Nov. 3, 1959 H. HANSEN 2,910,755

SLIDE FASTENERS

Filed Sept. 4, 1956 3 Sheets-Sheet 1

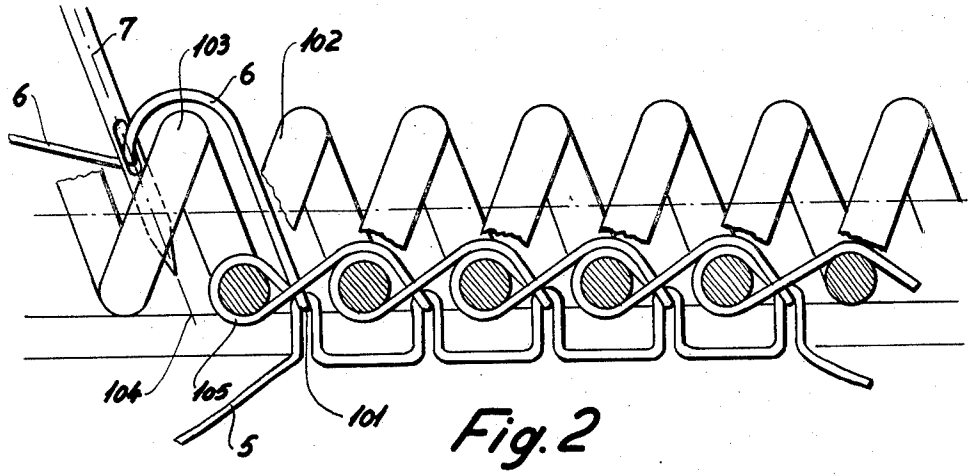

Fig. 2

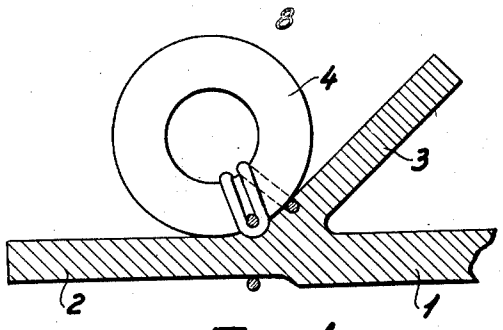

Fig. 1

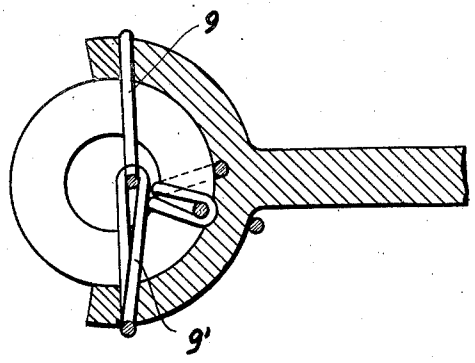

Fig. 3

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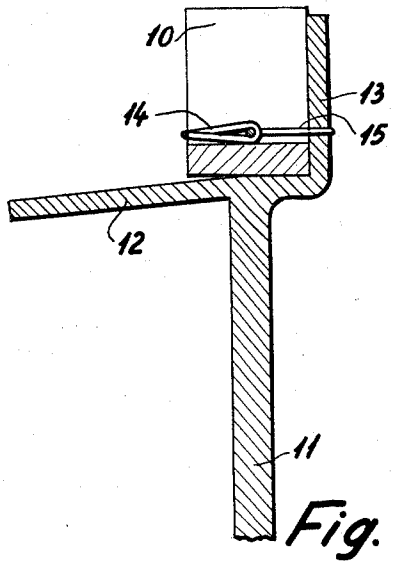

