United States Patent [19]

Johnston et al.

[11] **3,818,575**

[45] **June 25, 1974**

[54] **METHOD OF FORMING END STOPS ON SLIDE FASTENERS**

[75] Inventors: **James R. Johnston,** Meadville; **George B. Moertel,** Conneautville, both of Pa.

[73] Assignee: **Textron Inc.,** Providence, R.I.

[22] Filed: **May 14, 1973**

[21] Appl. No.: **359,835**

Related U.S. Application Data

[62] Division of Ser. No. 220,589, Jan. 25, 1971, Pat. No. 3,775,815, which is a division of Ser. No. 28,793, April 15, 1970, Pat. No. 3,686,719.

[52] **U.S. Cl.** **29/408**

[51] **Int. Cl.** **B23p 11/00**

[58] **Field of Search** ..... 29/408, 207.5 ST, 207.5 R, 29/410

[56] **References Cited**

UNITED STATES PATENTS

2,884,691 5/1959 Rath et al. 29/408

Primary Examiner—Thomas H. Eager

[57] **ABSTRACT**

A method of forming an end stop for a slide fastener including folding the slide fastener to have a T-configuration exposing the undersides of the folded portions, disposing fusible material in cavities below the exposed undersides and fusing the material to the undersides of the folded portions to form a separate stop member on either side of the slide fastener.

