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SLIDING CLASP FASTENER

This invention relates to a sliding elasp fastener, more particularly to such a fastener which can be opened and closed in either of two reciprocal directions.

5 A variety of sliding clasp fastners or zippers are known which are equipped with a pair of sliders, providing an option for the user to manipulate either of the two sliders to open or close the fastener from either direction. Such fasteners have coupling
10 elements formed by press, injection or die-casting into a symmetrical mating structure, the element in a row on one stringer tape having a prong engageable with a groove in the corresponding element on the opposite tape. One problem posed by such form of coupling
15 elements is that while the fastener is smoothly operative with the slider moving in one or the forward direction, the operation becomes sluggish or otherwise defective when the slider is moved in the other or the reverse direction account of the prong on one stringer

getting jammed in the groove or severely striking against the front end wall of the groove on the mating stringer.

A means for coping with this problem is disclosed in Japanese Laid-Open Patent Publication 58-116946 wherein the coupling element is dented at an outer marginal edge of the groove so as to reduce interacting impact with the mating prong. However, such an element structure lacked, due to reduced contact area, an element-to-element coupling strength sufficient to withstand lateral pull or stresses applied perpendicularly to the plane of the fastener. Another difficulty was that the front end wall defining the groove is susceptible to deformation by repeated impinging contact with the corresponding prong, resulting in weakened interengagement of the fastener stringers.

According to the present invention, there is provided a sliding clasp fastener of the type having a pair of sliders for opening and closing the fastener from either of two directions, which comprises a pair of identical stringers and a series of discrete coupling elements

mounted on each of the respective stringers, said coupling elements each including, at one of its ends, leg portions defining therebetween an aperture, and at the opposite end a coupling head portion, said coupling head portion having an engaging prong and a pocket complementary in shape with the contour of said prong, said coupling head portion including an outer end wall having an outer marginal surface facing away from said leg portions and extending contiguous to said engaging prong, and a substantially flat inner surface facing away from said outer marginal surface and defining a side of said pocket, said outer marginal wall having a portion sloping downwardly away from said pocket to form a guide slope, said coupling head portion further including at least one reinforcement rib disposed on said flat inner surface and extending from an upper edge of said flat inner surface toward the bottom of said pocket.

It is believed possible by means of the present invention to provide a sliding clasp fastener which can be opened and closed from either direction by a pair of sliders and which carries coupling elements mutually engageable or disengageable with least frictional resistance even when the slider is moved along the fastener in the reverse direction.

It is further believed possible by means of the present invention to provide a sliding clasp fastener having a pair of stringers which can be coupled together with sufficient strength to withstand stresses applied in a direction parallel or perpendicular to the plane of the fastener.

The invention will be described by way of example with reference to the accompanying drawings, wherein like references refer to like parts unless stated otherwise, and wherein:-

Figure 1 is perspective view of one of a

series of discrete coupling elements of a fastener embodying the invention;

Figure 2 is a longitudinal cross-sectional view of a coupling head portion of the element of Figure 1;

5 Figure 3 is a perspective view of a modified form of a coupling element of a fastener embodying the invention;

Figure 4 is a perspective view of another modified form of coupling element of a fastener embodying the invention;

10 Figure 5 is a longitudinal cross-sectional view of a portion of the same;

Figure 6 is a plan view of a sliding clasp fastener embodying the invention and a pair of sliders;

15 Figure 7 is a schematic cross-sectional view on enlarged scale of adjacent coupling elements, showing the same in coupling condition within the interior of reversely operated slider;

20 Figure 8 is a transverse cross-sectional view of a sliding clasp fastener shown under the influence of stresses applied upwardly in a direction perpendicular to the plane of the fastener;

Figure 9 is a cross-sectional view of a coupling head portion shown in the condition of Figure 8;

25 Figure 10 is a cross-sectional view of a punch and die apparatus employed to form the coupling element of Figure 1; and

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Figure 11 is a perspective view of the punch of Figure 10.

Referring now to the drawings and Figures 1 and 2 in particular, there is shown an individual coupling element 10 in a series of discrete formation embodying the present invention. The coupling element 10 is generally rectangular in shape and has at one of its ends opposed leg portions 11, 11' defining therebetween a substantially oblong aperture 12 for receiving, as is well known, a beaded edge of a stringer tape as shown in Figure 8. At the opposite end of the coupling element 10 is formed a coupling head portion 13 which includes an engaging prong 14 and a receiving pocket 15 complementary in shape with the contour of the prong 14 as better shown in Figure 2. The pocket 15 is defined by an outer end wall 16, an inner end wall 17, side walls 18, 18' and a bottom wall 19, the bottom wall 19 being contiguous with the engaging prong 14. The outer end wall 16 has an outer marginal surface tilted away from the pocket opening to form a guide slope 20 substantially coextensive with the width of the wall 16 for purposes to be hereafter described. The inner surface of the outer end wall 16 is substantially flat, faces away from the outer marginal surface, and defines

a side of the pocket 15. There is formed a rib 21 integral with and projecting from the inner surface of the outer end wall 16 and having a thickness increasing progressively toward the bottom wall 19 of the pocket 15, the rib 21 serving to provide reinforcement of the element 10 as hereafter described.

Figure 3 shows a modified form of coupling element 10 which is substantially the same in construction as that of Figure 1 and 2 except that there are provided two laterally spaced ribs 21.

