

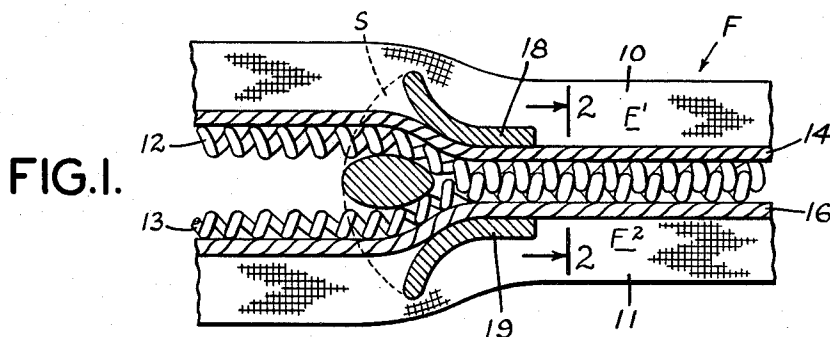
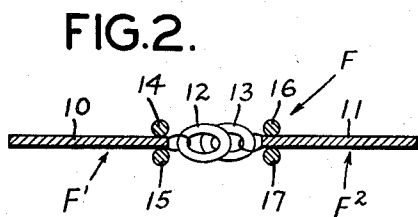
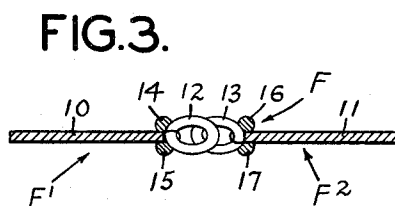
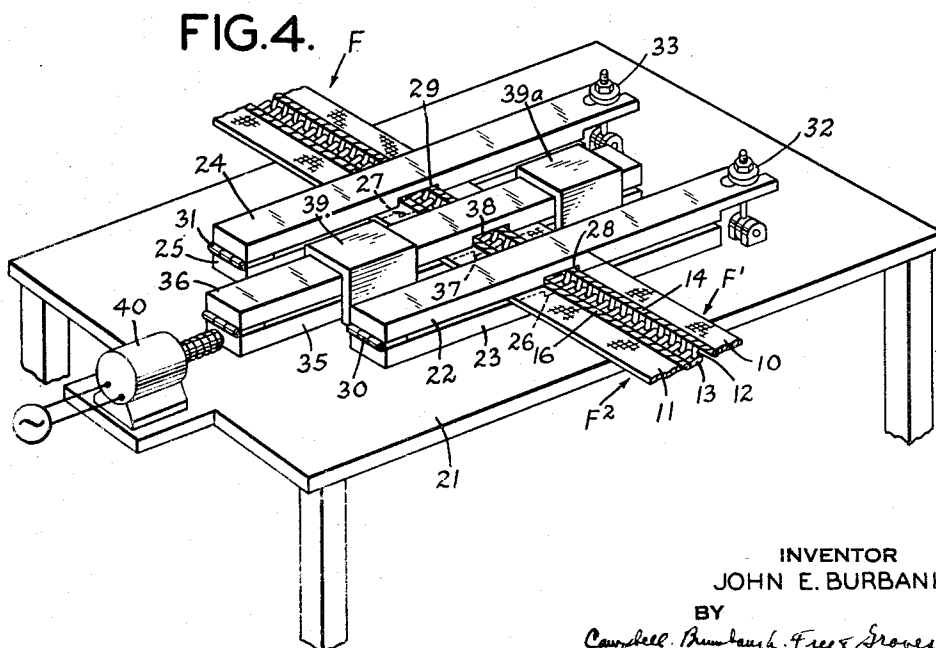
June 28, 1960

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TEXTILE PROCESSING

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 5.