11 Claims, 6 Drawing Figures

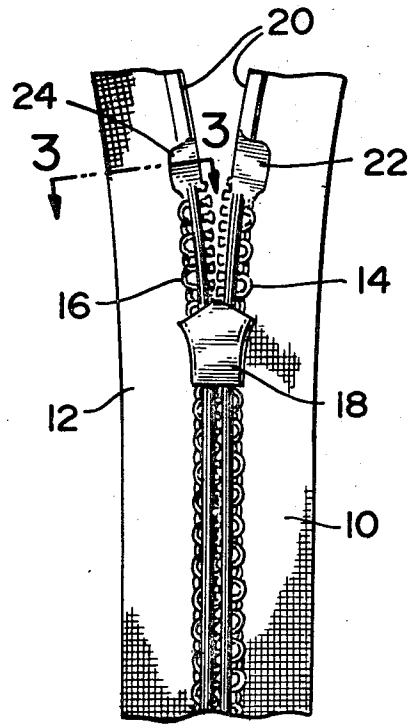


FIG. 1

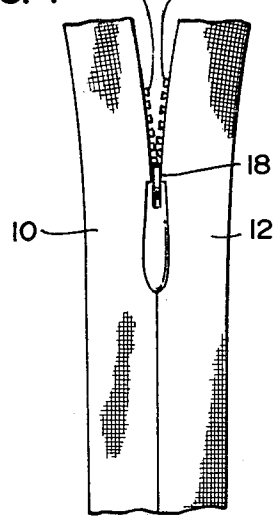


FIG. 2

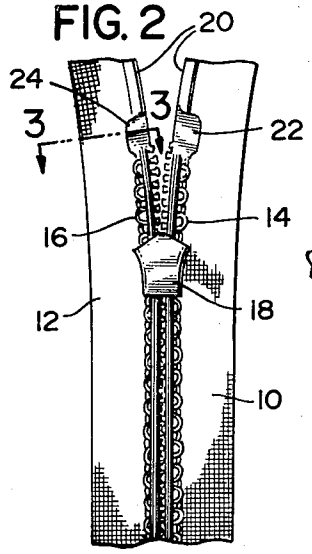


FIG. 3

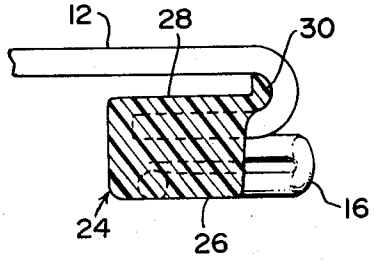
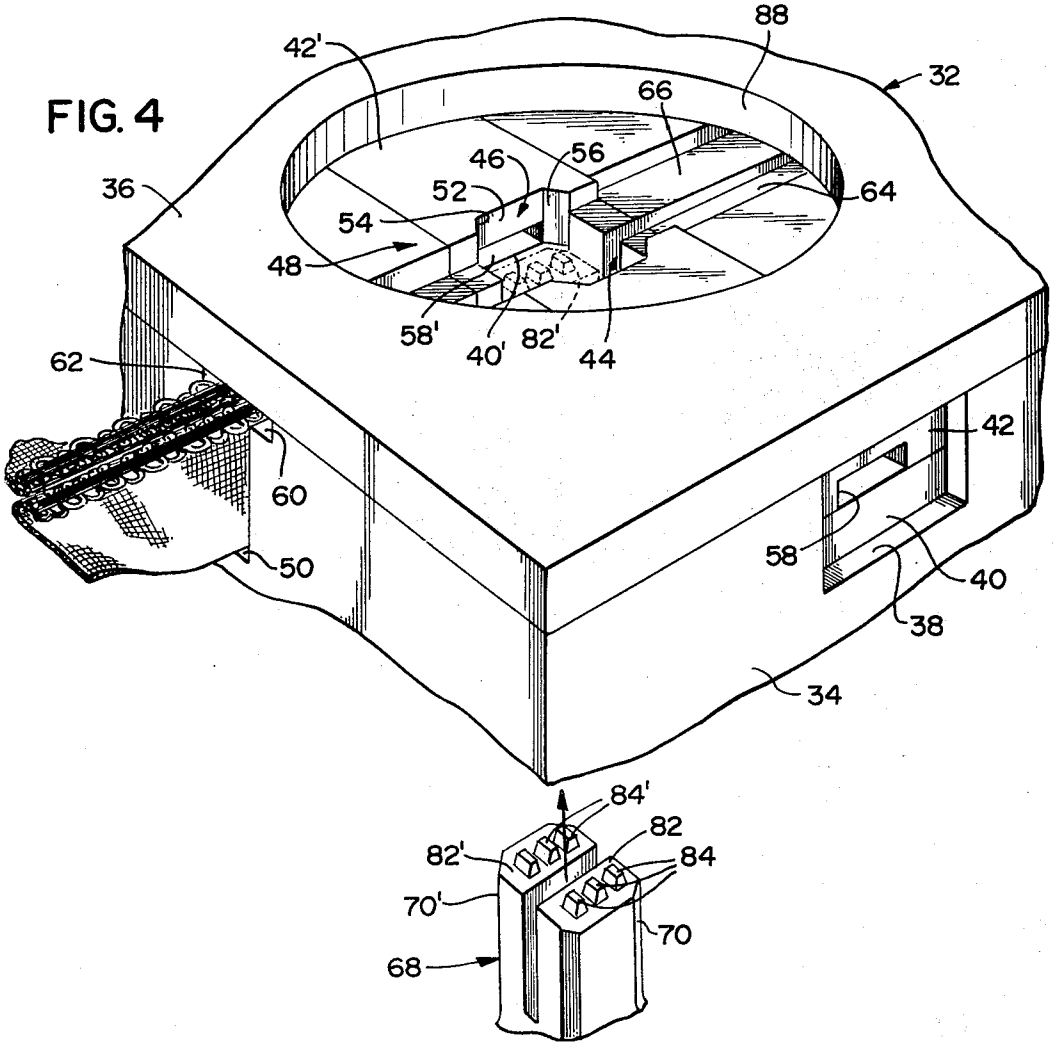


