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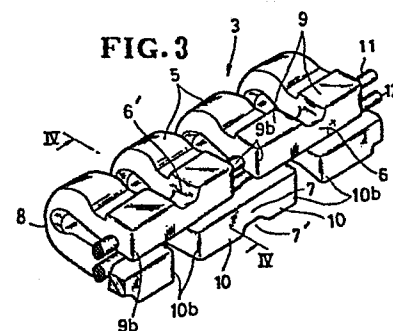
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54 Slide fastener stringer.

57 A slide fastener stringer (1) having a continuous zigzag-shaped thermoplastic molded coupling element strip (3). The strip (3) includes a succession of spaced coupling elements (5), each having a pair of first and second legs (9, 10) extending from a head (8) in a common direction. A plurality of first and second solid connecting portions (6, 7) is disposed alternately at opposite sides of the strip (3) and extends one between each adjacent pair of the coupling elements (5). The individual connecting portions (6, 7) are more slender than the coupling element legs (9, 10). The two adjacent legs (9, 9), (10, 10) interconnected by each connecting portion (6), (7) terminate in a combined broad foot with opposite corners or ends (9b, 9b), (10b, 10b) thereof substantially squared and thus not chamfered.



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SLIDE FASTENER STRINGER

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
5 a stringer tape along a longitudinal edge thereof.

Japanese Utility Model Laid-Open Publication (Jikkaisho) 58-55513 discloses a slide fastener stringer in which, as illustrated in Figures 10 and 11, a continuous zigzag-shaped strip 53 of thermoplastic
10 molded coupling elements 55 is attached to a stringer tape 52 along a longitudinal edge thereof by sewn stitches 54. The successive coupling elements 55 are interconnected by a plurality of thermoplastic molded connecting portions 56 alternately disposed at opposite
15 sides of the strip 53 and extending one between each adjacent pair of the coupling elements 55. The two adjacent legs (of adjacent coupling elements 55) interconnected by each connecting portion 56 terminate

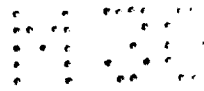
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in a combined foot which is chamfered at 56b, thus having only a small contact area engageable with the guide flange 64 of one corresponding wing 63a of the slider 63. With this limited contact area of the combined foot, the uncoupled individual coupling elements which are about to enter the Y-shaped guide channel 66 of the slider 63, would tend to easily roll or turn facewise of the fastener as the strip 33 is twisted, causing non-smooth closing operation of the slide fastener. For the same reason, the individual connecting portions 56 are less resistant to wearing, making the individual coupling elements 55 and thus the slide fastener less durable.

Further, because the individual connecting portion has a uniform thickness equal to the thickness of the adjacent coupling element leg portions and hence has relatively high rigidity, the prior stringer is poor in flexibility, also causing non-smooth coupling-and-uncoupling operation of the slide fastener.

According to the present invention, there is provided 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 thereof, said strip including



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

5 (2) a plurality 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 adjacent
10 pair of said first legs, each of said second connecting portions extending between an adjacent pair of said second legs;

(c) the two adjacent legs which are interconnected by each said connecting portion jointly
15 terminating in a combined broad foot with opposite ends thereof substantially squared; and

(d) a pair of connector threads extending transversely of said coupling elements along the entire length of said strip and embedded in said first and
20 second legs, respectively, of each said coupling element, each of said connector threads being disposed close to and extending alongside a respective one of such two series of said first and second connecting portions.

25 The invention seeks to provide a slide fastener stringer having a zigzag-shaped thermoplastic molded coupling element strip which has not only

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adequate flexibility but also good durability, thus enabling smooth and sure coupling operation of the slide fastener, at which time a row of coupling elements is bent arcuately away from the coupling
5 elements of a companion stringer in conformity with the Y-shaped guide channel of a slider without rolling of the uncoupled individual coupling elements that are about to enter the slider.