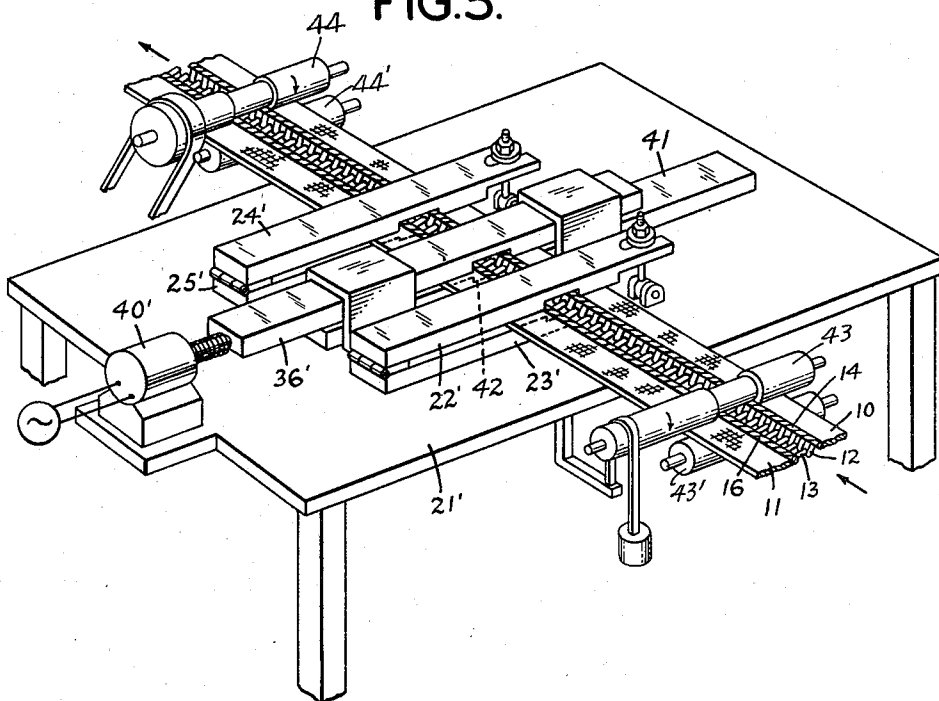
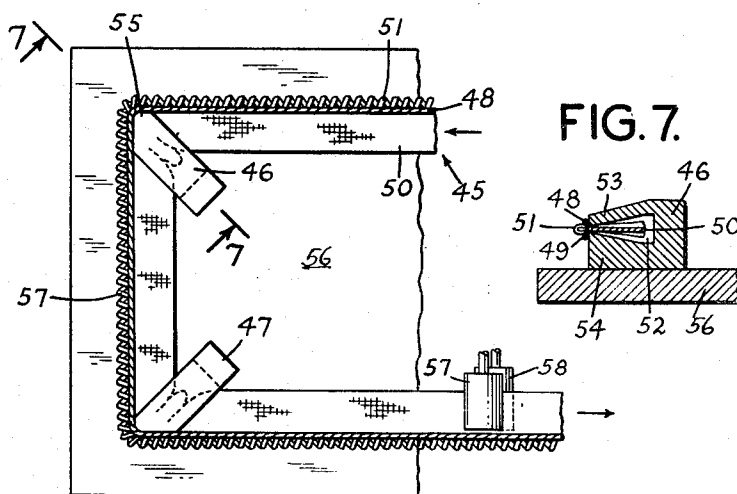


FIG. 6.

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4 Claims. (Cl. 29—408)

This invention relates to the manufacture of slide fasteners and it relates particularly to the processing and treatment of slide fasteners to improve their ease of operation.

In slide fasteners of all types, it is desirable to provide a structure which enables the slider to move easily along the stringers or rows of fastening elements without danger of the slider becoming detached unintentionally from the stringers. The slide fastener industry, particularly the manufacturers of the metallic tooth or scoop type fastener try to keep the force required to move slider at not substantially in excess of eight ounces. An operating force of this order can be achieved with metallic type fasteners for the reason that the teeth have relatively smooth hard outer surfaces over which the slider moves and with which the slider comes in contact. Moreover it is common to use a wax or other lubricant on the teeth to facilitate the movement of the slider. In addition, the slider may be mounted on the stringers in loosely fitting relation to the tapes and the teeth without danger of disengagement of the slider from the stringer for the reason that the teeth provide substantially flat shoulders of substantial width for engagement by the edge flanges of the sliders.

