United States Patent [19]

Schwendt

[11] **3,922,761**

[45] **Dec. 2, 1975**

[54] **SEPARABLE SLIDE-FASTENER STRINGER**

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[22] Filed: **Aug. 31, 1973**

[21] Appl. No.: **393,580**

[30] **Foreign Application Priority Data**

Sept. 1, 1972 Germany 2242978

[52] **U.S. Cl.** ..... **24/205.11 F**; 24/205.2

[51] **Int. Cl.** **A44b 19/36**

[58] **Field of Search** ..... 24/205.11 F

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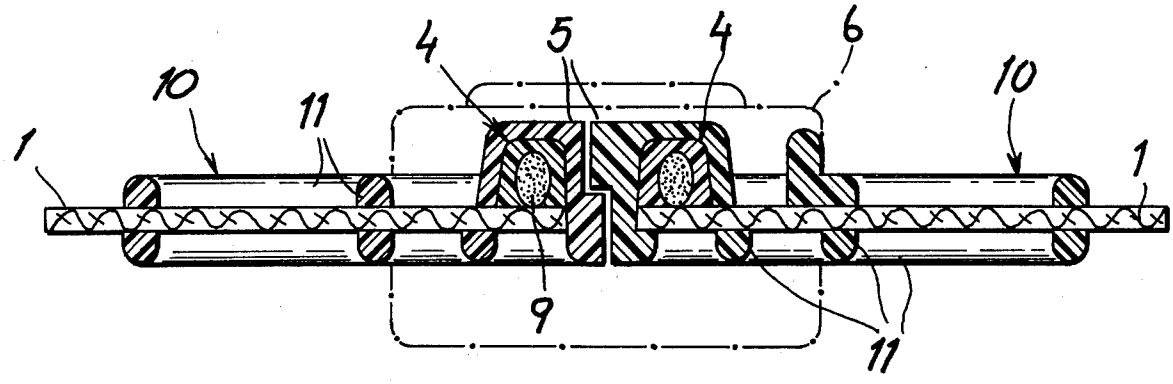
Attorney, Agent, or Firm—Karl F. Ross; Herbert Dubno

[57] **ABSTRACT**

A separable slide fastener consists of a stringer whose tapes are each provided with a continuous thermoplastic synthetic-resin monofilament coupling element engageable upon moving of a slider along the coupling elements and disposed so that, at least at one end, the coupling elements may be brought together to enable the two stringer halves to be interengaged. At this end, the coupling elements are fused into a reinforcing bead which extends along the edge of the tape and is encased, in turn, in one of the two mutually engageable separable connecting members which are injection molded onto the tape on both sides thereof.