FIG. 4



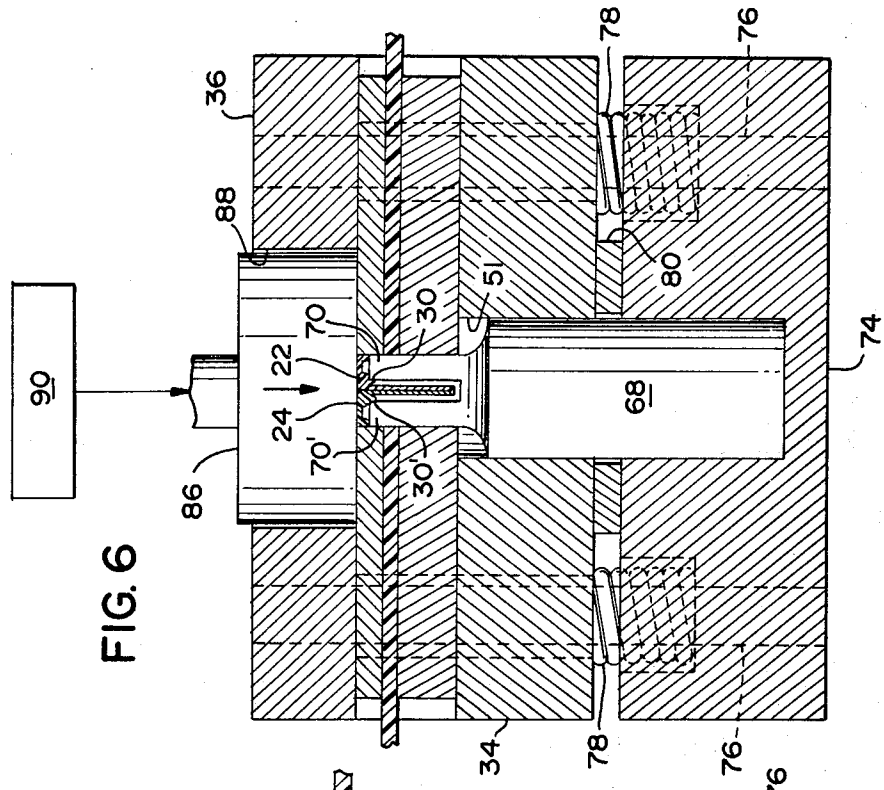

78
76
36
88
80
51
70
30
22
74
90
68
24
70'
30'
86
34
78
76

FIG. 6

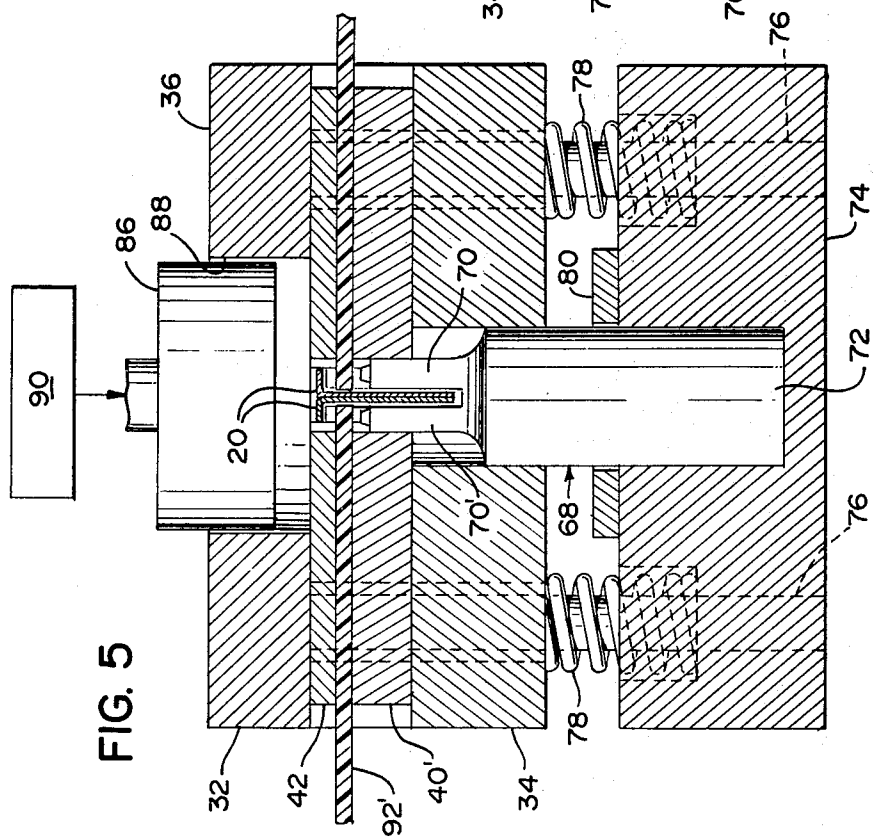

76
78
36
74
86
88
80
70
90
72
20
70'
68
76
78
32
42
92'
40'
34

FIG. 5

METHOD OF FORMING END STOPS ON SLIDE FASTENERS

CROSS REFERENCE TO RELATED APPLICATION

This is a divisional application of copending application Ser. No. 220,589 filed Jan. 25, 1972, now U.S. Pat. No. 3,775,815 issued Dec. 4, 1973, which is a divisional application of application Ser. No. 28,793 filed Apr. 15, 1970, now U.S. Pat. No. 3,686,719 issued Aug. 29, 1972.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to slide fasteners and more particularly to a method for forming an end stop on a slide fastener.