Fig. 4

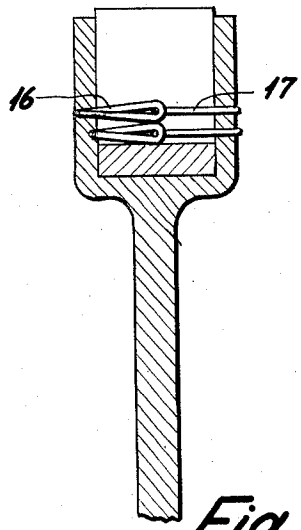

Fig. 5

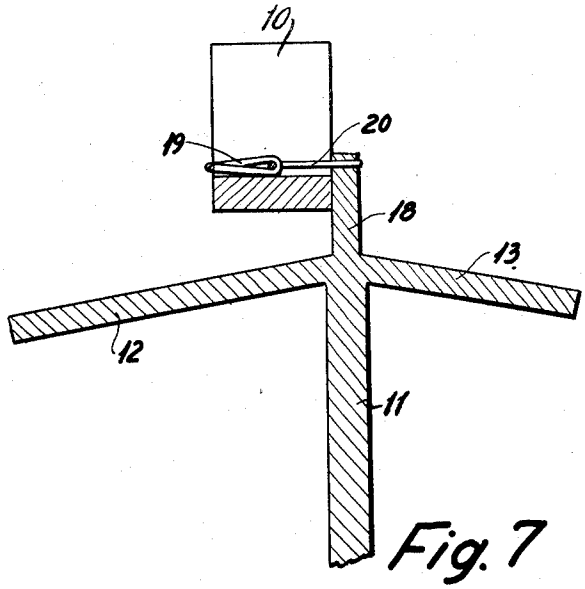

Fig. 7

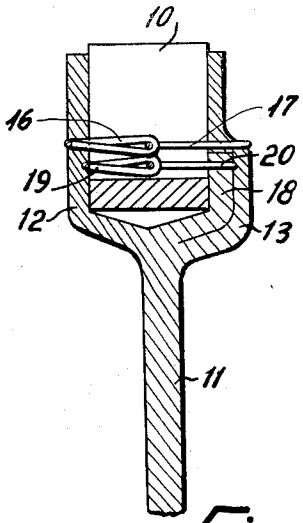

Fig. 8

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SLIDE FASTENERS

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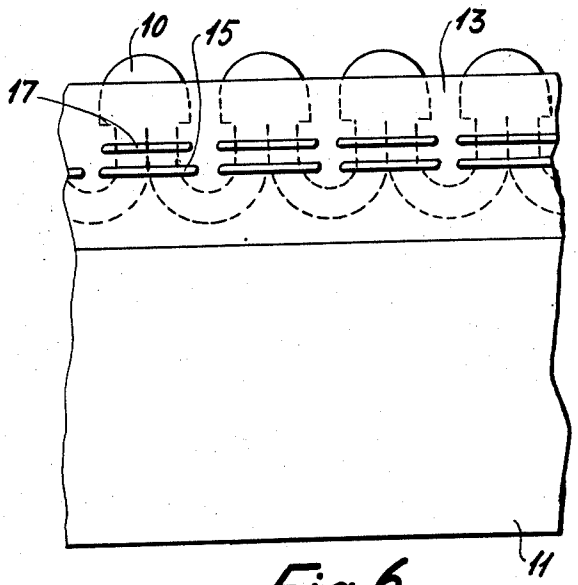

Fig. 6

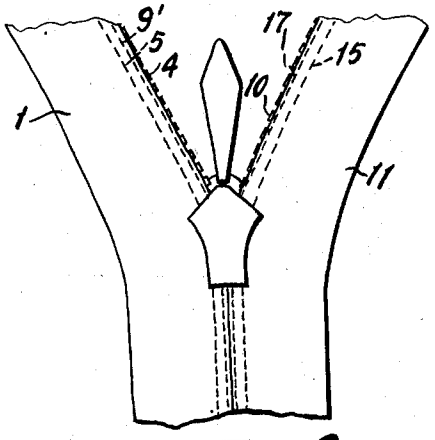

Fig. 9

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SLIDE FASTENERS

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Application September 4, 1956, Serial No. 607,810

