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3,490,133

METHOD AND APPARATUS FOR REMOVING COUPLING ELEMENTS FROM  
SLIDE FASTENER STRINGERS PRODUCED WITH AN  
UNINTERRUPTED ROW OF COUPLING ELEMENTS  
Filed Dec. 28, 1966

FIG. 1

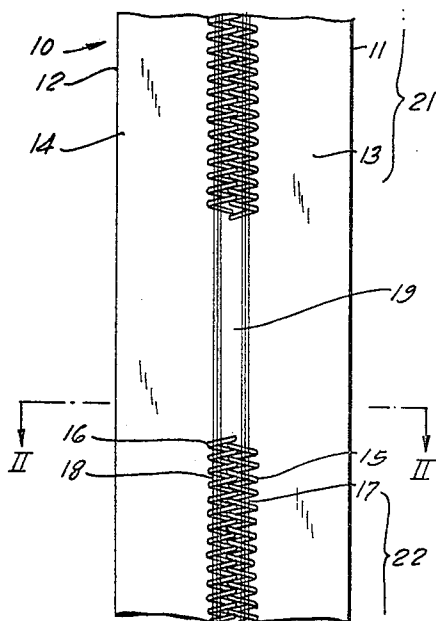


FIG. 2

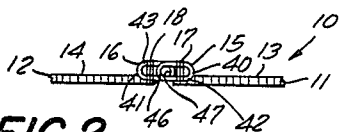


FIG. 7

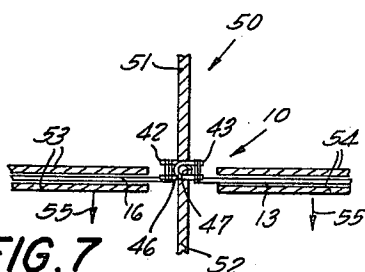


FIG. 8

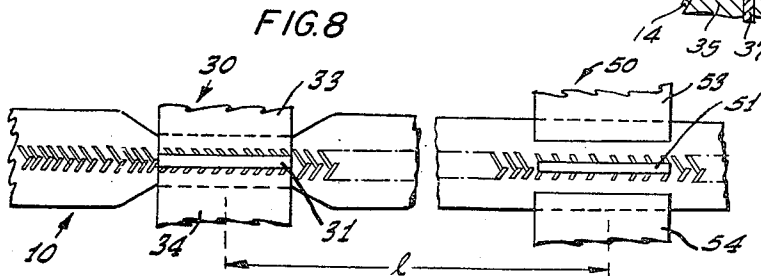


FIG. 3

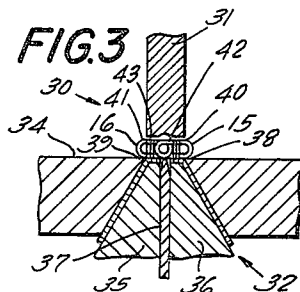


FIG. 4

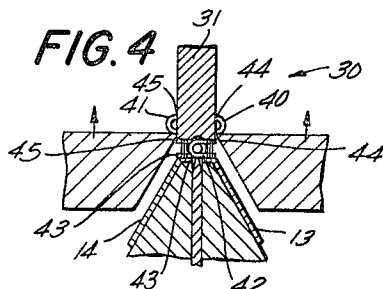


FIG. 5

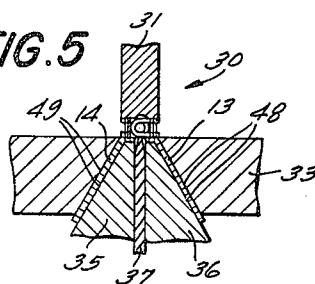
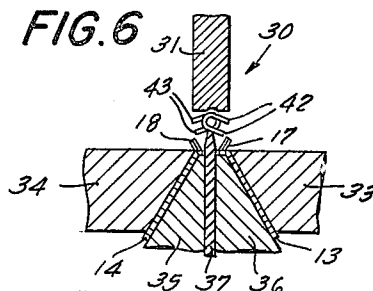


FIG. 6



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## METHOD AND APPARATUS FOR REMOVING COUPLING ELEMENTS FROM SLIDE FASTENER STRINGERS PRODUCED WITH AN UNINTERRUPTED ROW OF COUPLING ELEMENTS

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12 Claims

### ABSTRACT OF THE DISCLOSURE

Method and apparatus to form in slide fastener stringers, originally produced with an interrupted row of coupling elements formed from a helically or meander-shaped continuous filament, spaced gaps free of coupling elements by cutting off connecting portions connecting leg portions of the coupling elements at one side of holding threads which fasten the coupling elements to a carrier band and by engaging and moving the connecting portions at the other side of the carrier band relative to the latter in such a manner so as to pull the leg portions connected thereto out of the holding threads without damaging the latter.