2. Description of the Prior Art

It is customary to provide end stops for slide fasteners; that is, a bottom stop for limiting opening movement of a slider and a top stop for limiting closing movement of the slider. The bottom stop, for many applications, is not externally visible after installation in a garment and may have any shape without irritating the wearer of the garment due to the garment material normally surrounding the bottom stop. The above consideration cannot be ignored for most top stops due to their relatively prominent and unprotected positions in garments. Accordingly, it is extremely desirable to provide a top stop which is unobtrusive and yet inexpensive and simple to form. Prior art attempts to provide such a top stop are disadvantageous in that they utilize relatively complex forming procedures and accordingly are unnecessarily expensive.

Particular problems have been encountered in the forming of top stops for slide fasteners presenting a seam-like appearance in that it is required that the top stop be completely hidden from external view. Furthermore, it is desirable that the top stop not protrude from the slide fastener in such a manner as to be felt by the wearer of a garment incorporating the slide fastener, and the top stop should be devoid of sharp edges or flash which could irritate the wearer and weaken the slide fastener.

Slide fasteners that present seam-like appearances are normally constructed by folding the tape edges inwardly such that interlocking elements may be secured to the edges and hidden by the abutting of the folded edges of the tape. Top stops of metal are undesirable for such slide fasteners due to the expense of forming and installing the top stops and further due to their incongruous appearance when used with slide fasteners having interlocking elements made of continuous filamentary plastic materials; and, accordingly the use of a plastic material to form a top stop is desirable. Top stops of plastic material are normally provided by forming a bar across the outer surface of the interlocking elements, and the bar is then cut to permit separation of the slide fastener. Cutting of the bar causes the formation of jagged edges which require final trimming or manual polishing; and, furthermore, a top stop formed in the above manner substantially weakens the surrounding area of the tape and frequently causes holes in the tape and enhances slider hang-up after installation in a garment.

In order to permit installation of slide fasteners having a seam-like appearance in a garment, it is required

that the tape area above the top stop be flexible to permit folding of the tape during the installation. It is, accordingly, extremely desirable to have the upper edge of the top stop well defined; however, prior art top stops have not provided such definition.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a top stop for a slide fastener presenting a seamlike appearance which is unobtrusive and simple and inexpensive to form.

The present invention is summarized in a method of forming end stop means on a slide fastener of the type having a pair of tapes with their edges folded upon themselves to provide a seam-like appearance when interlocking elements attached to the folded portions are interengaged, the method including supporting the slide fastener such that the undersides of the folded portion are exposed, disposing fusible material adjacent the exposed underside of each folded portion, and fusing the material onto the folded portions to form a pair of stop members.

Another object of the present invention is to form a stop member on the underside of the folded portion of a slide fastener presenting a seam-like appearance.

A further object of the present invention is to form a slide fastener stop member having a defined shape and a curved lip disposed at the inner fold surface of the slide fastener tape.

The present invention has another object in that end stop means are formed on a slide fastener by a simple method.

Another object of the present invention is to form a stop member by fusing a blank of fusible material to the underside of the folded portion of a slide fastener tape.

A further object of the present invention is to construct apparatus for forming end stop means for a slide fastener presenting a seam-like appearance.

Some of the advantages of the present invention over the prior art are that end stops are inexpensively and quickly mass produced, that slide fastener tape wear is reduced, that damage to the slide fastener tape during forming of the end stop is obviated, that the tape area adjacent the end stop is reinforced, that no finishing or manual work is required, and that the surfaces of the end stop are smooth without flash or jagged edges.

Further objects and advantages of the present invention will become apparent from the following description of a preferred embodiment taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation of a slide fastener having a top stop in accordance with the present invention.

FIG. 2 is a rear elevation of the slide fastener of FIG. 1.