5 Claims, 9 Drawing Figures



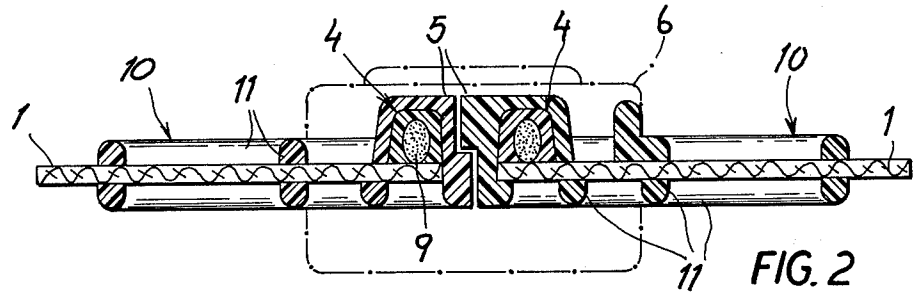


FIG. 2

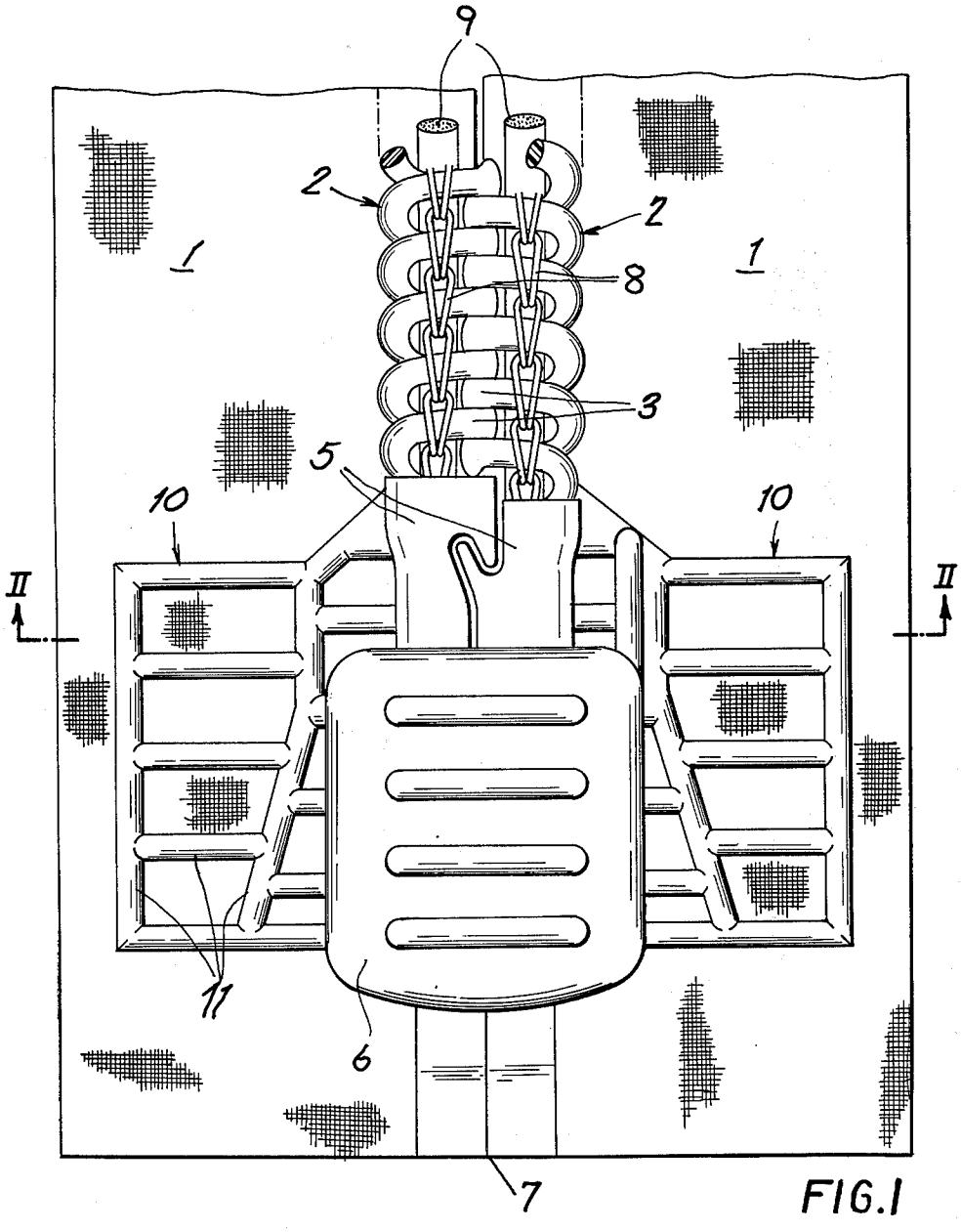


FIG. 1

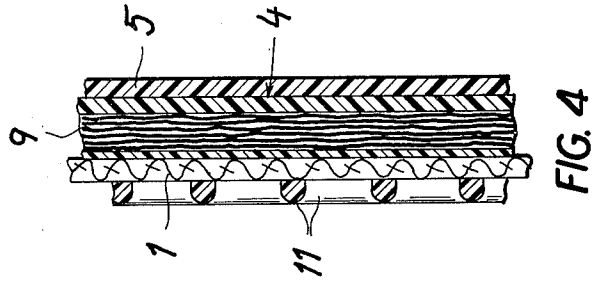
