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SLIDE FASTENER STRINGER HAVING CONTINUOUS
THERMOPLASTIC MOLDED COUPLING ELEMENT STRIP

The present invention relates to slide fasteners,
and more particularly to a slide fastener stringer having
a continuous zigzag-shaped thermoplastic molded coupling
element strip attached to a stringer tape along a longi-
tudinal edge thereof.

Various slide fastener stringers are known in
which a continuous zigzag-shaped strip of thermoplastic
molded coupling elements is attached to a stringer tape
along a longitudinal edge thereof. The successive coupl-
ing elements are interconnected by a plurality of thermo-
plastic molded connecting portions alternately disposed
at opposite sides of the strip and extending one between
each adjacent pair of the coupling elements. Because of
relatively high rigidity of the thermoplastic connecting
portions, the prior art stringers are poor in flexibility.

U. S. Patent 3,328,857 discloses a continuous
zigzag-shaped thermoplastic molded coupling element
strip having thermoplastic connecting portions which are
thin or slender in order to produce an increased degree

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of flexibility. In general, slender connecting portions have only an insufficient degree of strength and hence tend to be easily broken or otherwise injured when the stringer and thus the coupling element strip is bent in an edgewise direction during the opening and closing of a slide fastener. In the strip of U.S. Patent 3,328,857, a flexible core thread is embedded in each series of the thermoplastic connecting portions through the full length of the strip, making the latter more flexible, but, on the other hand, causing each connecting portion to be in the form of a tube having a reduced thickness. Because of this small thickness of the tubular connecting portions, sufficient durability of the strip is difficult to achieve.

15 According to the present invention, there is provided a slide fastener stringer comprising: a stringer tape; a continuous zigzag-shaped thermoplastic molded coupling element strip attached to said stringer tape on and along one longitudinal edge thereof, said strip including a succession of laterally spaced coupling elements, each element having a head and a pair of first and second legs extending from said head and a pair of first and second legs extending from said head in a common direction, and two series respectively of first and second connecting portions alternately disposed at opposite sides of said strip and extending one between each adjacent pair of said coupling elements, each of said first connecting portions extending between an

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adjacent pair of said first legs, each of said second
connecting portions extending between an adjacent pair
of said second legs; and a pair of connector threads
extending transversely of said coupling elements through
5 the full length of said strip and embedded in said first
and second legs, respectively, of each said coupling
element; characterized in that said connecting portions
of said strip are solid and slenderer than said legs;
and that each of said connector threads is disposed close
10 to and extends alongside a respective one of such two
series of said first and second connecting portions.

It is possible by means of the invention to
provide a slide fastener stringer having a zigzag-shaped
thermoplastic molded coupling element strip which has
15 not only adequate flexibility but also good durability,
thus enabling smooth and sure coupling-and-uncoupling
operation of the slide fastener, at which time a row of
molded coupling elements is bent arcuately away from the
coupling elements of a companion stringer in conformity
20 with the Y-shaped guide channel of a slider.

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 pair of interengaged slide fastener stringers, each embodying the present invention;

Figure 2 is a cross-sectional view taken along
5 line II-II of Figure 1;

Figure 3 is a fragmentary perspective view of a continuous molded coupling element strip;

Figure 4 is a cross-sectional view taken along
line IV-IV of Figure 3;

10 Figure 5 illustrates the manner in which the opposed coupling element strips are bent in opposite edgewise directions as they are being coupled or uncoupled by a slider;

Figure 6 is a fragmentary side elevational view
15 of the opposed fastener stringers having been bent arcuately in a common facewise direction;

Figure 7 is a fragmentary plan view of a modified form of molded coupling element strip;

Figure 8 is a cross-sectional view taken along
20 line VIII-VIII of Figure 7;

Figure 9 is a fragmentary plan view of a modified slide fastener stringer; and

Figure 10 is a cross-sectional view taken along
line X-X of Figure 9.