5 The coupling elements 10 shown in Figures 1, 2 and 3 may be most conveniently and suitably formed by press or die-cast. The coupling element 10 of Figure 1 in particular may be made by an apparatus shown in Figure 10 which comprises a stationary die 22 and a
10 movable punch 23. A starting material of continuous length not shown may be provided at predetermined intervals with the guide slopes 20 conveniently at the stage of punching out or cutting into individual element blocks. This block 10' is placed on the die 22
15 and worked by the punch 23 as shown in Figure 10 whereby the coupling head portion 13 is produced with the prong 4 formed with the material that has moved from the pocket 15, and at the same time with the rib 21 formed by a complementary recess 24 in the punch 23.
20 The presence of the recess 24 is important as it serves to retain the desired dimensions of the guide slope 20, and were it not for such a recess, the slope 20 would be reduced in size or otherwise deformed as a result of the movement of the material from the pocket 15.

25 Figures 4 and 5 show another modification of coupling element 10 which may be formed by injection or die-casting and which is substantially the same as that

of Figure 1 except that there is a laterally elongated rib 21 which is formed along the inner upper marginal edge of the outer end wall 16.

Referring to Figure 6, there is shown a complete sliding clasp fastener F which comprises a pair of identical stringers F_1 and F_2 each carrying along their longitudinal beaded edges a series of discrete coupling elements 10 of the construction above described and a pair of sliders S_1 and S_2 respectively positioned at the opposite ends of the fastener. The upper slider S_1 opens and closes the fastener F in the forward direction. The lower slider S_2 is the one which opens and closes the fastener F in the reverse direction, in which instance the coupling elements 10 embodying the invention function as desired. The behavior of adjacent coupling elements 10 on the opposed stringers F_1 and F_2 within the interior of the slider S_2 moving to close the fastener F is illustrated in Figure 7, in which the engaging prong 14 of the element 10 on one stringer F_1 moves around and in sliding contact with the outer surface of the outer end wall 16 of neighboring element 10 in the opposite mating stringer F_2 and slips into the pocket 15 in the latter element. This coupling operation of adjacent elements 10 is facilitated by the provision of the guide slope 20 which permits movement of the prong 14 therealong into the pocket 4 with minimum frictional resistance.

The provision of the rib 21 is another feature of the invention in that it serves to reinforce the outer end wall 16 of the element 10 which has been somewhat weakened as a result of forming the guide slope 20 at the outer surface of the outer end wall 16.

The rib 21 provides sufficient reinforcement to retain the elements 10 stably in interengaged position against stresses applied vertically upwardly in the direct as shown in Figures 8 and 9, or lateral pull tending to spread apart the fastener stringers.

In saying that the surface 20 is tilted away from the pocket opening, it is meant that, given that the pocket opening is at the top of the element (remote from the prong 14) as shown for example in Figs. 1 to 5, the surface 20 - at the outer end of the element - slopes towards the outside (away from where leg portions 11, 11' are) in an upward direction as seen in those Figures.

It will be seen that surface 20 extends from the top of the element (as seen in Figs. 1 to 5) less far down than the pocket 15 itself, meeting a substantially vertical surface 25 (Figs. 2 and 5) which extends down to where the prong 14 is, the prong 14 having a front surface 26 which is generally convexly curved so as to be tilted variably, away from the tip of the prong 14. That is to say, surface 26 is more and more downwardly tilted in a downward direction as seen in Figs. 1 to 5.



CLAIMS

1. A sliding clasp fastener of the type having a pair of sliders for opening and closing the fastener from either of two directions, which comprises a pair of identical stringers and a series of discrete coupling elements mounted on each of the respective stringers, said coupling elements each including, at one of its ends, leg portions defining therebetween an aperture, and at the opposite end a coupling head portion, said coupling head portion having an engaging prong and a pocket complementary in shape with the contour of said prong, said coupling head portion including an outer end wall having an outer marginal surface facing away from said leg portions and extending contiguous to said engaging prong, and a substantially flat inner surface facing away from said outer marginal surface and defining a side of said pocket, said outer marginal wall having a portion sloping downwardly away from said pocket to form a guide slope, said coupling head portion further including at least one reinforcement rib disposed on said flat inner surface and extending from an upper edge of said flat inner surface toward the bottom of said pocket.



2. A sliding clasp fastener according to claim 1, said guide slope substantially coextending with the width of said outer end wall.
3. A sliding clasp fastener according to claims 1 or 2, the or each said rib having a thickness increasing progressively toward the bottom of said pocket.
4. A sliding clasp fastener according to claims 1, 2 or 3, the or each said rib terminating far short of the bottom of said pocket.
5. A sliding clasp fastener according to claims 1, 2 or 3, the or each said rib extending over the entire depth of said pocket.
6. A sliding clasp fastener according to any preceding claims, including two said ribs spaced laterally from one another.
7. A sliding clasp fastener substantially as described with reference to and as illustrated in Figures 1 and 2 of the accompanying drawings.
8. A sliding clasp fastener substantially as described



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with reference to and as illustrated in Figures 1 and 2 modified as in Figure 3 of the accompanying drawings.

9. A sliding clasp fastener substantially as described with reference to and as illustrated in Figures 1 and 2 modified as in Figures 4 and 5 of the accompanying drawings.

10. A sliding clasp fastener substantially as described with reference to and as illustrated in Figure 6 of the accompanying drawings.
