APPARATUS FOR BACKING SLIDE FASTENER ELEMENTS

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This invention relates generally to separable fasteners and to apparatus for making the same. It is particularly directed to a novel slide fastener assembly structure and to apparatus for securing the structure to a base. Slide fasteners include those separable fasteners constituting stringers adapted for interfiting engagement with each other and a slider movable along the stringers for effecting engagement and disengagement of the latter. Slide fasteners are broadly of two types. One type is that which comprises generally a row of substantially parallel spaced links or coupling elements, each link or coupling element being secured at one end to a runner or cord, and the links or coupling elements together with the runner constituting a stringer. The free ends of the links or coupling elements are adapted for interfiting engagement with the links or coupling elements of a second stringer; and a slider is provided for effecting the engagement and disengagement of the stringer elements.

Another type of separable fastener is that which employs helicoid stringers wound for interfiting engagement with each other, as disclosed in my prior United States Patent No. 2,300,442, and also shown in my United States Patents Nos. 2,541,728 and 2,541,729. The last two patents and my copending application for United States patent entitled "Method and Apparatus for Making Separable Fasteners," bearing Serial Number 418,491, filed March 25, 1954, relate to means for making such helicoid stringers.

In this type of fastener like portions of all convolutions or loops of the helicoid stringers serve as links or coupling elements, and other like portions of all convolutions or loops constitute the equivalent of the runners or cords of the link-type fastener. While the apparatus of the present invention has been primarily developed and employed in connection with the type of separable fasteners having helicoid stringers, and will be described hereinafter with particular reference thereto, it will be understood that the novel features of the invention are equally well suited for use in connection with the link-type fastener.

More particularly, the present invention embraces improvements in the means for securing a helicoid stringer to a base disclosed in my United States Patent No. 2,586,891, wherein the securing of a helicoid stringer to a base involved a sewing operation in which it was necessary to pass a needle between adjacent convolutions of the stringer. Obviously, to produce the product shown in the cited patent, perfect synchronization of movement is required between the helicoid stringer and the sewing needle to prevent the latter from striking convolutions of the former and to effect securement, by lashing stitches, of each convolution to the base or backing member; and, further, the smallest helicoid stringer and base assembly available is limited by the size of the needle, as the latter must be able to pass between adjacent convolutions. In addition, the constructions and methods of the prior art required two separate sewing operations to attach the two stringers desired to form part of a single fastener to two separate tapes, and it was necessary to disengage the two stringers during the attaching operations, which served to increase labor costs and to produce misregister of the coupling elements of the two stringers due to elongation and other deformation thereof.

The present invention, which is illustrated in the drawing, and which will be described hereinafter in greater detail, contemplates apparatus for attaching a base to a helicoid stringer by a process of winding whereby a sewing operation at this stage in the manufacture of separable fasteners is obviated.

By means of the apparatus of the invention the base is built or fabricated prior to the stringer in such manner that a helicoid stringer of minute proportions may be provided with a base or backing member, or, in fine, a fabric attached to and paralleling the stringer along one side thereof and through which a sewing needle may subsequently be conveniently passed for the purpose of securing the stringer and base assembly to a suitable tape. Further, by means of the present apparatus a stringer and base assembly may be made at relatively high speed.

A form of the apparatus adopted for the purpose of illustrating the invention in the drawing is adapted for lashing a cord or the like to the outside of and parallel to the stringer by means of one or more filaments wound around the cord and around consecutive like portions of the convolutions of the helicoid stringer. Of course, while both the cord and the lashing filaments constitute the base or backing member, it will be understood that the cord, which may be of sufficient thickness to facilitate the subsequent sewing operation when the stringer and base assembly is attached to a tape, is, for practical purposes, the sewable base, for the lashing filaments may be extremely fine threads. However, the apparatus as illustrated may operate to form a base along the outside of the stringer, the base comprising solely what would have been the lashing filaments had they been present. In such case, of course, the filament or filaments wound around consecutive like portions of the convolutions of the helicoid stringer should be of sufficient thickness to provide an easily sewable base.