### BACKGROUND OF THE INVENTION

Slide fasteners are known in the art in which the coupling elements on the two slide fastener stringers are formed from a continuous, either helically wound or meander-shaped, filament which is connected to the carrier band of the stringer by holding threads. Such slide fastener stringers are manufactured by either interweaving the continuous filament forming the coupling elements of the stringer with the threads of the carrier band or by fastening the continuous filament to the carrier band by sewing. In the first case, the holding threads extending over the leg portions of the continuous filament are formed by warp or weft threads of the woven carrier band, whereas in the second case the holding threads are formed by the sewing threads.

For efficient production of such slide fastener stringers as well as for reduction of the necessary stock in the slide fastener plant, it is advantageous to produce substantially endless slide fastener stringers provided with a continuous row of coupling elements and to subsequently then remove portions from the continuous row of filaments from the stringer to provide the stringer with spaced gaps free of coupling elements and to sever then the carrier band of the stringer in the region of the gaps from which the coupling elements have been removed so as to form slide fastener stringers of selected length according to the orders received from the customer.

A rather cumbersome method is known in the art to provide gaps free of coupling elements in slide fastener stringers produced as mentioned above by cutting the holding threads which fasten the row of coupling elements to the carrier band for the length of the gap to be formed to sever in this way the unnecessary coupling elements from the carrier band. In this case, when the holding threads are in the form of weft or warp threads of the woven carrier band, damage of the carrier band will result, which evidently will have a detrimental influence on the tensile strength of the finished slide fastener. When the coupling elements are sewn onto the carrier band the sewing thread on the coupling elements

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is cut in the region where the gaps have to be formed, which will result that the coupling elements adjacent the opposite ends of the thus formed gaps will no longer be properly attached, which will likewise detrimentally affect further processing of the slide fastener.

Another method is also known in which gaps in the continuous row of coupling elements on an endless stringer are produced by only punching off the coupling portions of the coupling element which project beyond the edge of the carrier band, whereas the remainder of the coupling elements remains attached to the band. This method, however, does not lead to gaps which are completely free of coupling elements, but this method will produce only gaps with coupling elements from which the coupling portions have been removed. This not only renders further processing of the slide fastener stringers rather difficult, but this method has also the disadvantage that during cutting off the portions of the cutting elements extending beyond the edge of the carrier band the latter may be easily damaged.

It is an object of the present invention to provide for a method and apparatus for producing in slide fastener stringers originally manufactured with an uninterrupted row of coupling elements spaced gaps of predetermined length completely free of coupling elements and which avoid the disadvantages of methods and apparatus known in the art for this purpose.

### SUMMARY OF THE INVENTION

A method for producing gaps of predetermined lengths and free of coupling elements and spaced a selected distance from each other in at least one continuous slide fastener stringer formed by a carrier band and an uninterrupted row of coupling elements along one edge of the carrier band and formed by continuous filaments bent so as to form leg portions extending spaced in longitudinal direction of the edge from each other and transverse to the latter and connecting portions connecting respective ends of adjacent leg portions to each other, wherein the coupling elements abut over part of their width against one face of the carrier band and the connecting portions projecting beyond the edge of the latter are formed with coupling faces and wherein the leg portions are intermediate the ends thereof connected by holding threads to the band said method comprising the steps of severing the leg portions from the connecting portions located to one side of the holding threads and facing away from the connecting portions formed with the coupling faces over a distance equal to said given width, gripping the connecting portions formed with the coupling faces and still connected to the leg portions, and moving the gripped connecting portions in such a manner so as to pull the leg portions connected thereto out of the threads.

The connecting portions on which the coupling faces are provided and which project laterally beyond the edges of the carrier bands are usually farther spaced from the holding threads than the opposite connecting portions so that relatively large faces are available for gripping the connecting portions provided with the coupling faces, whereby a secure grip on these connecting portions will be assured. This will facilitate pulling the leg portions out of the holding threads without damaging the latter so that even if the holding threads are formed by warp or weft threads of the woven carrier band the latter will not be damaged in any way and if the holding threads are constituted by sewing threads, the latter will not be severed so that the coupling elements which have to stay on the stringer will remain securely attached thereto.