Many other advantages, features and additional
10 objects of the invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying drawings in which a preferred embodiment incorporating the principles of the invention is shown by way of illustrative exmple.

15 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 line II-II of Figure 1;

20 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;

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

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Figures 6, 7, 8 and 9 are cross-sectional views taken along lines VI-VI, XII-XII, XIII-XIII and IX-IX, respectively, of Figure 5; and

Figures 10 and 11 illustrate a prior art
5 problem.

Figures 1 and 2 illustrate a pair of coupled slide 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
10 an inner longitudinal edge thereof by sewn threads 4, the strip 3 being folded on itself along its longitudinal centerline.

The coupling element strip 3 is continuously produced on a rotating die wheel (not shown) having an
15 endless zigzag-shaped peripheral cavity receptive of heated thermoplastic synthetic resin, such as polyamid, 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
20 zigzag-shaped structure. The thus folded strip 3 includes a series of laterally spaced coupling elements 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
25 each adjacent pair of the coupling elements 5. Each coupling element 5 has a head 8 and a pair of first and second legs 9, 10 extending from the head 8 in a common

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direction and terminating in their respective feet 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 feet 9a, 9a thereof, and
5 each second connecting portion 7 extends between an adjacent pair of the second legs 10, 10 and is disposed close to the feet 10a, 10a thereof.

As best shown in Figures 2 and 4, the first and second connecting portion 6, 7 are thinner or more
10 slender 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
15 stringer 1.

A pair of first and second connector threads 11, 12 extends transversely of the successive coupling elements 5 along the entire length of the strip 3 and is embedded in the first and second legs 9, 10,
20 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, being disposed close to the side thereof which
25 faces the coupling heads 8. 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

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second legs 9, 10.

The leg 9, 10 of each coupling element 5 has a generally trapezoidal shape, as viewed in plan (Figure 3), having a width increasing progressively from the coupling head 8 toward the foot 9a, 10a. Thus the foot 9a, 10a of each leg 9, 10 has a sufficiently large contact area engageable 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. Each coupling element 5 can be prevented from turning or rolling facewise of the slide fastener stringer 1 when a thrusting force is exerted on the slide fastener in a facewise direction thereof (Figures 10 and 11), partly because of such large contact area of the foot 9a, 10a and partly because outer corners or opposite ends 9b, 9b; 10b, 10b of a combined broad foot extending between the two adjacent interconnected legs 9, 9 ; 10, 10, respectively, are not chamfered, having no sloping or round surfaces. This broad foot makes the corresponding coupling elements 5 less abrasive, guaranteeing improved durability of the coupling element strip 3 and thus of the slide fastener stringer 1.

Further, partly because the connecting portions 6, 7 are more slender than the legs 9, 10 and partly because the connector threads 11, 12 are disposed close to and extend alongside the respective series of

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connecting portions 6, 7, the coupling element strip 3 has not only adequate flexibility but also good durability; the solid slender connecting portions 6, 7 and the connecting threads 11, 12 close thereto coact to produce such advantageous characteristics. This construction enables the coupling element strip 3 to be bent arcuately away from the corresponding strip 3 of a companion stringer 1 in conformity with the curvature of the respective guide flange 14 of the slider 13 when the opposed stringers 1, 1 of the slide fastener are being coupled or uncoupled, as shown in Figures 5. At that time the connector threads 11, 12, which are disposed close to the respective sides of the connecting portions 6, 7 which sides are facing the heads 8, serve to prevent the slender connecting portions 6, 7 from being excessively bent and thus from being broken or otherwise damaged.