The present apparatus is adapted to operate in association with a pair of stringers which may be fed toward the apparatus in interfiting engagement, separated in usual manner, and, after the application of a base to each of the stringers, rejoined, so that the resulting product is an interfitted pair of stringers with bases attached to the outsides of the pair. Thus an advantage of the invention is that a pair of stringers in interfiting engagement and provided with oppositely disposed tapes may be united with the articles to be separably fastened at relatively high speed by means of a two-needle sewing machine or other multiple securing device which may be employed to unite the stringers in their engaged relationship, and with such articles. As no synchronization is required between the stitching and the convolutions of the stringers, a sewing machine may operate at extremely high speed to effect a considerable saving in time in completing the fastener. Relative deformation or other misregister of the stringers is obviated, and perfect matching thereof is maintained.

Further, as the stringers are firmly secured to their bases there is practically no likelihood of the stringers twisting and presenting their non-meshing portions toward each other, as frequently occurred in prior art constructions.

For convenience herein those portions of the convolutions of a helicoid stringer to which the base is at-
tached are regarded as being on the outside of the stringer; and, conversely, those other portions which operate as link and coupling elements in the finished fastener are regarded as being on the inside.

Other objects, features, and advantages of the present invention will be more fully understood from the following detailed description, and from the drawings, in which, for purposes of clarity, some parts are shown greatly en-
larged and somewhat exaggerated.

In the drawing:

Fig. 1 is an elevational view of one embodiment of the invention; Fig. 2 is the section 2—2 of Fig. 1, and Fig. 3 is a perspective view of a part of an apparatus showing the inventive device included therein.

It has been suggested above that the apparatus is adapted to operate in association with a pair of stringers originally in interfitting engagement, which, after separa-
tation in usual manner, may each be provided with a base, and then rejoined to produce a pair of interfitting stringers with bases attached to the outsides of the pair. However, the embodiment of the invention shown in the drawing is suitable for applying a base to a single stringer, and where it is desired to apply a base to each of two separate stringers subsequently to be joined together in inter-
fitting engagement, and to apply the bases simultaneously, two of such embodiments, or the equivalent, are required; and, also, two winding or braiding machines are required, the two embodiments and the two machines being in timed relationship to each other. It will be further understood from the following brief description of the structure of a pair of separable helicoid stringers adapted for inter-
fitting engagement, as disclosed in greater detail in United States Patents Nos. 2,300,442, 2,341,728, and 2,341,729, and in my pending application for United States patent bearing Serial Number 498,991, filed March 25, 1954, all mentioned above, that the two embodiments required for work with a cooperable pair of stringers may be either exact duplicates, or mirror images of each other, depend-
ing upon the relative directions of rotation of the associ-
a
ted winding or braiding machines. If the machines are directly geared together for opposite directional rotation, the embodiments would ordinarily be mirror images of each other. If, for example, an idler were employed in coupling the machines, the embodiments might well be exact duplicates.

The cooperable helicoid stringers of a pair forming part of the device of this invention, and the raceway hereto are preferably two oppositely directed, but otherwise similar, slightly flattened coil-like elements formed of like filaments of material which may be per-
manently set as helicoids. While the cross section of the stringer, as an entity, may be circular, it has been found more convenient in the manufacture of the com-
plete separable fastener that the cross section be elliptical for such cross section facilitates the application of bases to the cooperative stringers with less interference with the coupling elements thereof. A particular feature of the filament employed for form-
tion thereof, only by stretching the pair of helicoids to free their interlocking convolutions for sidewise move-
ment away from each other. In short, where two such helicoids form part of a separable fastener, a portion of the slider, already mentioned, is alternately to free the interlocking helicoids by progressively bending them away from each other, the equivalent of slightly elongating the helicoids at successive stations of position and simulta-
neously guiding the free convolutions sidewise out of en-
gagement with each other, in interfitting engagement by a reversal of such process.

The apparatus of the invention is adapted to operate as an attachment for, or in association with, a conven-
tional winding or braiding machine. Only those parts of such a machine necessary to an understanding of the pres-
ent invention are shown in Fig. 3. Thus, there is a table 2 having a racing 3 therein, which raceway is circular about the center of the table. Posts 4 and 5 travel in such raceway, driven therein by known mechanism, not shown, and mounted upon each post 4 and 5 is a spool 6 and 7 respectively, each carrying a supply of thread or other filament to be wound, one of these spools being in the base aperture 8 in such table 2, the aperture being enlarged at 9 to permit passage therethrough of a helicoid stringer.