The method according to the present invention may be carried out in a specially advantageous manner by first pulling up two stringers to engage the coupling faces on

the coupling elements of the two stringers with each other and then simultaneously forming the gaps free of coupling elements in the two stringers by carrying out the above-mentioned method steps. This will not only improve the efficiency of the method, but this will also assure that the coupling elements which are engaged with each other will provide especially large engaging portions for gripping and pulling out the portions of the coupling elements after the connecting portions thereof which are not engaged have been severed from the remainder of the coupling portions.

The apparatus for carrying out the above method mainly comprises cutting means having cutting edges engaging the leg portions of at least one stringer to one side of the holding threads for cutting off the connecting portions located on the aforementioned side of the holding threads from the leg portions during movement of the cutting edges in direction substantially normal to the leg portions, and pulling means arranged to engage the connecting portions on the other side of the holding threads and movable relative to the carrier band in a direction so as to pull the leg portions still connected to the connecting portions on the other side of the holding threads out of the latter. When the apparatus is used for simultaneously acting on the engaged coupling elements of a pair of stringers, the cutting means preferably include a punch having a pair of substantially parallel cutting edges extending in longitudinal direction through a distance equal to the length of the gap to be produced and spaced in transverse direction a distance from each other substantially equal to the distance between that connecting portions on a pair of pulled up stringers which face away from each other, and a die having cutting edges corresponding to the cutting edges of the punch, wherein the die and punch are movable with respect to each other for cutting off the connecting portions from the ends of the leg portions. In order to avoid accidental damaging of the carrier band during cutting of the coupling elements, it is advantageous to move during the cutting the die relative to the punch away from the carrier bands.

Preferably, the apparatus includes also additional punch means located opposite said one punch and between the cutting edges of the die and engaging the carrier bands of the two stringers on the faces thereof opposite to the faces against which the coupling elements abut, so that the coupling elements will be held between the punch and the additional punch means and the die is movable relative to the punch and the punch means.

In use of the apparatus an elongated stringer provided along one edge thereof with a continuous row of coupling elements as described above, or a pair of stringers in which the coupling elements are engaged with each other, are intermittently fed in longitudinal direction through the apparatus, whereby during the moments of standstill of the stringers the gaps free of coupling elements are produced on the stringers.

Removing of the coupling elements to form the gaps is carried out in two steps. In the first step the connecting portions of the coupling elements of the two stringers which face away from each other are severed from the respective ends of the leg portions by the cutting means of the apparatus, and in the second production step, the other connecting portions are gripped and the leg portions remaining attached thereto are pulled out by the pulling means from the holding threads.

Two different arrangements of the pulling means relative to the cutting means are possible and each of the possible arrangements has certain advantages.

In one of the possible arrangements, the cutting means and the pulling means are arranged to act successively on the same portions of the two slide fastener stringers while the latter are not moved in longitudinal direction, and this will result in a relatively short apparatus for performing the method. In this case, the cutting means are used as part of the pulling means. In this arrangement the

die means is provided with a pair of holding faces spaced from and facing a corresponding pair of holding faces on the additional punch means and the aforementioned holding faces cooperate with each other for clamping portions of the carrier band of the two stringers therebetween. Furthermore, the additional punch means includes an ejector punch acting on the connecting portions provided with the coupling faces and being movable together with the one punch relative to the die and the remainder of the additional punch means for pulling the leg portions connected to the connecting portions provided with the coupling faces out of the holding threads after the other connecting portions have been cut off from the leg portions.