Claims priority, application Denmark February 16, 1956

7 Claims. (Cl. 24—205.1)

This invention relates to slide fasteners of the type in which the rows of coupling links are made from a continuous string constructed with regularly shaped and distributed curls or curved portions to form the coupling links. The term "string" as used in this specification is intended to include any form of a ribbon, band, thread, filament or similar element of any cross sectional configuration commonly used or suitable for the production of slide fasteners of the type here in question, while the term "curl" is intended to mean any form of a curvilinear portion of a string suitable when recurring regularly along the length of the string to form the engaging members or coupling links of a slide fastener. The type of slide fasteners above defined is of particular interest where it is desired to make the rows of coupling links from flexible non-metallic materials, such as modern plastics among which nylon is an example.

One example of a regularly curled string that comes within the above definition is a coil in which the coupling links will be formed by the convolutions or turns of said coil. Another example is a non-coiled serpentine-like structure which may be substantially flat and consists essentially of a string bent back and forth to form open loops directed alternately one way and the other. In the finished slide fastener every second of these loops will be directed towards the middle of the slide fastener or in other words towards the opposite row of coupling links for engagement therebetween. These loops will be referred to in the following as "outward loops," while the loops therebetween having their closed ends directed away from the middle of the slide fastener will be referred to as the "inward loops." Slide fasteners, in which the two rows of coupling links are constructed in accordance with one and the other respectively of the two basic forms described, form the object of my co-pending application Serial No. 592,915. The present invention is very well suited for use in slide fasteners of the type disclosed in my said co-pending application, but may also be successfully used in slide fasteners, in which both rows of coupling links are constructed in accordance with one of the said basic forms, or in any other type of slide fastener of the general type above defined.

More particularly, the invention has to do with the manner in which rows of coupling links of the type referred to are attached to the flexible support, on which they are to be seated in the finished slide fastener. This flexible support is generally in the form of a tape of textile fabric and, for convenience, will be referred to in the following as the tape, but it will be understood that on principle it makes no difference whether the flexible support is in the form of a separate tape to be attached to a garment by sewing or is formed by a larger piece of material or by the garment itself, and likewise it is not essential whether the flexible support or tape consists of a textile fabric or of any other suitable material, such as a sheet of plastic.

Rows of coupling links of the type here considered are generally attached to the tapes by a sewing operation, and

it is an object of the invention to provide an improved sewing method, by which such rows of coupling links can be reliably attached to the tapes in a simple and rapid operation.

Another object of the invention is to provide a sewing method, by which a row of coupling links of the type referred to can be attached to a flexible support in such a manner that in the finished slide fastener the danger of breakdown due to wear on the sewing thread will be kept at a minimum.

A further object of the invention is to devise a slide fastener of the type concerned, in which the rows of coupling links are firmly and reliably held in grooves between wings along the edges of their respective tapes so as to effectively reduce the danger of catching of extraneous bodies or elements between the rows of coupling links and the slide of the slide fastener, and to expose any sharp edges of the rows of coupling links as little as possible.

With these and other objects in mind, there is provided, according to one feature of the present invention, a structure for use in slide fasteners, comprising a flexible support constructed with two wings along an edge thereof to form a groove therebetween, a continuous string regularly curled to form a row of coupling links being received in the groove between said wings and being attached to said flexible support by means of a first sewing seam located adjacent the bottom of said groove and a second sewing seam extending transversely through both of said wings and the row of coupling links received therebetween.

The invention also relates to special methods, by which the said sewing operations, and particularly the sewing at the bottom of the groove between the marginal wings of the tape, can be performed, and also to a special form of a backstitch seam for attaching a helical row of coupling links to a tape.