The fixed cylinder is indexed 10, and has a longitudinal groove 11 along one side thereof, and two staggered helices 12 and 13, both wound in the same direction and freely surrounding the cylinder for rotation therearound. The helices 12 and 13 may be formed of wire or other suitable material which may be set in the form illustrated.

One end portion of the material of helix 12 extends tangentially away from the cylinder near the lower end thereof, and this tangentially extending portion is design-
ated 14. One end portion of helix 13 also extends tangentially away from the cylinder near the lower end thereof, and this last named tangentially extending portion is designated 15. It will be seen in Figs. 1 and 2 that the portions 14 and 15 of helices 12 and 13, respectively, extend away from the cylinder in opposite directions. Each of these portions 14 and 15 is secured, in suitable manner, to posts 4 and 5, respectively. Accordingly, as the spool carriers travel around their common circular path the two helices 12 and 13 are rotated around the cylinder 10.

The upper end portions of the material of helices 12 and 13 are bent to form simple thread or filament guides 16 and 17, respectively. Guide 16 is associated with a thread or filament 18 drawn from spool 6, and guide 17 is associated with a thread or filament 19 drawn from spool 7.

The cylinder 10 is longitudinally bored from end to end, as indicated by the reference number 20, and the top portion 21 of the bore is flared so that but an exceedingly this wall 22 remains between the upper end of the bore and the deepest part of the longitudinal groove 11 of cylinder 10.

A helicoid stringer 23 is seen in the drawing, and its elongation is thus at its widest, greater than its thick-
ness. For example, the cross section of the filament it-
self may be, and preferably is, substantially similar to a half circle, whereby the filament has a longitudinally ex-
tending flat surface. If the cross section of the filament employed is substantially similar to a half circle, the width of the filament is about twice the thickness thereof. Accordingly two filaments of this type may be wound in a staggered relationship to each other around a mandrel the cross section of which is elliptical or otherwise oblong, with the longitudinally extending flat surfaces of the two filaments in contact with the mandrel and thereby pre-
venting rotation of the filaments along their lengths; and, if the filaments result from so winding them, are set (e.g., as by heat-
treatment) in their resulting helicoid forms, the two heli-
coids may thereafter be separated, without literal destruc-

with the outside of the stringer by the actions of threads or filaments 18 and 19 which are respectively directed by guides 16 and 17 between alternate pairs of convolutions of the stringer, and, as a result of the operation of the winding machine,bash the cord 24 to the successive convolutions of the helicoid on the outside thereof, as shown.

It will be understood that the scale of the drawing is greatly enlarged, but this fact in no way affects the essence of the invention. Ordinarily a stringer of this type shown would be very small in cross section, possibly even less than one sixteenth of an inch. Further it will be understood that the helices 12 and 13, both as to cross section of their filiform material and as to pitch, are required to conform to the particular size and character of stringer to be handled by them. Where the stringer is of minute size the helices 12 and 13 may be wires of high gage, and therefore very resilient. However this has been found to be impossible as the intermeshing of the helices with the convolutions of the stringer has remained undisturbed under ordinary operating conditions even where minute filament cross sections were involved, for the more stable helicoid stringer actually operates to preserve the distribution of the convolutions of the feed elements. It is believed that a patent filament such as hereinafter described, a collar fixed with relationship to the cylinder, and, at the top thereof, or above, be provided to counteract against any tendency of the feed helices to progress axially with respect to the cylinder during their rotary movement therearound.

From the foregoing it will be understood that a single feed helix could be adapted to serve in place of the pair designated 12 and 13, provided the pitch of the single helix were 50% of that of either of those described. Similarly, the helicoid stringer might well be fed along the cylinder by means of a cylindrical matrix revolving around the cylinder 10, the matrix having suitable internal threads like a nut. In the latter case a filament may be brought into engagement with the helicoid stringer and the cord, if the latter is desired to be used, through a suitable opening in the matrix, which, of course, would revolve with the winding machine.