FIG. 3 is an enlarged section taken along line 3—3 of FIG. 2.

FIG. 4 is an exploded view in broken perspective of forming apparatus according to the present invention.

FIG. 5 is a side elevation, partially in section, of the apparatus of FIG. 4 during an initial forming step.

FIG. 6 is a side elevation, partially in section, of the apparatus of FIG. 4 during a final forming step.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A slide fastener presenting a seam-like appearance is illustrated in FIGS. 1 and 2 and includes tapes 10 and 12 which have their inner edges folded upon themselves. Interlocking elements 14 and 16 are attached to the folded portion of tapes 10 and 12, respectively; and, a slider 18 rides on elements 14 and 16 to control the interengaging thereof with only the pull of the slider externally visable.

The slide fasteners are mass produced in continuous strips with the interlocking elements normally made of a continuous filamentary material having a coiled or ladder-like configuration and sewn to the folded portions of the tapes by stitching threads, as shown in FIG. 4. The continuous slide fastener strips are gapped at predetermined locations to provide slide fasteners of desired lengths; that is, the interlocking elements are cut or punched off of the tapes to provide clean or gapped areas of the folded portions that are devoid of interlocking elements as indicated at 20 in FIG. 2. The slide fastener strips are adapted to be cut at the gapped areas, and with the addition of top and bottom stops and the slider the slide fastener is completed.

The above described steps in the mass production of slide fasteners are provided as a brief background leading to the present invention which is concerned with the forming of an end or top stop for such slide fasteners. Thus, it is clear that the present invention may be utilized with any suitably produced and configured slide fasteners and not just the slide fastener illustrated in the drawings.

As is illustrated in FIGS. 2 and 3 a top stop for the slide fastener includes a pair of stop members 22 and 24 formed adjacent end ones of elements 14 and 16, respectively, in the gapped area 20. Stop members 22 and 24 are substantially identical in construction, and only stop member 24 will be described in detail.

Stop member 24 is a mass of fusible material which grips the folded portion of tape 12 by flowing through interstices in the material of the tape. Any fusible material or any material capable of changing states in response to a predetermined condition such as heat or pressure may be used with the present invention. The mass of stop member 24 has a precisely defined shape with an outer surface 26 coinciding with the top surface of the folded portion of gapped area 20. An inner surface 28 is disposed between the underside of the folded edge and tape 12 and terminates at one end beyond the outer edge of the folded portion and at the other end in a curved lip 30 which has a configuration corresponding to the inner fold edge of the tape.

Apparatus for forming the top stop is illustrated in FIG. 4 and includes a forming block 32 having a base 34 and a top plate 36 secured thereto both of which are generally square in plan view and rectangular in cross section. Base 34 has a channel 38 cut therethrough, and a pair of identical lower stock guides 40 and 40' and a pair of identical upper stock guides 42 and 42' are disposed therein in superposed relation. Guides 40 and 42 and 40' and 42' are cut to define recesses 44 and 46 having open ends facing each other in a forming area 48 which is symmetrical about a slide fastener guide slot 50 that runs transversely to channel 38 through forming area 48. A bore 51 is contrally disposed in base 34 and communicates with channel 38.

Recesses 44 and 46 are identical and each includes a center wall 52 with angled side walls 54 and 56 on either side thereof. Side walls 54 and 56 extend to bottom guides 40 and 40'; however, center walls 52 are formed above stock guide channels 58 and 58' formed by rectangular slots in the bottom of upper guides 42 and 42', respectively, such that the channels communicate with the recesses.

Slide fastener guide slot 50 is generally T-shaped with an elongated vertical portion extending entirely through block 32 and a pair of horizontal shoulders 60 and 62 extending to recesses 44 and 46 on the left hand or entrance side of block 32. On the right hand or exit side of block 32, horizontal shoulders 64 and 66 are formed closer to the top surface in the forming area than shoulders 60 and 62 and are wider than shoulders 60 and 62. The width of shoulders 64 and 66 is the same as the distance between center walls 52 of recesses 44 and 46. Upper guides 42 and 42' are formed with shoulders aligned with shoulders 60 and 62 on the left side and shoulders 64 and 66 on the right side to permit smooth movement of a slide fastener strip through block 32 in a manner to be described hereinafter.