25 The term "close" means either in near relation or in contact.

Figures 1 and 2 illustrate a pair of coupled slide

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fastener stringers 1,1, each comprising a stringer tape 2 and a continuous zigzag-shaped molded coupling element strip 3 attached to the tape 2 along an inner longitudinal edge thereof by sewn threads 4, the strip 3 being 5 folded on itself along its longitudinal centerline.

The coupling element strip 3 is continuously produced on a rotating die wheel (not shown) having an endless zigzag-shaped peripheral cavity receptive of heated thermoplastic synthetic resin, such as polyamid, 10 delivered from a fixed extrusion nozzle (not shown) and, before having been bent into a U-shaped cross section (Figures 2, 3 and 4), it has a continuous flat zigzag-shaped structure. The thus folded strip 3 includes a series of substantially parallel spaced coupling elements 15 5 interconnected by a plurality of first and second solid connecting portions 6,7 alternately disposed at opposite sides of the strip 3 and extending one between each adjacent pair of the coupling elements 5. Each coupling element 5 has a head 8 and a pair of first and second 20 legs 9,10 extending from the head 8 in a common direction and terminating in their respective heels 9a,10a (Figure 4). Each first connecting portion 6 extends between an adjacent pair of the first legs 9,9 and is disposed close to the heels 9a,9a thereof, and each second connecting 25 portion 7 extends between an adjacent pair of the second legs 10,10 and is disposed close to the heels 10a,10a thereof.

As best shown in Figure 2 and 4, the first and

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second connecting portions 6,7 are thinner or slenderer than the first and second legs 9,10, and are disposed on the respective inner sides of the first and second legs 9,10 to provide a recess or bay 6',7' (Figure 3) between each adjacent pair of the coupling elements 5, as viewed in an edgewise direction of the stringer 1.

A pair of first and second connector threads 11, 12 extends transversely of the successive coupling elements 5 through the full length of the strip 3 and is embedded in the first and second legs 9,10, respectively, of each coupling element 5. Each of the first and second connector threads, 11,12 is disposed close to and extends alongside a respective one of the two series of the first and second connecting portions 6,7 and is disposed close to the head (opposite to the heel 9a,10a) side thereof. As shown in Figures 2, 3 and 4, the first and second connector threads 11,12 are disposed on the respective inner sides of the first and second legs 9,10.

Partly because the connecting portions 6,7 are slenderer than the legs 9,10 and partly because the connector threads 11,12 are disposed close to and extends alongside the respective series of connecting portions 6,7, the coupling element strip 3 has not only adequate flexibility but also good durability; the solid slender connecting portions and the connector threads close thereto coact to produce such advantageous characteristics. This enables that the coupling element strip 3 is

bent arcuately away from that of a companion stringer in conformity with a respective one of a pair of flaring guide flanges 14,14 of a slider 13 when the opposed stringers 1,1 of a slide fastener are being coupled or uncoupled, as shown in Figure 5. At that time the connector threads 11,12, which are disposed close to the respective head (opposite to the respective heel 9a,10a) side of the connecting portions 6,7, serves to prevent the slender connecting portions from being excessively bent and thus from being broken or otherwise injured.

Another advantage of the fastener stringer 1 is that since the first and second slender connecting portions 6,7 are disposed on the respective inner sides of the first and second legs 9,10 to provide a bay 6',7' (Figure 3) between each adjacent pair of the coupling elements 5, the stringer 1 and thus the coupling element strip 3 can be bent arcuately in a facewise direction, as shown in Figure 6, without accidental uncoupling of the coupling elements 5 with those of a mating stringer 1. At that time, the first (upper) connecting portions 6 are bent so as to expand the upper bays 6' and, on the contrary, the second (lower) connecting portions 7 are bent so as to shrink the lower bays 7'. At the same time, the inter-coupling-element portions of the first (upper) connector thread 11 are expanded and, on the contrary, the inter-coupling-element portions of the second (lower) connector thread 12 are compressed.