Another advantage of the fastener stringer 1 is that since the first and second slender connecting portion 6, 7 are disposed on the respective inner sides of the first and second legs 9, 10 to provide the bay 6', 7' (Figure 3) between each adjacent pair of the coupling elements 5, the stringer 1 and thus the coupling element 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 portion 7 are bent so as to shrink

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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. Accordingly, the connector threads 11, 12 facilitate expansion of the connecting portions 6, 7, thus preventing the latter from being broken. The connecting portions 6, 7 in turn protect the connector threads 11, 12 from sudden undue stress, thus preventing the connector threads 11, 12 either from being broken or from being removed from the coupling element legs 9, 10. With this arrangement, smooth and sure coupling-and-uncoupling of the coupling elements 5 is guaranteed for a long time.

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CLAIMS:

1. A slide fastener stringer (1) comprising:
 - (a) a stringer tape (2);
 - (b) a continuous zigzag-shaped thermoplastic molded coupling element strip (3) attached to said stringer tape (2) on and along one longitudinal edge thereof, said strip (3) including
 - (1) a succession of laterally spaced coupling elements (5), each having a head (8) and a pair of first and second legs (9, 10) extending from said head (8) in a common direction, and
 - (2) a plurality of first and second connecting portions (6, 7) alternately disposed at opposite sides of said strip (3) and extending one between each adjacent pair of said coupling elements (5), each of said first connecting portions (6) extending between an adjacent pair of said first legs (9), each of said second connecting portions (7) extending between an adjacent pair of said second legs (10);
 - (c) the two adjacent legs (9, 9), (10, 10) which are interconnected by each said connecting portion (6), (7) jointly terminating in a combined broad foot with opposite ends (9b), (10b) thereof substantially squared; and
 - (d) a pair of connector threads (11, 12) extending transversely of said coupling elements (5)

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along the entire length of said strip (3) and embedded in said first and second legs (9, 10), respectively, of each said coupling element (5), each of said connector threads (11, 12) being disposed close to and extending
5 alongside a respective one of such two series of said first and second connecting portions (6, 7).

2. A slide fastener stringer according to claim 1, said connecting portions (6, 7) being more slender than said legs (9, 10).

10 3. A slide fastener stringer according to claim 1, said first and second connector threads (11, 12) being disposed close to the respective sides of said connecting portions (6, 7) which sides are facing to said heads (8).

15 4. A slide fastener stringer according to claim 1, said first and second connecting portions (6, 7) being disposed on the respective inner sides of said first and second legs (9, 10) to thereby provide an outwardly opening bay (6', 7') between each adjacent
20 pair of said coupling elements (5) as viewed in an edgewise direction of said stringer tape (2).

5. A slide fastener stringer according to claim 1, said first and second connector threads (11, 12) being disposed on the respective inner sides of said
25 first and second legs (9, 10).