A forming anvil 68 has a bifurcated end forming a pair of elongated legs 70 and 70' each of which has an outer surface contoured to mate with recesses 44 and 46, respectively. Anvil 68 has a base 72 secured in a support 74, as shown in FIGS. 5 and 6 and extending into bore 51 in base 34; and, four locating pins 76 extend between support 74 and block 32 to provide alignment therefor. A bias spring 78 is coiled around each pin 76 and is mounted in compression between support 74 and block 32 such that in the absence of external forces block 32 is spaced from support 74. An annular stop 80 is disposed on the top of support 74 surrounding the base 72 of anvil 68.

Legs 70 and 70' of anvil 68 have flat top faces 82 and 82' with three energy directing projections 84 and 84' extending therefrom, respectively. The space between legs 70 and 70' forms a slide fastener guide slot which is aligned with the elongated portion of slot 50.

A fusing member 86 in the form of an ultrasonic horn is generally cylindrical with a flat bottom surface adapted to extend through an aperture 88 in top plate 36 to engage the top surface of forming area 48. Member 86 is adapted to receive energy from an ultrasonic source 90; however, it is clear that energy for fusion may be supplied from any suitable source.

A method of forming a top stop in accordance with the present invention will now be described utilizing the apparatus as illustrated in FIGS. 4, 5 and 6. A gapped continuous slide fastener strip enters block 32 from the left hand side in slot 50 after having been folded upon itself to have a T-configuration, as illustrated in FIG. 4. That is, the outer surfaces of tapes 10 and 12 of the slide fastener strip are folded in face-to-face relation to form the vertical bar of the T-configuration and the folded portions and the interlocking elements, where they have not been gapped, form the horizontal bar of the T-configuration. Thus, the inner surface of the folded portions of the tapes rest on shoulders 60 and 62 as the slide fastener strip enters block 32.

The slide fastener strip is moved within block 32 to a position such that the end elements adjacent a gapped

area are aligned with the left hand edges of recesses **44** and **46**. In this position the slide fastener strip is supported such that the undersides of the folded portions are exposed above recesses **44** and **46**. With the slide fastener strip properly located, strips of stock **92** and **92'** of a fusible material, such as a thermoplastic material like nylon, are inserted in guide channels **58** and **58'** and moved towards the tapes a predetermined distance such that a predetermined amount of stock extends into recesses **44** and **46**, as shown in FIG. **5**. Faces **82** and **82'** on the legs of anvil **68** are disposed below channels **58** and **58'**, respectively, to permit entry of the stock in recesses **44** and **46**.

Member **86** is then lowered to contact the top surface of forming area **48** and move block **32** down against the force of springs **78** to contact stop **80**. The relative movement between anvil **68** and block **32**, and more particularly between the mated contours of recesses **44** and **46** and legs **70** and **70'**, shears stock strips **92** and **92'** to form two blanks disposed between the top faces **82** and **82'** of legs **70** and **70'** and the underside of the folded portions of the tapes. As shown in FIG. **6**, the top faces **82** and **82'** of anvil **68** together with the upper portions of recesses **44** and **46** form cavities containing the sheared stock blanks.

The difference in depths from the top surface of forming area **48** of shoulders **60** and **62** and shoulders **64** and **66** compensates for the fact that there are no interlocking elements on the gapped area of the folded portions which are supported on shoulders **64** and **66** whereas there are interlocking elements on the folded portions resting on shoulders **60** and **62**. Thus, the bottom surface of member **86** evenly engages the top surface of forming area **48** and the folded portions of the slide fastener strip.

After the shearing operation, the ultrasonic horn is energized to melt the blanks and cause them to take the shape of the cavities. Energy directing projections **84** and **84'** localized the ultrasonic energy, and the localization coupled with the well defined cavities permit the blanks to fuse onto the tape material to form flash free stop members without unduly fusing interlocking elements which must be utilized for interengagement. Flow of the melted blanks through the folded portions is limited by engagement of member **86** with the outer surface thereof; however, portions of the melted blanks are permitted to creep down a short distance in the space between legs **70** and **70'** as defined by the inner fold surfaces of the folded portions to form curved lips **30** and **30'**.