The other possible arrangement of the cutting means and pulling means relative to each other is to arrange the pulling means spaced in direction of intermittent movement of the slide fastener stringers from the cutting means. The two aforementioned production steps of cutting and pulling are in this arrangement performed on two different locations of the apparatus. It is thereby especially advantageous to space the pulling means from the cutting means at such a distance, that this distance corresponds to the distance between two gaps to be formed on the stringers or to a multiple of the latter named distance. In this arrangement, the first operating step, that is the cutting step, is performed at the location of the cutting means during a first pause of intermittently feeding the stringers, and the second operating step that is the pulling step is performed at the location of the pulling means during the next pause or one of the next following pauses during intermittent feeding of the band, while at the same time the cutting means will perform the cutting operation for the next following gap, or for one of the following gaps. In such an arrangement the intermittent feeding of the slide fastener stringers has to stop only for a time period necessary to perform either the cutting or the pulling operation, whichever of the operations is longer, whereas in the first mentioned arrangement the feeding of the slide fastener stringers has to be stopped each time for a time period equal to the sum of the time periods necessary for performing the cutting and the pulling operation. While the apparatus of the second mentioned arrangement is necessarily longer and will require more space, the necessary operating time for producing a series of gaps will be considerably shorter in the second arrangement.

The pulling means for the second arrangement preferably include opposite clamping members of a maximum width equal to that of the engaged connecting portions of the pair of stringers, and a pair of clamping means respectively located on opposite sides of the clamping members for respectively clamping portions of the carrier bands of the pair of stringers therebetween and the clamping members are movable relative to each other for clamping the engaged connecting portions therebetween and the clamping members are movable relative to the clamping means for pulling the leg portions connected to the engaged connecting portions out of the holding threads. During this pulling out of the leg portions, the latter may extend inclined to the movement of the clamping members which facilitates pulling out of the leg portions from the loops of the holding threads.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

#### BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top view of two interengaged slide fastener stringers provided with a gap free of coupling elements;

FIG. 2 is a transverse cross section taken along the line II—II of FIG. 1;

FIGS. 3-6 are schematic cross sections through an apparatus for carrying out the method according to the present invention, wherein the various elements of the apparatus are respectively illustrated in positions the elements will take relative to each other during successive steps of operation;

FIG. 7 is a cross section through a modification of the apparatus according to the present invention; and

FIG. 8 is a top view showing the pulling means displaced from the cutting means.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 partially illustrate a slide fastener band 10 comprising a pair of engaged slide fastener stringers 11 and 12 in which gaps 19 (only one of which is shown) of predetermined length and spaced selected distances from each other have been produced with the method and apparatus according to the present invention. Each of the two slide fastener stringers 11 and 12 comprises a woven carrier band 13, respectively 14, along facing edges thereof rows of coupling elements 15, respectively 16, are provided which are formed from a coiled filament preferably formed from plastic material and which are respectively connected to the carrier bands by holding threads 17, respectively 18. In the schematically illustrated slide fastener stringers the rows of coupling elements 15 and 16 are formed from a helically coiled polyamide filament which is fastened to the respective carrier band by sewing. The two stringers 11 and 12 form one unit since the coupling elements are engaged with each other by appropriate coupling faces not illustrated in the drawing. The coupling elements on the two stringers 11 and 12 comprise leg portions 42, respectively 43, which are interconnected at the outer ends facing away from each other by outer connecting portions 40, respectively 41, and at the other ends thereof by inner connecting portions 46, respectively 47. The coupling faces are formed in the usual manner on the inner connecting portions 46 and 47 of the two rows of coupling elements.

For the reasons mentioned above, the two slide fastener stringers 11 and 12 are originally produced in a continuous manner with continuous uninterrupted rows of coupling elements, and the slide fastener stringers are fed through the apparatus according to the present invention in such a manner to produce on desired locations of the two stringers gaps 19 of predetermined length and completely free of coupling elements which are located between stringer portions 21 and 22 with rows of coupling elements 15 and 16 of preselected length. During further processing of the two stringers, the successive sections 21 and 22 are cut from each other in the region of the gaps 19 and subsequently thereto sliders for coupling and uncoupling the coupling elements on the two stringers are placed on the same and the stringers may also be provided with top and bottom stops for limiting movement of the slider. It would also be possible to cut the carrier bands in the region of the gaps during the process in which the gaps 19 are produced.

The FIGS. 3-6 illustrate one modification of an apparatus for producing the gaps 19 in two interengaged slide fastener stringers as illustrated in FIGS. 1 and 2. The various elements of the apparatus are illustrated in FIGS. 3-6 in positions they will respectively take with respect to each other during carrying out the various process steps according to the present invention. It is mentioned that FIGS. 3-6 only schematically illustrate the elements for cutting and removing the coupling elements to form the gaps 19, whereas the means for moving the various elements illustrated in proper sequence are for simplification reasons not shown in the drawings. Moving means for moving the various elements illustrated do not form part of the present invention and they will be obvi-

ous to any person skilled in the art from the following description of the direction and sequence of the movements of the elements.