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FIG. 1

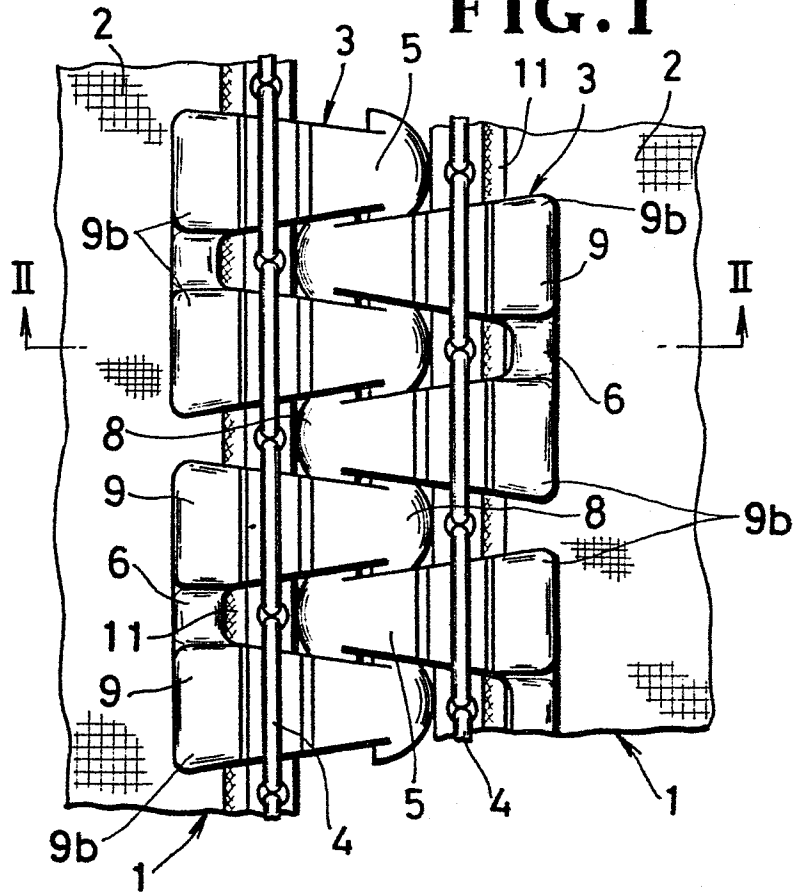
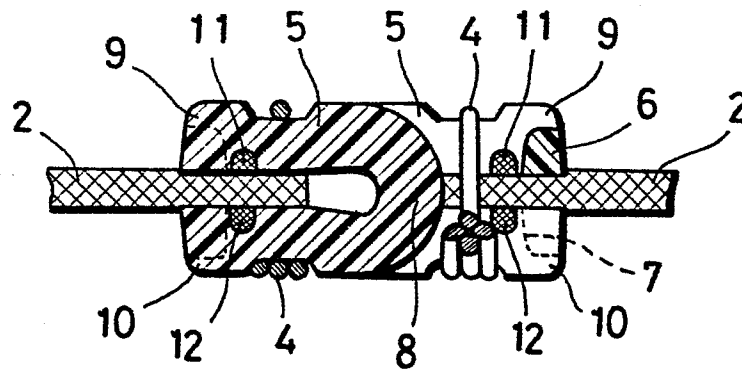


FIG. 2



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FIG. 3

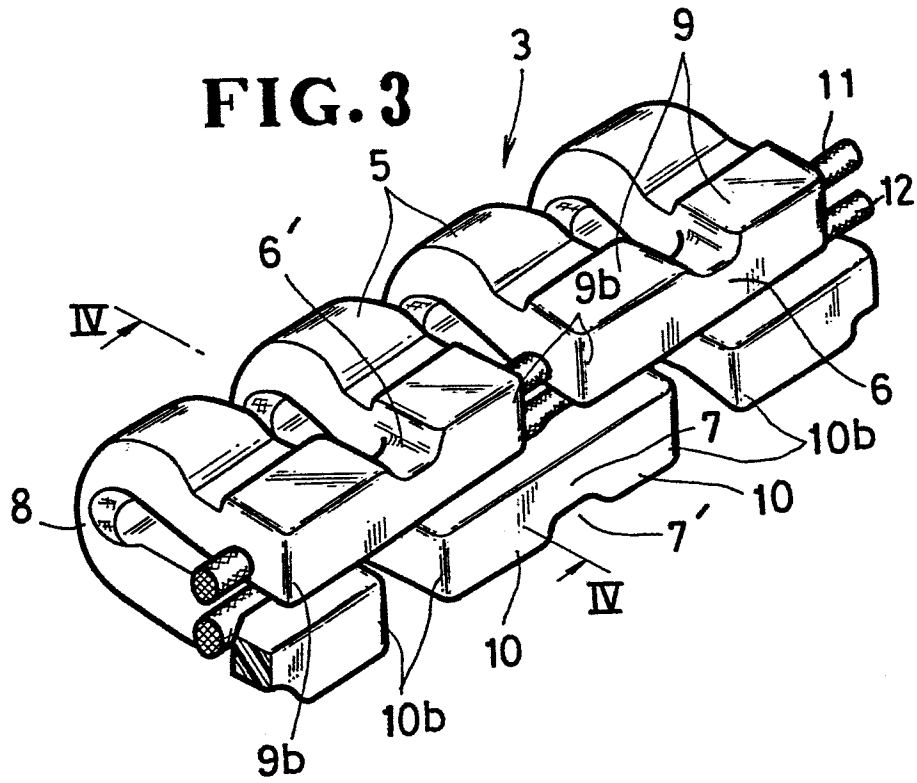
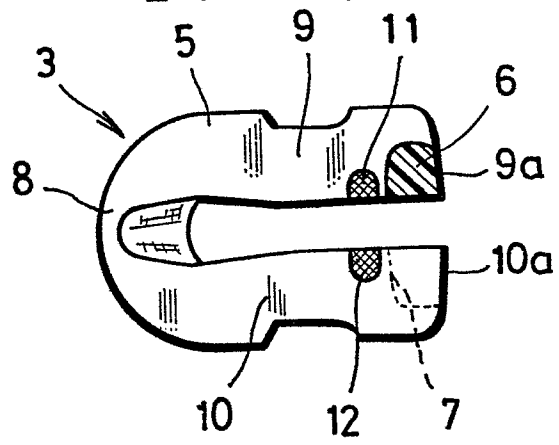