Slide fasteners of the coil type such as, for example, those disclosed in the Lawrence Schwartz U.S. Patent No. 2,858,592, granted November 4, 1958, present somewhat different problems in construction and operation than metallic tooth fasteners. Inasmuch as the coils forming the fastening elements are elliptical in cross-section and the filaments from which the coils are made are smooth and rounded, the slider cannot be used in direct engagement with the coils if operating failures are to be avoided. For that reason, guide beads or cords are secured to the stringers adjacent to the coils for engagement by the slider to guide it and prevent it from becoming detached from one or both of the stringers. The slider must be in relatively tight-fitting relation to the guide beads and the tape or other fabric to which the guide beads and the fastening coils are secured in order to prevent disengagement of the slider from the stringers under high-stress conditions.

It was believed for a long time that the tight fit necessary for the slider was the principal factor contributing to the difficulty of moving the slider along the fastening elements. In some instances, an operating force as high as twenty-four ounces was required for moving the slider. Attempts to reduce the operating force for the slider by lubricating the fastening elements and slider are not very successful because most lubricants seem to increase the force required to move the slider. Silicone-oil lubricants are the most satisfactory but do not overcome resistance to movement of the slider sufficiently. Reducing the closeness of fit of the slider also does not produce much improvement in ease of movement but greatly increases the possibility of detachment of the slider from the stringers.

Inasmuch as the above-mentioned expedients did not greatly improve the operation of the fastener it was decided to examine the feasibility of modifying the stringer

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to reduce the operating force of the slider. It was found that processing of the tapes, bead cords and assembling the coils with them to form the stringers, cause the fibers or threads to adjust themselves relatively into fixed or set relation. In this set condition, the fibers and threads have a high resistance to displacement under operating stress. Having made this discovery, it occurred to me that the fibers in the tapes and beads might be rearranged to provide greater flexibility in the stringers while rendering the beads and tapes denser and smoother so that they would resist movement of the slider to a substantially lesser degree.

In accordance with the present invention, a method has been provided in which the guide beads and the fabric adjacent thereto are flexed, compacted and compressed and rendered more flexible without weakening them.

More particularly, the desired characteristics can be imparted to the stringers by repeatedly flexing the stringers while subjecting them to tension and thereby tending to rearrange the fibers and threads in the stringer elements to render the stringers more flexible and force the beads on the stringers toward the fastening coils and reduce their overall spacing and dimensions.

Compacting of the beads and fabric produces a smoother surface on them and prevents expansion of the beads or fluffing of the fibers of the beads or tapes by movement of the slider. At the same time, the denser and more compact bead structure resists any tendency of the slider to jump off of either of the stringers or otherwise produce faulty operation.

For a better understanding of the present invention, reference may be had to the accompanying drawings, in which:

Figure 1 is a plan view of a portion of a coil type slide fastener with a slider therefor shown partially in section and illustrating the action of the slider in causing the coil fastener elements to mesh with each other;

Figure 2 is a view in cross-section taken on line 2—2 of Figure 1, illustrating a conventional meshed slide fastener prior to treatment in accordance with the present invention;

Figure 3 is a corresponding cross-sectional view of a slide fastener after treatment in accordance with the present invention;

Figure 4 is a perspective view of a typical apparatus for treating the slide fastener to improve its operating properties;

Figure 5 is a perspective view of a modified form of apparatus for improving the operating characteristics of a slide fastener;

Figure 6 is a plan view of another form of apparatus for treating a coil-type slide fastener; and

Figure 7 is a view in cross-section taken on line 7—7 of Figure 6.

Figure 1 illustrates a coil-type slide fastener of the kind disclosed in the Schwartz U.S. Patent No. 2,858,592. Such a slide fastener F includes a pair of tapes 10 and 11 to which are secured a pair of meshing coils 12 and 13 formed of nylon filament or the like, of oblong cross-section.

Adjacent to the inner edges of the coils and on opposite sides of the tape are mounted guide beads or cords 14, 15, 16 and 17. A slider S is mounted for sliding movement lengthwise of the coils 12 and 13 and has its edge flanges 18 and 19 engaging the outer sides of the beads 14 to 17. The beads guide the slider and prevent it from becoming disengaged from the coil elements. Each tape with its attached coil and beads forms a stringer F¹ or F² of the fastener F.