The operating members 30 of the apparatus illustrated in FIGS. 3-6 comprise a punch 31, a die having spaced portions 33 and 34, and additional punch means located between the portions 33 and 34 of the die opposite the punch 31. The additional punch means 32 includes a pair of punch parts 35 and 36 between which an ejector punch 37 is located movable relative to the punch parts 35 and 36 between the positions shown in FIGS. 5 and 6, respectively. The length of the various operating members of the apparatus according to the present invention in horizontal direction is equal to the length of the gap 19 to be produced with the apparatus.

A slide fastener band 10 comprising two pulled up slide fastener stringers of the type illustrated in FIGS. 1 and 2 in which the slide fastener stringers are provided with uninterrupted rows of coupling elements intermittently fed between the operating members 30 of the apparatus. The slide fastener band 10 is thereby fed between the members 30 in such a manner that the row of coupling elements 15 and 16 which abut with part of their width against one face of the respective carrier bands 13 and 14 face with the free sides thereof upwardly.

The gaps 19 free of coupling members are produced in the slide fastener band by the operating members 30 in two operating steps during the time the intermittently fed band is at rest. The first of the operating steps is illustrated in two successive phases in FIGS. 3 and 4 and the second operating step is illustrated in two successive phases in FIGS. 5 and 6.

During the first operating step, that is during the cutting operation, the connecting portions 40 and 41 which face away from each other of the two rows of coupling elements 15 and 16 are simultaneously severed over the length of the gap to be produced from the corresponding ends of the leg portions 42 and 43. The cutting step is carried out in the following manner:

When the slide fastener band during intermittent feeding thereof between the cooperating members 30 of the apparatus is stopped, the various members 31-37 are moved toward each other until they assume the position as illustrated in FIG. 3. Thereby the cutting edges 38 and 39 of the die members 33 and 34 are positioned on the ends of the leg portions 42 and 43 which abut against the upper faces of the carrier bands 13 and 14 and which are connected by the connecting portions 40 and 41 which face away from each other. The opposite sides of the coupling elements 15 and 16 are engaged by the bottom face of the punch 31 having cutting edges 44 and 45 respectively aligned in vertical direction with the cutting edges of the die members 33 and 34. The distance of the cutting edges 38 and 39 from each other is equal to the distance between the cutting edges 44 and 45 of the punch 31 and this distance is equal to the distance between the connecting portions 40 and 41 which face away from each other, and it will be noted that this distance is slightly greater than the distance between the outermost holding threads 17 and 18 of the two stringers.

After the various elements of the apparatus have assumed the position as shown in FIG. 3, the punch 31 and the additional punch means 32, with the coupling elements 15 and 16 clamped therebetween, are moved relative to the die members 33 and 34 in vertical direction. In a preferred form of the apparatus the punch 31 and the additional punch means 32 are held stationary, whereas the die members 34 and 38 are moved relative to the aforementioned members in upward direction as indicated by the arrows in FIG. 4. The cutting edges 38 and 44 on the one side and the cutting edges 39 and 45 on the other side cooperate together to cut during the movement relative to each other the connection portions 40 and 41 for the length of the gap 19 to be cut out from the coupling members 15 and 16. The

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movement of the cutting edges is carried out in such a manner that the cutting edges 38 and 39 move away from the carrier bands 13 and 14 so that a damage of these carrier bands will not occur. The portion of the coupling members remaining on the carrier bands 13 and 14, which portions consist of the leg portions 42 and 43 and the connecting portions 46 and 47 which are provided with the coupling faces and which remain attached to the leg portions have a U-shaped configuration.

During the second operating step which is illustrated in FIGS. 5 and 6, the remaining portions of the coupling members are pulled out from the loops of the holding threads 17 and 18. This operation is performed in the following manner:

After the tools 30 have reached the relative position to each other as illustrated in FIG. 4, the die members 33 and 34 are moved downwardly. The die members 33 and 34, as well as the members 35 and 36 of the additional punch means are provided on the sides thereof respectively facing the carrier bands 13 and 14 with inclined clamping faces 48 and 49, which during downward movement of the die members 33 and 34 approach each other to clamp the carrier bands 13 and 14 therebetween. After the members have reached the position as illustrated in FIG. 5, the ejector punch 37 sandwiched between the members 35 and 36 is moved together with the punch 31 in upward direction relative to the die 33, 34, while the carrier bands 13 and 14 remain clamped between the aforementioned clamping faces 48 and 49. During this movement of the ejector punch 37 and the punch 31, the remaining portions of the coupling members are pulled out from the loops of the holding threads 17 and 18. To obtain a better grip on the remaining portions of the coupling members, it is advantageous to provide the end face of the ejector punch 37 and the bottom face of the punch 31 with appropriate small cavities formed in such a manner to assure a tight engagement of the portions of the coupling members with the aforementioned faces.