FIG. 4



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FIG. 5

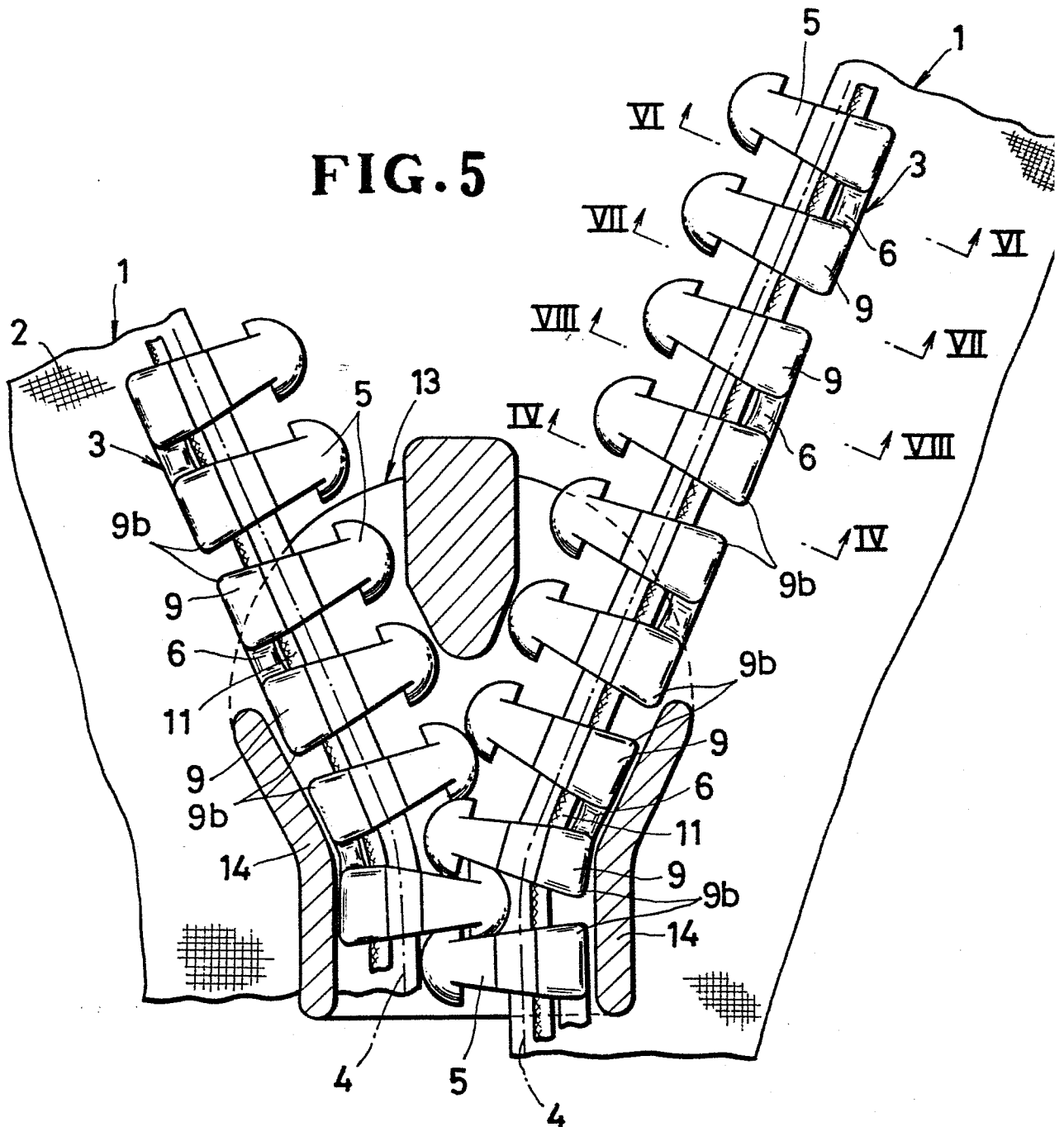


FIG. 6