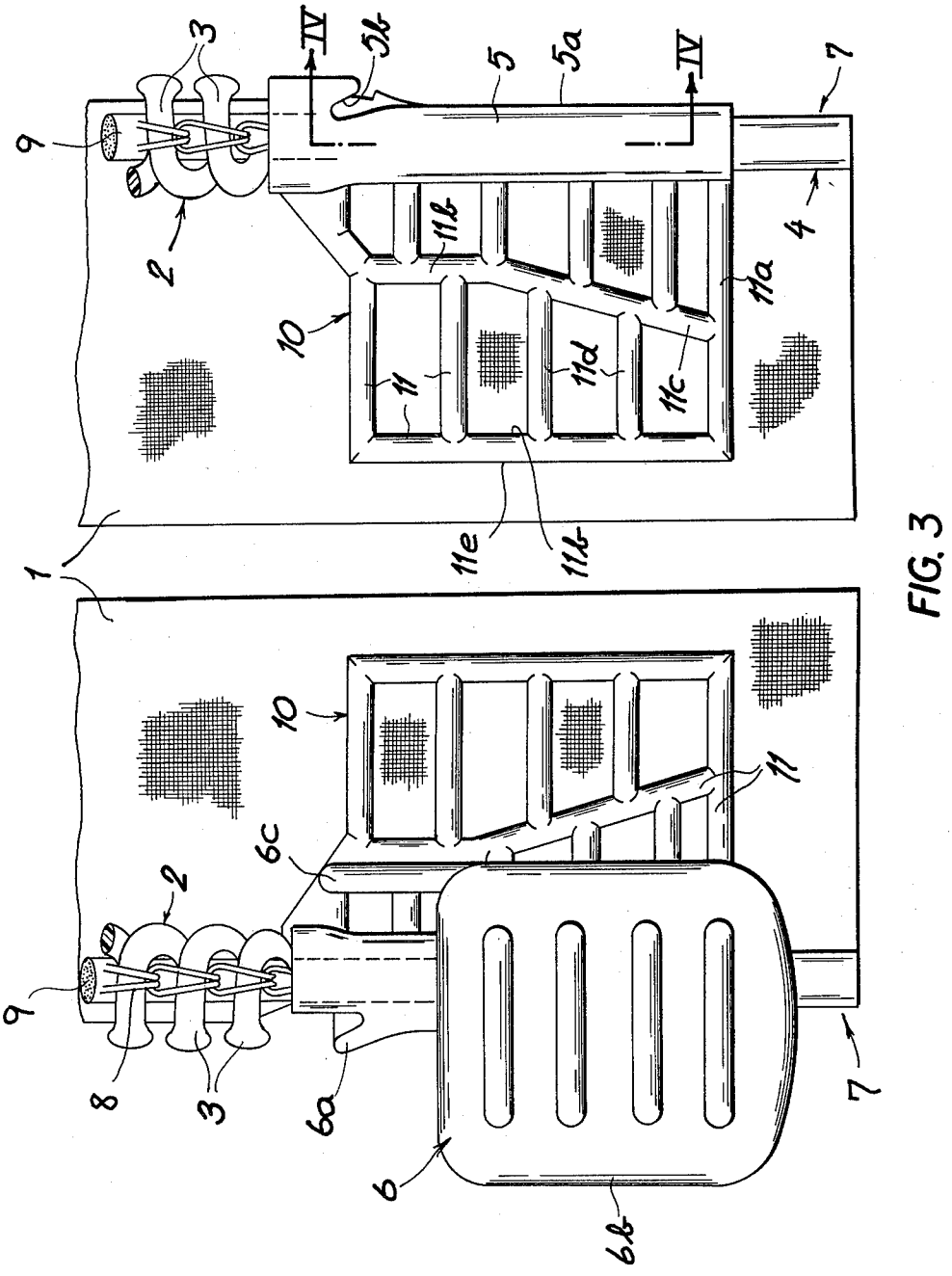

5
4
9
1
11

FIG. 4


IV
3b
5
5a
IV
7
3
9
2
4
11b
11a
10
11
11d
11c
11e
11b
1
10
11
6c
2
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8
3
6a
6
6b
7