I claim:

1. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof; means cooperating with said cylinder for feeding a stringer of slide fastener elements along said groove and partly within the same; means for feeding a cord to said stringer of slide fastener elements, and a supply of filament traversing a fixed orbit around said cylinder, in timed relationship with said means, for winding filament around said stringer and between the elements thereof as the latter pass beyond an end of said cylinder.

2. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof and a longitudinal hole through said cylinder; means cooperating with said cylinder for feeding a stringer of slide fastener elements along said groove and partly within the same; a cord passed through said hole; and a supply of filament traversing a fixed orbit around said cylinder, in timed relationship with said means, for winding filament around said stringer and between the elements thereof as the latter pass beyond an end of said cylinder, and for lashing said cord to said stringer, whereby the advance of said stringer draws cord through said hole.

3. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof; means cooperating with said cylinder for feeding a helicoid stringer of slide fastener elements along said groove with certain parts of consecutive convolutions of said stringer partly within said groove; a cord passed through said hole; and a supply of filament traversing a fixed orbit around said cylinder, in timed relationship with said means, for winding filament around said certain parts of said convolutions and between said elements as the latter pass beyond an end of said cylinder, and for lashing said cord to said certain parts of said convolutions, whereby the advance of said stringer draws cord through said hole.

4. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof and a longitudinal hole through said cylinder; means cooperating with said cylinder for feeding a helicoid stringer of slide fastener elements along said groove with certain parts of consecutive convolutions of said stringer partly within said groove; a cord passed through said hole; and a supply of filament traversing a fixed orbit around said cylinder, in timed relationship with said means, for winding filament around said certain parts of said convolutions and between said elements as the latter pass beyond an end of said cylinder, and for lashing said cord to said certain parts of said convolutions, whereby the advance of said stringer draws cord through said hole.

5. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof; a helix surrounding said cylinder and rotating therearound in mesh with the consecutive convolutions of a helicoid stringer of slide fastener elements adjacent said groove with certain parts of said convolutions within said groove for feeding said stringer along said groove; means for feeding a cord to said stringer of slide fastener elements, a supply of filament traversing a fixed orbit around said cylinder for winding filament around said certain parts of said convolutions and between said elements as the latter pass beyond an end of said cylinder; and an elongated member extending radially from said helix and being fixed to an end thereof and engaging part of said supply of filament for rotation thereby.

6. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof and a longitudinal hole through said cylinder; a helix surrounding said cylinder and rotating therearound in mesh with the consecutive convolutions of a helicoid stringer of slide fastener elements adjacent said groove and with certain parts of said convolutions within said groove for feeding said stringer along said groove; a cord passed through said hole, a supply of filament traversing a fixed orbit around said cylinder for winding filament around said certain parts of said convolutions and between said elements as the latter pass beyond an end of said cylinder, and for lashing said cord to said certain parts of said convolutions, whereby the advance of said stringer draws cord through said hole.

7. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof; a helix surrounding said cylinder and rotating therearound in mesh with consecutive coupled slide fastener elements of a stringer thereof adjacent said groove with certain parts of said convolutions within said groove for feeding said stringer along said groove; means for feeding a cord to said stringer of slide fastener elements, a supply of filament traversing a fixed orbit around said cylinder for winding filament around said stringer and between the consecutive elements thereof as the latter pass beyond an end of said cylinder; and an elongated member extending radially from said helix and being fixed to an end thereof and engaging part of said supply of filament for rotation thereby.

8. In apparatus of the class described, a fixed cylinder having a longitudinal groove along one side thereof and a longitudinal hole through said cylinder; a helix surrounding said cylinder and rotating therearound in mesh with consecutive coupled slide fastener elements of a stringer thereof adjacent said groove with certain parts of said convolutions within said groove for feeding said stringer along said groove; a cord passed through said hole; and a supply of filament traversing a fixed orbit around said cylinder for winding filament around said stringer and between the consecutive elements thereof as the lat-
ter pass beyond an end of said cylinder, and for lashing said cord to said stringer between said elements, whereby the advance of said stringer draws cord through said hole; and an elongated member extending radially from said helix and being fixed to an end thereof and engaging part of said supply of filament for rotation thereby.

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