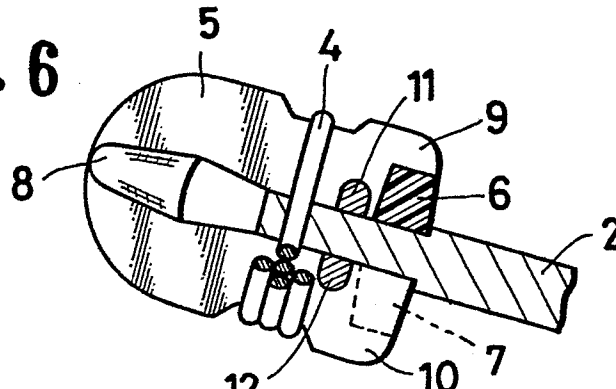


FIG. 7

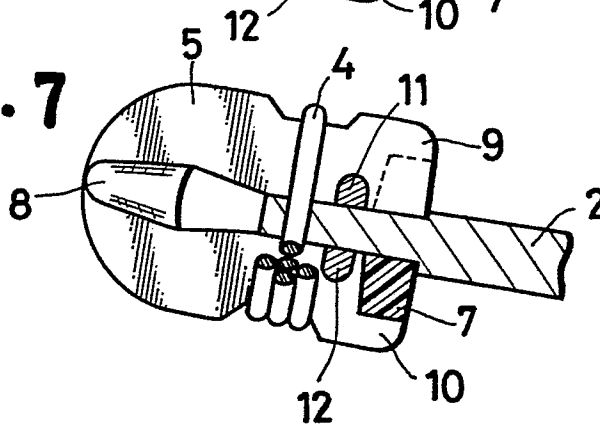


FIG. 8

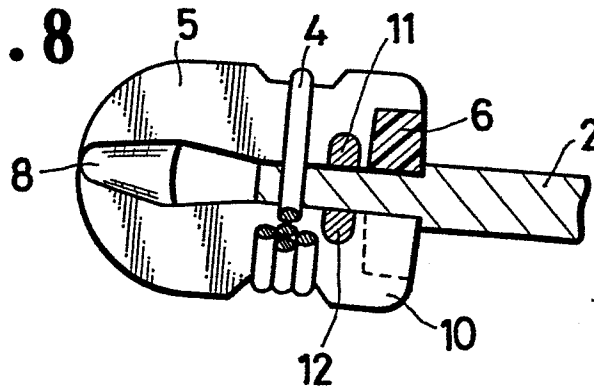