Other features, objects and advantages of the invention will be apparent to those skilled in the art from the following detailed description of some specific embodiments and examples, reference being made to the accompanying drawings, in which:

Figure 1 illustrates a first stage of the process of attaching a helical row of coupling links to a tape constructed with two marginal wings, in a section taken perpendicularly to the longitudinal direction of the tape and the row of coupling links,

Figure 2 is a longitudinal section through same,

Figure 3 shows the same tape with the row of coupling links attached thereto upon completion of an additional and final sewing operation, as viewed in section perpendicularly to the longitudinal direction of the tape and the row of coupling links,

Figure 4 illustrates a first stage of the process of attaching a serpentine-like or looped line row of coupling links to a tape having two marginal wings, in a section taken perpendicularly to the longitudinal direction of the tape and the row of coupling links,

Figure 5 shows a corresponding section upon the completion of an additional and final sewing operation,

Figure 6 shows the structure of Figure 5 in side elevation as viewed from the right hand side in Figure 5,

Figure 7 illustrates a first stage of the attachment of a serpentine-like or looped line row of coupling links to a tape constructed with three marginal wings, as viewed in a section at right angles to the longitudinal direction of the tape and the row of coupling links,

Figure 8 is a corresponding section upon the completion of an additional and final sewing operation, and

Figure 9 shows a slide fastener comprising one row of coupling links attached to a tape in accordance with the structure illustrated in Figure 3 and another row of

coupling links attached to its tape in accordance with the structure illustrated in Figure 5.

Referring first to Figures 1–3, 1 is a tape, the marginal portion of which is split up into two wings 2 and 3. 4 is a coil shaped or helical row of coupling links to be sewn to the said tape.

To this end, in a first stage of the operation, one marginal wing 3 is bent backwards as illustrated in Figure 1, and while the wing 3 remains in this position, the row of coupling links 4 is attached to the wing 2 adjacent the base thereof by a sewing operation. In the example illustrated, this sewing may be performed by means of an ordinary back-stitch sewing machine operating with an upper- or front-thread or yarn and an under- or back-thread or yarn. Where reference is made here and in the following to a back-stitch seam, this is meant to refer to the ordinary type of sewing seam formed by interengaging simple loops or stitches gripping the structure to be sewn from one and the other side respectively. In the instance under consideration, the sewing seam, though made by means of a back-stitch sewing machine, will not strictly speaking be a back-stitch seam as above defined, as will be apparent from the description to follow. During the sewing, the upper-thread is passed from the topside of the helical row of coupling links at an inclination down through each convolution of the coil in succession and then through the tape, to which it is attached by means of the under-thread in the ordinary manner as illustrated in Figure 2. This results in a peculiar loop formation, which will best be understood by reference to Figure 2. This figure illustrates, how the sewing progresses in a direction from the right to the left, which means that the tape and the coil are fed forward in a direction from the left to the right. The last attachment between the under-thread 5 and the upper-thread 6 that has been made prior to the instant considered, is denoted by reference character 101. From this point of attachment, the upper-thread has been pulled obliquely up through the convolution 102 and across the top portion of the next following convolution 103 by means of the needle 7 in conjunction with the feeding movement of the tape and coil, and in the moment illustrated in Figure 2, the needle 7 is in the process of passing the upper-thread obliquely down through the said next following convolution 103 to perform the next attachment at 104. In this manner, a large loop is formed between the points of attachment 101 and 104, which loop straddles the top of the convolution 103. When the upper-thread is subsequently tightened, the said loop is at the same time caused to slide down the side flank of the convolution 103, so that it will take the same form as its predecessor as illustrated at 105. It will thus be seen that in the completed structure, the upper-thread will extend from a point of attachment in each interval between consecutive convolutions of the coil through the convolution on one side of the said interval and then under and back through the next following convolution to a point of attachment in the next following interval between convolutions. In this manner, each convolution will be directly connected in the sewing zone with its neighbouring convolutions through loops lying above the tape without being attached in an intermediate point. One result of this is that if the row of coupling links is subjected, in a zone thereof, to forces in a direction away from the tape, such as will occur when the assembled rows of coupling links are subjected to forces tending to pull them apart, the individual convolutions or in other words coupling links in the zone in question will be contracted towards one another so as to strengthen the engagement between these coupling links and the corresponding coupling links of the other row.