FIG. 3

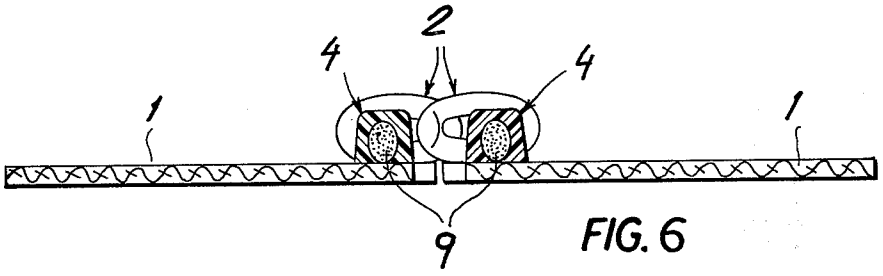


FIG. 6

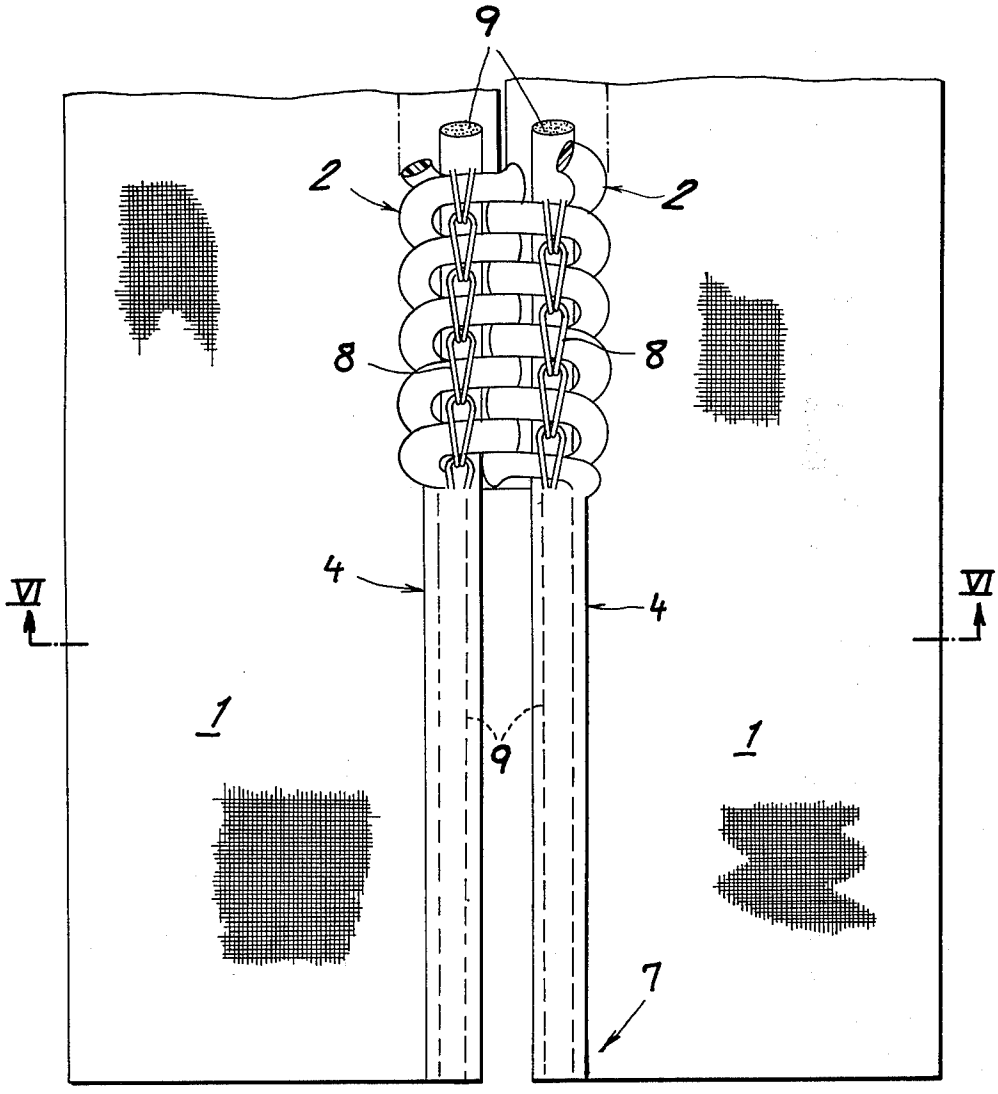


FIG. 5

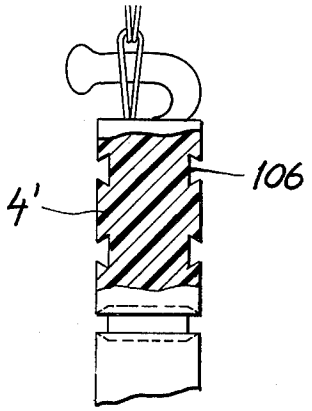
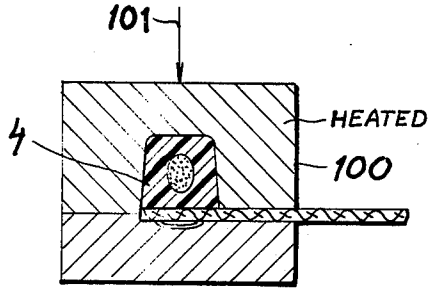


FIG. 7

FIG. 8



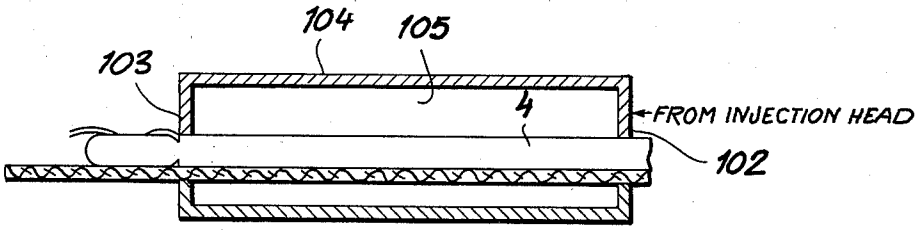


FIG. 9

SEPARABLE SLIDE-FASTENER STRINGER

FIELD OF THE INVENTION

The present invention relates to separable slide fasteners of the type in which a pair of stringer halves have continuous coupling elements formed along juxtaposable edges and, at least at one end, are mutually engageable or can otherwise be brought together to enable a slider to move along the coupling elements to bring them into interdigitating or connected relationship. The invention also relates to an improved connecting structure for this end of the slide-fastener stringer and to a method of making same.

BACKGROUND OF THE INVENTION

Separable slider fasteners may be provided for a variety of purposes, e.g. on jackets, sweaters and like garments which must be opened fully in the region bridged by the slide fastener, for fabric assemblies having two parts designed to be separated widely from one another or interchangeably engaged with one another, and elsewhere in which the opening spanned by the slide fastener is not to be restricted to a slit defined at its ends by a pair of so-called end stop members bridging the two coupling elements or tapes permanently.