The fusing or melting of the stock blanks permits the fusible material to flow through interstices in the folded portions to grip the tapes. In order to form an extremely strong bond between the stop members and the slide fastener it is desirable to utilize threads made of a fusible material such as nylon to stitch the interlocking elements to the folded portions or in the weaving of the tapes such that the stock fuses with the threads. The bond is further enhanced by making the interlocking elements of a fusible material such as nylon and fusing the end ones of the elements with the stock and the threads.

Once the stop members have been formed and set, the slide fastener strip is moved along to the next gapped area for formation of a top stop for another slide fastener. The extra width of shoulders **64** and **66** accommodates the stop members to permit exit of the slide fastener from block **32**.

It will be appreciated that the stop members **22** and **24** are formed separately on the underside of the folded portions and on the outer ends thereof to assure proper limiting of slider movement. No severing operations are required, and there are no projections or jagged edges which could be felt or could irritate a wearer of a garment utilizing the slide fastener. The use of cavities for forming the stop members coupled with the localization of the ultrasonic energy by projections **84** and **84'** permits the stop members to have precisely defined shapes with no flash or jagged edges and prevents undesired melting or fusing or other components of the slide fastener such as threads or interlocking elements removed from the stop members. The defined shape of the stop members permits the gapped area **20** to be flexible to ease installation of the slide fastener in a garment. The curved lips formed contiguous with the inner fold surface of the folded portions serve to increase bearing area between the stop members and the tapes and reduce wear.

Many of the advantages of the present invention can be seen in the simple method by which the stop members are formed, which method includes essentially the steps of supporting the folded portions of the tapes to expose the underside thereof, disposing fusible material adjacent the exposed undersides of the folded portions and fusing the material onto the folded portions to form two separate stop members.

Of course, it will be appreciated that precise positioning and movement of components during formation of the end stop means may be accomplished by conventional production procedures. That is positioning of the slide fastener strip in the forming area may be accomplished in a conventional manner, and movement of stock strips **92** and **92'** to provide blanks of predetermined size may similarly be accomplished in a conventional manner.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A method of forming end stop means on a slide fastener of the type having a pair of tapes with their edges folded upon themselves to provide a seam-like appearance when interlocking elements attached to the folded portions are interengaged, the method comprising

supporting the slide fastener such that the undersides of the folded portions are exposed;

disposing fusible material adjacent the exposed underside of each folded portion; and

fusing the material onto the folded portions to form a pair of stop members.

2. The method as recited in claim **1** wherein said supporting step includes folding the slide fastener to have a T-configuration with the tapes forming a vertical bar of the T-configuration and the folded portions forming a horizontal bar of the T-configuration.

3. The method as recited in claim **1** wherein said supporting step includes placing the exposed underside of each folded portion adjacent a cavity, and said disposing step includes providing a blank of the fusible material in each of the cavities.

4. The method as recited in claim 3 wherein said providing step includes shearing a predetermined amount from strip stock of the fusible material to form each blank.

5. The method as recited in claim 4 wherein said supporting step includes supporting the slide fastener in a forming block defining the cavities along with the ends of a forming anvil, and said shearing step includes positioning the strip stock in the cavities and moving the forming block relative to the forming anvil to shear the strip stock.

6. The method as recited in claim 5 wherein said moving step includes moving a fusing member to engage and move the forming block.

7. The method as recited in claim 6 wherein said fusing step includes providing ultrasonic energy to the fusing member.

8. The method as recited in claim 6 wherein said supporting step includes positioning the outer surface of each folded portion to be engaged by the fusing member.

9. A method of forming a stop member on the underside of a folded portion of a tape of a slide fastener presenting a seam-like appearance, the method comprising

supporting the slide fastener to expose the underside of the folded portion;

disposing a blank of fusible material in a cavity adjacent the exposed underside of the folded portion; and

fusing the material onto the underside of the folded portion.

10. The method as recited in claim 9 wherein said disposing step includes shearing a predetermined amount from a strip of the fusible material.

11. The method as recited in claim 10 wherein said supporting step includes supporting the slide fastener on a forming block adjacent the cavity defined by the forming block and a forming anvil, positioning the strip of fusible material in the cavity and said shearing step includes moving the forming block relative to the forming anvil to shear the blank from the strip.

* * * * *