To keep the sewing thread free from wear as much as possible in the finished slide fastener, it is important that the sewing should be made as closely as possible to the base or bottom end of the wing 2, and considering the position which the row of coupling links is to occupy between the two wings 2 and 3 in the finished slide fastener, it is therefore preferable not to perform the sewing in the middle plane of the row of coupling links but in a plane displaced therefrom as far as possible in a direction towards the body portion 1 of the tape. In Figure 1, the dash dotted line 8 indicates the plane, in which the threads are carried during the sewing, and it will be seen that this plane comes as closely as possible to a tangential plane to the inner contour of the coil when allowance has to be made for the thickness of the thread. Moreover it will be seen that the said plane intersects the wing 2 along a line adjacent the base thereof. The needle 7 will be located immediately to the left of the said plane and will have the outlet end of its eye and also its hook or catch arranged on the right hand side thereof as viewed in Figure 1. This carrying of the threads in a plane displaced relative to the middle plane of the helical row of coupling links is also advantageous from another point of view. As above mentioned, the large loop 6 formed between consecutive points of attachment across the top of the convolution therebetween should be caused during the tightening thereof to slide down along the flank of the convolution 103. It is important that this sliding should take place to the proper side, viz. as viewed in Figure 1 to the right, or more generally the sliding should take place down the flank portion, which is inclined forwards in the direction of progress of the sewing, the term "forward inclination" being intended to mean an inclination such that the loop when sliding will thereby be advanced in the direction of progress of the sewing. When the upper-thread is already in advance located in a plane displaced relative to the middle plane of the coil, as above described, this will facilitate the sliding of the loop to the proper side, so that it becomes easier to prevent a sliding to the wrong side, whereby the convolution in question would be completely liberated from the stitches formed by the sewing thread.

After the sewing illustrated in Figures 1 and 2 has been completed, the wings 2 and 3 are closed together around the row of coupling links 4 and a transverse sewing seam is applied through the two wings and the helical row of coupling links therebetween, as illustrated in Figure 3. In this case, this sewing is made with back-stitches formed by an upper-thread 9 and an under-thread 9' having their loops interengaged in the middle of the row of coupling links. The attachment of the helical row of coupling links to the tape has thereby been completed. It will be seen that the threads 9, 9' of this second seam are supported against the threads of the first seam and are thereby prevented from sliding back.

Figures 4 and 5 illustrate the attachment of a serpentine-like or looped line row of coupling links 10 such as e.g. disclosed in my co-pending application Serial No. 592,915 to a tape 11, the marginal portion of which is split up into two wings 12 and 13. In a first operation, the wing 12 is bent backwards and the serpentine-like row of coupling links 10 is sewn to the wing 13 by means of a back-stitch seam formed by an upper-thread 14 and an under-thread 15. It will be seen that the upper-thread 14 is attached to the under-thread and thereby to the fabric of the tape in points adjacent the closed ends of the inward loops of the row of coupling links, so that the loops of the upper-thread will straddle the outward loops of the row of coupling links adjacent the bases thereof as best illustrated in Figure 6. In this case, the loop formation is entirely normal and there is no sliding of loops as described with reference to Figures 1 and 2. In a second operation, the wing 12 is bent forward along the side of the serpentine-like row of coupling links 10 and a transverse sewing seam is applied through the two wings 12 and 13 and the row of coupling links 10 therebetween, the sewing threads being passed through the inward loops thereof. Also this second sewing has been

illustrated as a simple back-stitch sewing with an upper-thread **16** and an under-thread **17**, the loops of which interengage in the middle of the row of coupling links. Also in this case the threads of the second seam are supported against the threads of the first seam.