Separable slide fasteners of this type generally comprise a pair of stringer halves, each of which is formed with a support tape having a continuous coupling element mounted along an edge thereof and provided at one end with a stop member to prevent the slider from shifting beyond the coupling element when the slider is moved toward this end. At its other end, the coupling element terminates at a structure which is matingly engageable with a complementary connector of the other coupling element but may be drawn away from the latter so that, when the coupling members are brought together, a slider may be shifted along the coupling elements to cause the latter to interdigitate.

Generally one of the connecting members is a male or plug-like body which is inserted longitudinally into the slider and also into a socket or channel or other formation on the other or female connecting member.

The coupling element may be synthetic-resin monofilaments stitched directly onto a fabric tape or secured to the latter by a filler cord through which the stiches pass.

It has been proposed heretofore, with thermoplastic coupling elements of the helical coil or meander type, to fuse the turns of the coupling element into the connecting members at the separable end of the slide fastener, thereby forming a unitary junction between the connecting members and the coupling elements.

This has proved to be unsatisfactory in many cases because of the lack of stability of the connecting members. Systems in which clamped connecting members of the plug-and-socket type are used, the separation of the coupling elements from the connecting members has proved to be a problem.

In general, the connecting members and coupling elements did not and could not form a unitary structure capable of withstanding the significant stresses developed in slide fasteners of the separable type.