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Accordingly, the connector threads facilitate expansion of the connecting portions, thus preventing the latter from being broken. The connecting portions in turn protect the connector threads from sudden undue stress, thus preventing the connector threads either from being broken or from being removed from the coupling leg portions.

With this arrangement, smooth and sure coupling-and-uncoupling of the coupling elements 5 is guaranteed for a long time.

Figures 7 and 8 illustrate a modified form of coupling element strip 15. The modified coupling element strip 15 has the same construction as the strip 3 (Figures 1-6) except that the first and second connector threads 11,12 are disposed close to the respective heel sides of the first and second connecting portions 6,7. When the strip 15 is bent arcuately away from the strip of a mating stringer during the closing or opening of a slide fastener, the inter-coupling-element portions of the connector threads 11,12 are compressed and, as a result, they become hard to prevent the individual connecting portions 6,7 from being excessively bent.

Figures 9 and 10 illustrate a modified slide fastener stringer 20 in which a modified form of coupling element strip 21 is woven into a woven stringer tape 2 along one longitudinal edge thereof in a known manner, the stringer tape 2 including a plurality of warp threads

22 (Figure 10) and a weft thread 23. Each coupling element 5 has a pair of parallel first grooves 24,24 extending transversely through the first leg 9 on an outer (upper) side thereof, and a pair of parallel second grooves 25,25 extending transversely through the second leg 10 on an outer (lower) side thereof. As better shown in Figure 10, a pair of first anchor threads 26,26 and a pair of second anchor threads 27,27 extend through the first grooves 24 and the second grooves 25, respectively, along the full length of the strip 21. A core thread 28 is disposed between the first and second legs 9,10 and extends through the full length of the strip 21. Further, an auxiliary thread 29 is disposed close to the heels 9a,10a and extends through the full length of the strip 21. In the strip 21, each connecting portion 6,7 has an inclined outer surface 6a,7a sloping down to the heel side (rightwardly). The weft thread 23 of the tape 2 has a plurality of loops 23a, each encircling one of the first and second connecting portions 6,7, the anchor threads 26,27, the core thread 28 and the auxiliary thread 29 between adjacent coupling elements 5. Each loop 23a of the weft thread 23 is open widely, perpendicularly to the general plane of the tape 2, urging the first and second anchor threads 26,27 toward one another between adjacent coupling elements 5 to hold the individual coupling elements 5 firmly in position.



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CLAIMS:-

1. A slide fastener stringer comprising:

(a) a stringer tape;

(b) a continuous zigzag-shaped thermoplastic molded coupling element strip attached to said stringer tape on and along one longitudinal edge thereof, said strip including

(1) a succession of laterally spaced coupling elements, each element having a head and a pair of first and second legs extending from said head in a common direction, and

(2) two series respectively of first and second solid connecting portions alternately disposed at opposite sides of said strip and extending one between each adjacent pair of said coupling elements, each of said first connecting portions extending between an adjacent pair of said first legs, each of said second connecting portions extending between an adjacent pair of said second legs, said connecting portions being slenderer than said legs; and

(c) a pair of connector threads extending transversely of said coupling elements through the full length of said strip and embedded in said first and second legs, respectively, of each said coupling element, each of said connector threads being disposed close to and extending



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alongside a respective one of such two series
of said first and second connecting portions.

2. A slide fastener stringer according to claim 1,
each said connector thread being disposed on the
5 respective head side of said first and second connecting
portions.

3. A slide fastener stringer according to claim 1,
each said connector thread being disposed on the
respective heel side of said first and second connecting
10 portions.

4. A slide fastener stringer according to claim 1, said first and second connecting portions being disposed on the respective inner sides of said first and second legs to thereby provide a bay between each adjacent pair of said coupling elements as viewed in an edgewise direction of said stringer tape.

5. A slide fastener stringer according to claim 1, said pair of connector threads being disposed on the respective inner sides of said first and second legs.

20 6. A slide fastener stringer according to claim 1, said first and second connecting portions being disposed close to the respective heels of said first and second legs.