Figures 7 and 8 illustrate a modification, in which a tape **11** is used which in addition to the wings **12** and **13** has a middle wing **18**. In the first operation, as illustrated in Figure 7, the serpentine-like row of coupling links **10** is sewn to the middle wing **18** by means of a back-stitch seam **19, 20** in the same manner as it was sewn to the side wing **13** in Figure 4. In this first stage, both side wings **12** and **13** are bent backwards and are kept in this position while the sewing is being performed. In a subsequent operation, as illustrated in Figure 8, the wings **12** and **13** are bent forward along the sides of the serpentine-like row of coupling links and the same transverse sewing with back-stitches **16, 17** as is illustrated in Figure 5 is performed. It will be seen that in this case the first sewing seam or bottom sewing seam will be perfectly protected between the side wings **12** and **13** so that the sewing thread will nowhere be present on the surface along which the slide is to be slid in the finished slide fastener. In exactly the same manner, a middle wing might be used for the attachment of a helical row of coupling links with equal results.

In Figure 9, a sewn helical row of coupling links according to Figure 3 is assembled with a sewn serpentine-like row of coupling links according to Figure 5 to form a slide fastener in which the loops of the serpentine engage between the convolutions of the coil. As described in my above mentioned co-pending application Serial No. 592,915, this structure distinguishes itself by a very firm and reliable engagement and other advantages, but the present invention is by no means limited to this structure, but can be used with equal success for slide fasteners in which two rows of coupling links according to Figure 3 or two rows of coupling links according to Figure 5 are assembled with one another. In the slide fastener of Figure 9 is will be seen that the free ends of the side wings **12** and **13** apply themselves to the flanks of the helical row of coupling links so as to practically abut the ends of the side wings **2** and **3** of the tape to which the helical row of coupling links is attached. The transverse sewing seam **16, 17** through the serpentine-like row of coupling links ensures that the side wings **12** and **13** remain in this position, and likewise the transverse sewing seam **9, 9'** through the helical row of coupling links ensures that the side wings **2** and **3** remain in the position shown. The slide of the slide fastener engages with the outer surfaces of the side wings and in the closed position of the slide fastener the rows of coupling links will therefore not at all be visible. Also in the open position of the slide fastener they will not be very conspicuous because they lie retracted between the wings of their respective tapes. As a rule it will therefore not be necessary to tint the rows of coupling links in accordance with the colour of the tapes. E.g. it may suffice to produce the rows of coupling links in one relatively dark and one relatively light shade, or the rows of coupling links may be produced from a transparent material, because the rows of coupling links will then take colour from the fabric owing to their position between the wings.

Moreover, it will be seen that the bottom sewing seams of the rows of coupling links lie in a retracted position relative to the lateral surfaces of the slide fastener, such that these seams are not much exposed to wear from the slide. These sewing seams, which are those on which the lifetime of the slide fastener primarily depends, can therefore be regarded as well protected against wear. By proceeding as illustrated in Figures 7 and 8 as far as the serpentine-like row of coupling links is concerned, and in similar manner as far as the helical row of coupling links is concerned, these bottom sewing seams may be additionally protected so that their thread will not at all be present on the outer surface of the slide fastener along which the slide is slid. Moreover, it is characteristic of all the sewing seams shown that any parts of the sewing thread present on the outer surface of the slide fastener extend throughout in the longitudinal direction thereof, whereby they are considerably less exposed to wear than thread portions extending transversely of the longitudinal direction of the slide fastener.

The danger of gripping of extraneous matter, such as underwear or the like garments, when the slide is pulled back and forth is very considerably reduced as a consequence of the sewing method described, because the side wings between which the rows of coupling links lie retracted cannot unintentionally bend away from the rows of coupling links, but are positively held in their protecting position so that any sharp edges of the rows of coupling links that might be inclined to grip foreign matter are efficiently covered.