This has especially been the case with so-called fine slide fasteners in which the synthetic-resin monofilaments may have a thickness of only 0.5 mm. Because of the stresses to which the slider fastener may be subjected, the coupling element may tear away from the

separable connecting members or break off at the latter. Moreover, the transition between the connecting members of the coupling elements of synthetic resin monofilament is often a problem, especially where the connecting members are simply clamped onto the coupling elements or to the tapes and may be readily released. A problem arises in this instance such that the slider is not stable for insertion of the connecting members into engagement with one another.

OBJECT OF THE INVENTION

It is the principal object of the present invention to provide an improved slide-fastener stringer arrangement wherein the aforementioned disadvantages are obviated and an effective junction can be made between the separable connecting member and the remainder of the slide-fastener stringer.

Yet another object of the invention is to provide a separable connecting arrangement for a slide-fastener stringer which is simpler to make and of greater structural integrity than earlier systems for the same purpose.

SUMMARY OF THE INVENTION

These objects and others which will become apparent hereinafter are attained, in accordance with the present invention, with a separable slide fastener which comprises a slide-fastener stringer for a pair of fabric tapes, respective coupling elements stitched to the textile tapes along juxtaposed edges thereof, and a slider shiftable along the coupling element for selectively engaging or disengaging them to close or open the slider fasteners respectively.

According to the present invention, each of the coupling elements is extended into a securing bar or fastening member at one end and the fastening member or bar runs along and continues the coupling element at this latter end while serving as an anchorage for a respective connecting member which is injection molded along opposite sides of the tape and encompasses the respective fastening member. The connecting members are preferably of the plug-and-socket or male-and-female type designed to be engageable to bring together the corresponding ends of the slide-fastener halves and enable movement of the slider to join them together. The fastening or securing members or bars probably are fused directly from the thermoplastic material of the coupling elements which they extend and are fully encased, at least between extremities of the bar, in the separable connecting member.

According to an important feature of the present invention, each of the coupling elements is a helix or meander of a thermoplastic synthetic-resin monofilament, e.g. a polyamide or a polyester having a thickness of 0.5 mm or less and is anchored to the respective support tape by stitches passing between the coupling heads of the coil or meander which may interdigitate with the complementary juxtaposed coupling element. The fastening members thus may be bars, beads or rods molded from the material of the thermoplastic coupling elements and in turn encased in the structural elements of the separable connecting structure when the latter are injection molded onto the tape overlying and underlying the latter. A filler cord extnds through the coil and/or may be provided therealong and serves to assist in anchoring the coil to the support tape. When the fastening bar or rod is formed by fusing or melting down and molding of the end of the coupling elements, it may

serve as a core for the injection-molded members to reinforce the latter and provide a transitional connection between the coupling elements and these separable members. To this end, at least a turn of the coupling element proximal to the fastening member or bar is fused directly to or terminates within, the synthetic-resin material forming the separable member.

The term "separable connecting members" has been used herein to describe the male and female members which are applied to the fastening rod or bar by injection molding and these members may be referred to as male-and-female and as plug-and-socket members as is convenient.

The invention thus resides in the fact that the coupling elements or shanks of coupling heads lie along longitudinal edges of the support tape and are molded at one end into respective fastening bars or rods about which the structural elements of the separating device are injection molded from thermoplastic synthetic-resin material so that the bars are surrounded above and below although at least an end of each fastening bar or members is left unecapsulated. The end of the coupling element and those at last coupling heads or turn at the end of the coupling elements turned toward the fastening member are melted into the fastening or securing bars.

When the textile filler cord is attached to the fabric tape by the stitches which penetrate the tape and pass over the shanks of the coupling heads of the synthetic-resin monofilament coupling element over the entire length of the tape and, at one end thereof a number of turns of the coupling element are fused thermally around the filler cord to form the securing bead or bar as described, the stitching threads are likewise embedded in the synthetic resin and the bar remains anchored most securely to the tape, being reinforced by the threads and filler cord.

The threads may, of course, also be formed from thermally fusible monofilament which merges with the thermosplastic of the coupling elements in the formation of the securing bars.

