at their respective end portions, are tapered and then continue in extended, narrow, parallel-sided portions which are curved or bent in opposite directions such that the two tapered end portions of said canal portions are oppositely disposed in point symmetry relation to each other, relative to the same said point; and that said composite pin-forming structure is divisible across said bay portions into two identical pairs of slider-lock pin members and inserting pin members.

2. A method of producing a separable slide fastener chain including a pair of oppositely disposed stringers of continuous length, each having a support tape and a fastener element formed from a plastic monofilament into a continuous structure having coupling head portions and secured by stitches to a longitudinal inner edge of the respective tape, which method comprises fusing a predetermined length of said fastener element integrally with said tape edge, forming a composite pin-forming structure centrally of the fused length of the fastener element, and cutting the composite pin-forming structure to provide an aperture therein; characterized in that said cutting of the composite pin-forming structure is such that said aperture is a multi-form aperture having a pair of bay portions extending transversely of the fastener chain and oppositely disposed in point symmetry relation to each other, relative to an imaginary point in the centre of the aperture, and a pair of elongated canal portions extending longitudinally closely along the stitches, said canal portions, at their respective end portions, tapering and then continuing in extended, narrow, parallel-sided portions which are curved or bent in opposite directions such that the two tapered end portions are oppositely disposed in point symmetry relation to each other, relative to the same said point, said composite pin-forming structure being divisible across the bay portions into two identical

pairs of slider-lock pin members and inserting pin members.

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