I claim:

1. In slide fasteners, a structure comprising a flexible support having two wings along an edge thereof to form a groove therebetween, a continuous string regularly curled to form a row of coupling links being received in the groove between said wings and being directly attached to one of said wings by means of a first sewing seam composed of stitches traversing the said wing adjacent the base thereof and individually straddling recurring portions of the curls of said string forming said coupling links, a second sewing seam being provided which extends transversely through both of said wings and the row of coupling links received therebetween.

2. A structure as in claim 1, in which said first sewing seam is a back-stitch seam having the loops of its back-thread extending along the outside of said one wing and having the loops of its front-thread straddling said recurring portions of the curls of said string.

3. A structure as in claim 1, in which said second sewing seam is a back-stitch seam having the loops of its front and back-thread extending along the outside of said first and second wing respectively and traversing said wings to interengage in the middle of said row of coupling links.

4. In the manufacture of slide fasteners, a method of attaching a row of coupling links formed by a coiled string to a flexible support having two wings along an edge thereof, comprising the steps of bending one of said wings back towards the body of said support, applying said coiled string to the other of said wings in a position such that a tangential plane to the inner contour of said coiled string perpendicular to said other wing will intersect the latter adjacent the base thereof, passing a sewing thread closely to said tangential plane from the top side of said coiled string at an inclination down through each convolution thereof in succession to be attached to said other wing, said inclination being directed backwards relative to the direction of progress of the sewing, thereby forming loops extending between consecutive points of attachment and straddling the top portion of the respective convolution located therebetween, successively tightening said loops, and while so tightening them causing them to slide down along the flank portion of the respective loop having a forward inclination in the direction of progress of the sewing, bending said first mentioned wing forwards along the side of said coiled string, and applying a back-stitch seam traversing both of said wings and the coiled string therebetween.

5. In the manufacture of slide fasteners, a method of attaching a row of coupling links formed by a continuous string of non-coiled serpentine-like configuration composed of alternate outward and inward loops, to a flexible support having two wings along an edge thereof, comprising the steps of bending one of said wings back towards the body of said support, applying said row of coupling links to the other one of said wings, passing a sewing thread from the top side of said row of coupling

links through the inward loops of said string in succession adjacent the closed ends thereof to be attached to said other wing, thereby to form loops of sewing thread straddling the outward loops of said string adjacent the bases thereof, bending said first mentioned wing forward along the side of said row of coupling links, and applying a back-stitch seam traversing both of said wings and the row of coupling links therebetween along a line located outside the said loops of sewing thread.

6. A structure as in claim 1, in which the stitches of said second sewing seam are supported, in a direction towards the bottom of said groove, against the stitches of said first sewing seam.

7. A slide fastener comprising a first flexible support constructed with two wings along an edge thereof to form a groove therebetween, a first row of coupling links formed by a coiled string being received in the groove between said wings and being attached to said flexible support by means of a first sewing seam formed by a sewing thread which from a point of attachment adjacent the base of one of said wings and between each pair of successive convolutions of said coil extends through one of said convolutions and then below the next following convolution and back through the latter to a point of attachment between same and said one of said pair of convolutions, and likewise adjacent the base of said wing, and a second sewing seam extending transversely through both of said wings and the row of coupling links located therebetween, a second flexible support constructed with two wings along an edge thereof to form a groove therebetween, a second row of coupling links formed by a continuous string of non-coiled serpentine-like configuration composed of alternate outward and inward loops being received in the groove between said wings of said second flexible support and being attached thereto by means of a first sewing seam comprising loops of sewing thread attached to one of said wings of said second flexible support and straddling outward loops of said string adjacent the bases thereof, and a second sewing seam extending transversely through both of said wings of said second flexible support and through inward loops of said string along a line located outside the said loops of sewing thread, the outward loops of said serpentine-like row of coupling links being engageable between the convolutions of said coil-shaped row of coupling links.

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