When the separable connectors are then injection molded onto the tape around at least a portion of each of the securing bars or beads, thereby encapsulating same over a portion of the length of each bar or bead, there results an intimate engagement of the connectors with the stringer via the bars into which the anchoring stitches and filler cords are integrated and which are monolithic with the remainder of the repective coupling elements at least at the last coupling head or turn.

The injection-molding step poses no difficulty since the securing bars are simply inserted into the corresponding molds and are sealingly engaged thereby at least along the longitudinal axis of the coupling elements. By this it is meant that the mold closes sealingly around the securing bar which, because of its substantially rectilinear shape and uniform cross-section, can be sealingly engaged by the mold without difficulties of the type which have been encountered when attempts have been made to mold separable connectors directly onto multiturn coupling heads of a coupling element.

The injection-molding connector parts are so shaped as to have web portions or the like extending outwardly from the respective bars and intimately bonded to the tapes, preferably on both sides thereof, thereby providing readily manipulatable members enabling engagement of the connectors by sliding one relative to the other in the longitudinal direction.

Preferably the webs are formed with or by networks of ribs for greater stability and non slip engagement by the fingers of the user.

The securing bars or beads may be provided with formations, e.g. reentrant portions or recesses receiving the plastic of the injection-molded members to the bars or beads around which they are injection molded.

In summary the advantages of the system described include an intimate anchoring and formation of the separable connectors simultaneously on the stringer from thermoplastic material in a single injection molding step with effective connection to the coupling element through the securing bars or beads. The latter permit an especially effective attachment of the connectors of a separable assembly and even enable the thermoplastic of the coupling element to blend into or fuse monolithically with the thermoplastic of the connectors on molding thereof.

Since the bars can serve as seals for the ends of the injection-molding cavity, injection pressures of 1,000 to 1,300 atmospheres gauge can be developed without difficulty. This provides the full advantage of an especially intimate bond of the high-pressure molded parts with the bars of the tape itself. Furthermore, the connectors can be molded from synthetic-resin materials which require such pressures and thereby can have especially high structural strength.

Of course, where the filler cord consists in whole or in part of a thermoplastic, it too may merge or blend with the thermoplastic synthetic resin of the coupling element in the formation of the bar and can constitute part of the monolith.

DESCRIPTION OF THE DRAWING

The above and other objects, features and advantages of the present invention will become readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a plan view of a portion of a completed slide fastener stringer, illustrating only the separable-connector end;

FIG. 2 is a cross-sectional view taken along the line II—II of FIG. 1;

FIG. 3 is a view similar to FIG. 1 showing the two halves of the slider fastener prior to connection but subsequent to the injection molding of the separable connectors and mounting of the slider not shown;

FIG. 4 is a cross-sectional view taken along the line IV—IV of FIG. 3;

FIG. 5 is a view of the portion of the stringer shown in FIG. 1 prior to injection molding of the separable connectors but after the securing bars or beads have been formed;

FIG. 6 is a cross-sectional view taken along the line VI—VI of FIG. 5;

FIG. 7 is a detail view of a portion of a securing bar or bead according to another embodiment of the invention and partly broken away;

FIG. 8 is a cross-sectional view illustrating the formation of the bar or bead; and

FIG. 9 is a diagram showing the engagement of a mold member with the bead in the injection molding of the separable connectors.

SPECIFIC DESCRIPTION

In the drawing, I show a slide-fastener stringer which comprises a pair of textile support tapes 1 carrying respective coupling elements 2 in the form of synthetic-

resin thermoplastic monofilament having a diameter of about 0.5 mm. In the embodiment shown, the coupling elements **2** are of the helical-coil type and are provided with thermally deformed coupling heads **3** adapted to engage behind the coupling heads of the opposite coupling element and between the turns thereof.

At one end of each coupling element there is formed by fushion of the coupling elements a securing bar or bead **4** extending parallel to the edge of the tape **1** and of generally rectilinear shape and uniform cross-section over its entire length (see FIG. **5**).