The coils 12 and 13 and the beads may be attached to the tapes 10 and 11 in any suitable way, as, for example,

by the overedge sewing operation disclosed in the Schwartz U.S. Patent No. 2,858,592.

Inasmuch as the tapes, beads and coils are subjected to flexing during their manufacture and assembly, the fibers and threads thereof tend to arrange themselves so that they are relieved of stresses and in relatively set relation. Inasmuch as the fibers and threads are in more or less set relations, they resist forces tending to move them out of such positions and thereby prevent the easy flexing of the bead cords during the operation of the slide fastener. As shown in Figure 1, the guide beads 14 to 17 must flex rather sharply to enable the slider to move along and cause the coils to mesh and unmesh.

In accordance with the present invention, the stringers F¹ and F² of the slide fastener are subjected to an additional treatment to modify the relative positions of the fibers and threads of the tapes and beads and to adjust the beads, tapes and coils relatively to produce a flexible but more compact assembly.

As disclosed in Figure 3, treatment of the fastener in accordance with the present invention, causes the guide beads 14 to 17 to be pressed tightly against the coils 12 and 13 and also reduces the cross-sectional dimensions of the beads and the tapes adjacent thereto without reducing the amount of material present in the guide beads or any other portion of the slide fastener. Such compacting and rearrangement of the beads and the cooperating elements of the slide fastener is accomplished by repeatedly flexing and bending and subjecting the stringers to tension stresses which tend to urge the beads into tighter engagement with the coils.

A typical apparatus for accomplishing this result is shown in Figure 4. As illustrated therein, the slide fastener F, is passed over a table or other support 21 on which are mounted pairs of guideblocks 22, 23, 24 and 25. The lower guideblocks 23 and 25 are fixed to the table 21 and are provided with upwardly opening notches 26 and 27 which receive the lowermost beads 15 and 17 and the coils of the fastener F in snugly fitting relation and provide abutment surfaces engaging the outer sides of the beads. Overlying the blocks 23 and 25 are hold-down blocks 22 and 24, also provided with notches or grooves 28 and 29 which fit snugly around the uppermost beads 14 and 16 of the slide fastener. As shown in Figure 4, the upper guideblocks 22 and 24 may be connected by means of the hinges 30 and 31 to the guideblocks 23 and 25 respectively, while the opposite ends of the upper guideblocks 22 and 24 may be retained by means of hold-down clamps or bolts 32 and 33 in a sliding engagement with the tapes 10 and 11 of the slide fastener. The holding and guiding arrangement just described permits endwise movement of the slide fastener F but prevents substantial lateral movement thereof.

Mounted between the sets of guideblocks 22, 23 and 24 and 25 are a pair of reciprocating bars 35, 36 which are also provided with upwardly facing and downwardly facing notches 37, 38, respectively, to engage around the guide beads and the coils of the fastener herein. The bars 35 and 36 are mounted for limited endwise reciprocation on the table 21 by means of guide elements 39, 39a mounted on the table 21. Endwise reciprocation is imparted to both of the bars 35, 36 by any suitable vibrator such as, a mechanical vibrator of the alternating current solenoid vibrator 40. A stroke of about three-sixteenths to about one-eighth of an inch is imparted to the bars 35 and 36 by the vibrator 40. When the slide fastener is drawn slowly through the apparatus, the vibrating bars 35 and 36 cause a rapid transverse bending of the beads substantially in planes substantially parallel with the plane of the fabric. The force of bending is exerted against the outermost bead in each direction so that the action of the apparatus is to force the beads inwardly toward their corresponding coils. As a result of the intensive flexing and working, the guide beads are

rendered more dense, the fibers in the beads and the tapes or fabric strips 10 and 11 are rearranged and a much smoother, more compact structure is provided.

With denser and more compact stringers described above, the operating force for the slider is reduced to commercial limits, that is, on the order of eight ounces so that the coil type fastener can be operated as easily as the metallic tooth-type of fastener after treatment. Even after repeated use, the operating forces do not increase nor is there any tendency towards faulty operation of the slide fastener.