FIG. 9

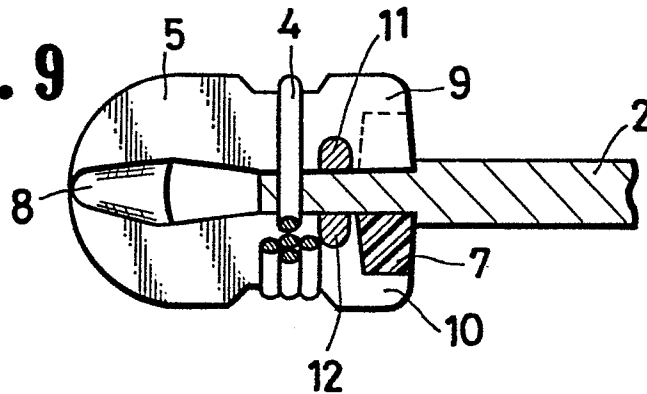


FIG. 10

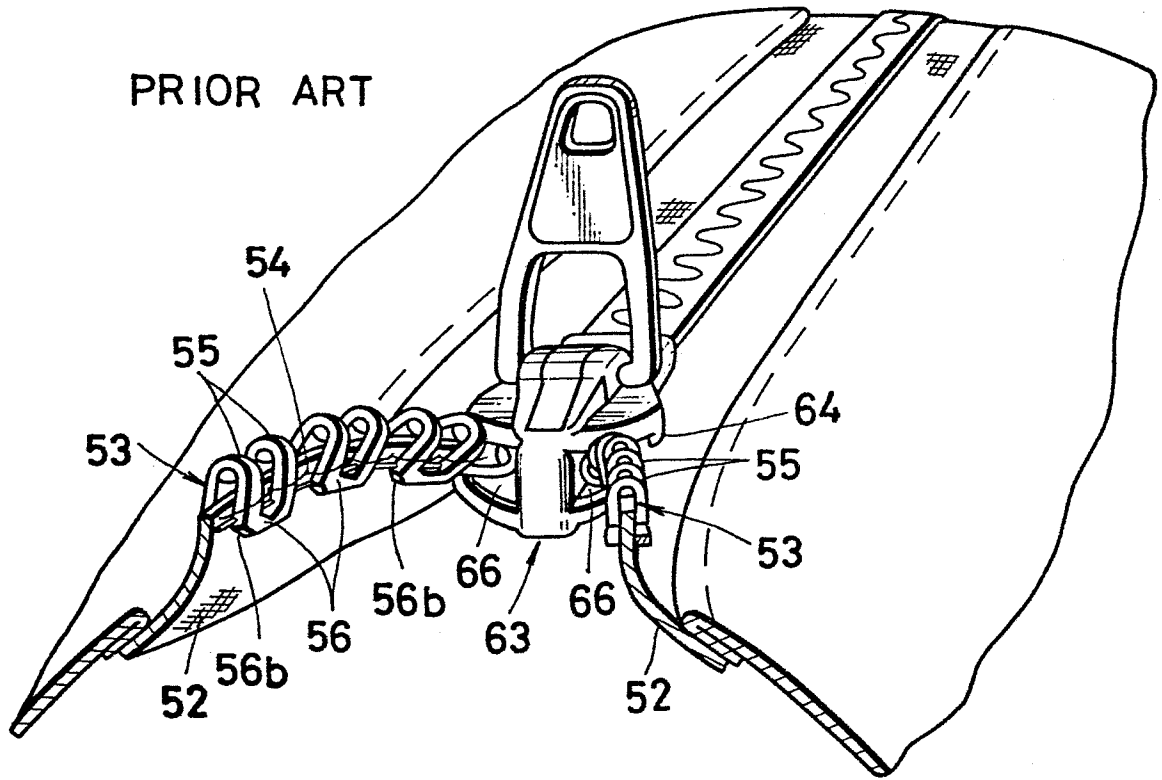


FIG. 11

PRIOR ART