A further embodiment of pulling means 50 according to the present invention is illustrated in FIG. 7. The pulling means illustrated in FIG. 7 are constructed and operate in the following manner:

After the connecting portions 40 and 41 which face away from each other have been severed from the corresponding leg portions, over a distance corresponding to the length of the gap 19 to be formed, by cutting means, for instance similar to cutting means as illustrated in FIGS. 3 and 4, the slide fastener band 10 is moved in longitudinal direction until the coupling members from which the connecting portions 40 and 41 have been severed are located between the operating elements of the pulling means 50. Movement of the slide fastener band 10 is then stopped, and the second operation, that is pull out of the remaining portions of the coupling elements from the loops of the holding threads 17 and 18 is performed by the apparatus as illustrated in FIG. 7. This apparatus is preferably spaced from the cutting means a distance equal to that between successive gaps 19 to be formed in the slide fastener band 10 so that during pull out of the remaining coupling portions by the pulling means 50, the cutting apparatus ahead of the pulling means may perform its cutting operation.

The pulling means 50 illustrated in FIG. 7 comprise two oppositely, substantially vertically arranged, blade-shaped clamping members 51 and 52 which, when the slide fastener band 10 is at rest, are moved towards each other so as to engage the remaining portion of the coupling members from opposite sides in the region of the connecting portions 46 and 47. The carrier bands 13 and 14 are sandwiched between plate shaped substantially horizontal clamping means 53 and 54 and clamped therebetween, whereupon the clamping means 53 and 54 are moved in downward direction, as indicated by the arrow 55, to pull thereby the leg portions 42 and 43 of the remaining portions of the coupling members, which are stationarily held

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between the opposite ends of the clamping members 51 and 52, out of the loops of the holding threads 17 and 18. A gap free of coupling elements is thus formed and the slide fastener band 10 is then again fed in longitudinal direction for a distance equal to that between two gaps and the aforementioned cycle is repeated.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of apparatus for providing gaps free of coupling elements in a slide fastener band originally produced with continuous rows of coupling elements differing from the types described above.

While the invention has been illustrated and described as embodied in an apparatus for providing gaps free of coupling elements in a slide fastener band originally produced with continuous rows of coupling elements in which the coupling elements are formed by a continuous filament which is attached by holding threads to the carrier bands of the slide fastener, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

As will be obvious to those skilled in the art, the movement of the various elements of the pulling means described can be carried out also in a manner different from the manner mentioned above, essentially is only that the various elements are moved relative to each other in such a manner so as to pull the remaining portions of the coupling elements out of the loops formed by the holding threads. For instance in the embodiment shown in FIGS. 5 and 6 the die members 33 and 34 together with the members 35 and 36 of the additional punch means could be moved downwardly while the ejector punch 37 and the upper punch 31 remain stationary, and with the arrangement shown in FIG. 7 it would be possible to move the carrier band 13 and 14 not in downward direction as described relative to the stationarily held remaining portion of the coupling members, but to move the carrier bands 13 and 14 in substantially horizontal direction away from each other.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

We claim:

1. A method of producing gaps of predetermined length and free of coupling elements and spaced a selected distance from each other in a pair of pulled up continuous slide fastener stringers each comprising a carrier band and an uninterrupted row of coupling elements along one edge of the carrier band and formed by a continuous filament bent so as to form leg portions extending spaced in longitudinal direction of said edge from each other and transverse to the latter and connecting portions connecting respective ends of adjacent leg portions to each other, wherein the coupling elements abut over part of the width against one face of the carrier band and the connecting portions projecting beyond said edge are formed with coupling faces engaged with corresponding coupling faces on the filament of the other stringer, and wherein the leg portions are intermediate the ends thereof connected by holding threads to said band, said method comprising the steps of severing the leg portions of a plurality of coupling elements of the filament of each stringer and extending over a distance equal to said predetermined length from the connecting portions located on one side of said holding threads and facing away from the connecting portions formed with said coupling faces; gripping the con-

necting portions formed with said coupling faces of said plurality of coupling elements and which are still connected to said leg portions; and moving said gripped connecting portions relative to the carrier bands in such a manner so as to pull the leg portions connected to said gripped connecting portions out of said holding threads.