To the securing bar or bead **4** are applied a plug connector **5** and a socket connector **6** of a separable connector arrangement. The socket connector is partly shown in dot-dash lines in FIG. **2** because it lies behind the section line II—II in FIG. **1.**

The connector element **5** and **6** of the separable connectors are injection molded from thermoplastic synthetic-resin and engage the securing bars or beads **4** from above and below but, on both parts, leave the securing beads or bars **4** free beyond the connector member as represented at **7.**

As the enlarged illustration of FIG. **1** demonstrates, the ends of the coupling elements are melted into the bars **4** which may be formed as shown in FIG. **8** by engaging the coupling elements with a heated die **100** and applying pressure in the direction of arrow **101.** The stitches **8,** which pass over the shank of the coupling element and penetrate through the filler cord **9** and the fabric **1,** in this region are likewise embedded in the thermoplastic forming the bars which surrounds the filler cord **9.** Elements **9** and **8** thus constitute reinforcements for the securing bars or beads whereby the latter are firmly anchored to the tape and form unitary structures along the edges of the latter.

The separable connectors **5** and **6** are then injection molded around at least the exposed portions of the bars and are so shaped that they have laterally extending webs **10** constituted by individual ribs which project laterally from the coupling elements and preferably run to the end of the tapes or extend from the last at least through a distance along the bars **4** and tape sufficient to stabilize the tape against deflection when the connectors are joined.

As can be seen from FIG. **9,** the bars **4** are sealingly engaged by the walls **102** and **103** of the injection mold **104** which forms the cavity **105** whereby the connectors **5** and **6** are produced. The mold is charged from a conventional injection-molding head at high pressure. It will be apparent that the seal between the mold and the bar **4** permits especially high molding pressure to be used. In FIG. **7,** I have shown an arrangement in which the bar **4'** is provided with recesses **106** (formation) inot which the injection molded material of members **5** and **6** can penetrate to increase the density with which the connectors **5** and **6** are anchored to the bars **4.**

Reverting to FIG. **3,** it will be apparent that the male or plug connector **5** comprises a limb **5***a* of uniform cross-section around the bar **4** and merging laterally into its web **10.** The web comprises a plurality of ribs **11***a* projecting in the transverse direction and bridged by a longitudinal rib **11***b* running into an inclined rib **11***a* at the end of a memeber **5** remote from the coupling element **2.** From the ribs **11***b* and **11***c*, further lateral ribs **11***d* extend and terminate in a rib **11***e* parallel to the longitudinal axis of the securing bar or bead **4.** The ribs define windows **11***f* through which the fabric is exposed.

At its end proximal to the coupling element, the plug formation **5***a* is provided with a recess **5***b* engageable by a spur **6***a* of the socket member **6.** The latter is formed with ribs equivalent to those described for the plug member and, in addition, has a box-like socket formation **6***b* molded unitarily with its web **10** and with a rib **6***c* serving as a guide and positioning element for the slider, not shown.

I claim:

1. A separable slide-fastener stringer comprises a pair of textile tapes, synthetic-resin monofilament coupling elements disposed along respective edges of said tapes and interdigitating upon movement of a slider therealong, respective straight securing bars of thermoplastic material monolithically merging with said coupling elements along edges of said tapes at one end of said stringer and anchored to said tapes while running to said end of the tapes, said bars being of substantially constant thickness, and respective matingly engageable and disengageable connectors in addition to said bars molded onto each of said tapes ahead of said ends and on opposite sides thereof substantially all around portions of the respective securing bars while leaving the respective securing bar free over a portion of the length thereof beyond the respective connector and up to the ends of the tapes, said bars being melted into and monolithically unitary with the respective coupling elements, said bars being adapted to sealingly engage the mold during molding of said connectors.

2. The stringer defined in claim **1,** further comprising a textile filler cord extending along each of said coupling elements and embedded in the respective securing bar.

3. The stringer defined in claim **1,** further comprising rows of stitching extending through each coupling element and embedded in the securing bar thereof.

4. The stringer defined in claim **1** wherein one of said connectors is formed as a plug and the other of said connectors is formed as a socket, both said connectors being provided with lateral webs bonded to the respective tape and extending away from the respective tape edge, each web being constituted of a respective network of individual ribs.

5. The stringer defined in claim **1** wherein said securing bars are provided with formations for anchoring said connectors thereto.

* * * * *