A modified form of treating apparatus is disclosed in Figure 5. This apparatus includes guideblocks elements 22', 23', 24' and 25' corresponding to the guide blocks 22 to 25 described above. It also includes a reciprocating upper bar 36' similar to the bar 36 described above, the bar 36' being operated by suitable reciprocating motor such as the solenoid motor 40'. The apparatus of Figure 5 differs from that disclosed in Figure 4 in that it includes an independently movable bar 41 which is mounted for endwise sliding movement on the table 21' and is provided with an upwardly-facing notch 42 engaging the lowermost guide beads of the slide fastener. In operation, the upper guide bar 36' is vibrated by means of the vibrator 40' while the lower bar 41 is moved only by its engagement with the beads of the stringers. Due to its inertia, it has a tendency to lag behind the movement of the bar 36' with the result that it resists movement of the stringers and thereby aids in compacting the guide beads and forcing them toward the center line of the meshed stringers. An advantage of the use of a free-floating bar 41 is that it eliminates the need for controlling the stroke or amplitude of vibration of the bar 36' within close limits and renders the apparatus substantially self-adjusting.

With either of the apparatuses disclosed above, it is desirable to maintain the tape under tension during its passage through the hold down and compressing bars so that the fibers themselves will be adjusted not only by compressive but by tension stresses.

Tensioning can be accomplished by exerting a friction drag on the fastener F by the braking rolls 43, 43' while pulling it through the apparatus by means of rolls 44, 44' or the like. Inasmuch as the action is one of flexing and subjecting the stringers to tension and compressive stresses the structure of the apparatus for accomplishing this result may be substantially modified. For example, as shown in Figures 6 and 7, a similar treating action can be produced by moving a single stringer 45 over forming elements 46 and 47 which cause the beads 48, 49, the tape 50 and the coil 51 to be flexed sharply substantially in the plane of the tape 50. As shown in Figure 7, each of the elements 46 and 47 consists of a guiding and bending member having a slot 52 which receives the tape 50 of the stringer and has a pair of lips 53 and 54 engaging behind the guide beads 48, 49 of the stringer. The outer end of each of the lips 53, 54 is provided with a nose portion 55 of sharply curved form over which the beads are stretched and flexed.

The members 46 and 47 are mounted on a platform or a table 56 and that the stringer 45 is drawn around the forming elements 46 and 47 under tension by means of a pair of power-driven friction rollers 57, 58 engaging the tape 50 so that the stringer is subjected to sharp and repeated flexing and the outer edges of the tape and the bead are likewise subjected to flexing and strong tension stresses tending to urge the beads outwardly and more tightly into contact with the coil 51.

Each of the above described apparatuses produces the desired effect of compacting and rearranging the fibers and threads of the tapes and guides beads adjacent to the coils with the result that a smoother, denser and slicker finish is imparted to them and the entire stringer is rendered more flexible, thereby greatly facilitating the movement of the slider along the stringers.

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It will be understood that the apparatus for compacting and rearranging the elements of the slide fastener are susceptible to considerable modification and that other forms of apparatus may be provided for flexing the stringers while under tension stresses, to produce the result described above. Accordingly, it will be understood that the apparatuses described above are illustrative and should not be considered as limiting the scope of the following claims.

I claim:

1. A method of treating a stringer of a slider fastener including a strip of fabric, a continuous fastener element secured to an edge portion of said strip and at least one guide bead secured to said strip adjacent to fastener element to guide a slider therealong, comprising guiding said strip and holding it substantially flat at two spaced apart zones, pulling said stringer through said zones, applying a force resisting movement of said stringer through said zones to tension said stringer in and between said zones, exerting pressure against said bead between said zones in a direction to urge the bead into closer juxtaposition to said fastener element thereby to contract and rearrange said bead relative to said strip and said fastener element.

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2. The method set forth in claim 1 in which said bead is repeatedly and intermittently subjected to and relieved of said pressure.

3. The method set forth in claim 1 in which a meshed pair of stringers is pulled through said zones, and pressure is exerted alternately on the beads of each stringer to urge them into closer juxtaposition to their corresponding fastening elements and to bend and flex said stringers substantially in the planes of said strips.

4. The method set forth in claim 1 in which said pressure is exerted on said bead by bending said stringer sharply around a bending member with said bead engaging said bending member and said fastening member on the opposite side of said bead from said bending member.

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