2. A method as defined in claim 1, and including the step of moving said slide fastener stringers in longitudinal direction through a distance equal to said selected distance and repeating the aforementioned steps.

3. A method as defined in claim 2, wherein said slide fastener stringers are intermittently moved through said selected distance after said leg portions are severed and before the connecting portions formed with said coupling faces are gripped and subsequently moved so as to pull said severed leg portions out of said threads.

4. A method as defined in claim 2, wherein intermittent movement of the slide fastener stringers in longitudinal direction occurs only after the severed legs have been pulled out of said threads.

5. An apparatus for carrying out the method of claim 1 and comprising, in combination, cutting means having cutting edges arranged to engage the leg portions of said stringers to said one side of said holding threads and movable in direction substantially normal to said leg portions for cutting off the connecting portions located at said one side of said holding threads from said leg portions; and pulling means arranged to engage the connecting portions on the other side of said holding threads and movable relative to said carrier bands in a direction so as to pull the leg portions connected to said connecting portions on the other side of said holding threads out of the latter.

6. An apparatus as defined in claim 5, wherein said cutting means include a punch having a pair of substantially parallel cutting edges extending in longitudinal direction through said predetermined distance and being spaced in transverse direction a distance from each other substantially equal to the distance between that connecting portions on a pair of pulled up stringers which face away from each other, and a die having cutting edges aligned with said cutting edges of said punch, said die and punch being movable with respect to each other for cutting off said connecting portions from the ends of said leg portions.

7. An apparatus as defined in claim 6, wherein said die is movable relative to said punch in direction away from the carrier bands of the two stringers during cutting off said connecting portions.

8. An apparatus as defined in claim 6, and including additional punch means located opposite said one punch and between said cutting edges of said die, said additional punch means having faces arranged to engage the carrier bands of the two stringers on faces thereof opposite to the faces against which said coupling elements abut and said

additional punch means being movable together with said one punch relative to said die.

9. An apparatus as defined in claim 8, wherein said die means has a pair of clamping faces spaced from and facing a corresponding pair of clamping faces on said additional punch means, said clamping faces cooperate with each other for clamping portions of the carrier bands of the two stringers therebetween, said additional punch means including further an ejector punch arranged for acting on the connecting portions provided with the coupling faces, being movable together with said one punch relative to said die and the remainder of said additional punch means for pulling the leg portions connected to said connecting portions provided with said coupling faces out of said holding threads after the other connecting portions have been cut off from said leg portions.

10. An apparatus as defined in claim 6, wherein said pulling means are displaced in longitudinal direction of said stringers from said cutting means.

11. An apparatus as defined in claim 10, wherein said pulling means are displaced in longitudinal direction of said stringers from said cutting means through a distance substantially equal to said selected distance between successive gaps to be formed in the slide fastener band.

12. An apparatus as defined in claim 10, wherein said pulling means include opposite clamping members of a maximum width substantially equal to that of the engaged connecting portions of the pair of stringers and of a length equal to said predetermined length, and a pair of clamping means respectively located to opposite sides of said clamping members for respectively clamping carrier band portions of the pair of stringers therebetween, said clamping members being movable relative to each other for clamping said engaged connecting portions therebetween, and said clamping means being movable relative to said clamping members in a direction for pulling said leg portions connected to the engaged connecting portions out of said holding threads.

#### References Cited

##### UNITED STATES PATENTS

|           |         |           |            |
|-----------|---------|-----------|------------|
| 3,005,581 | 10/1961 | Burbank   | 83—921     |
| 3,128,543 | 4/1964  | Fasciano. |            |
| 3,225,430 | 12/1965 | Fasciano. |            |
| 3,245,136 | 4/1966  | Taylor    | 29—408 X   |
| 3,391,441 | 7/1968  | Carlile   | 29—207.5 X |

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U.S. Cl. X.R.

29—200, 207.5, 208; 83—921