Dec. 8, 1970 C. S. THOMPSON 3,546,330

METHOD OF MAKING A TAPE SPLICE

Filed Aug. 2, 1968 2 Sheets-Sheet 1

FIG. 1

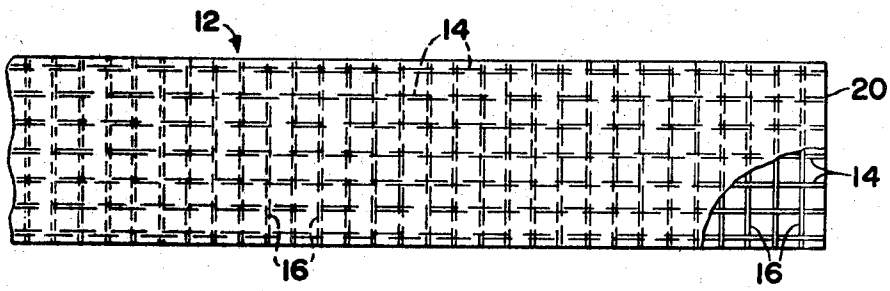
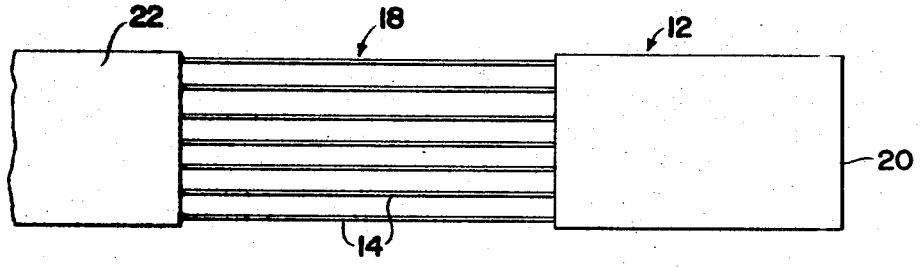


FIG. 2



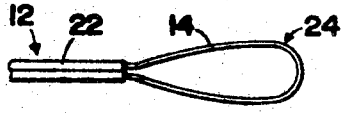


FIG. 3

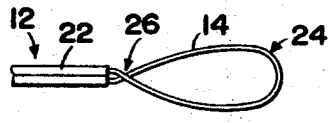


FIG. 4

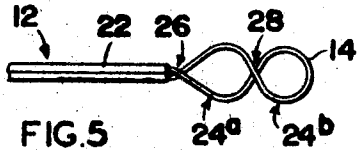


FIG. 5

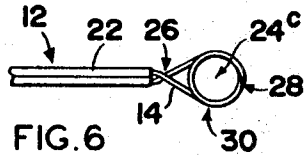


FIG. 6

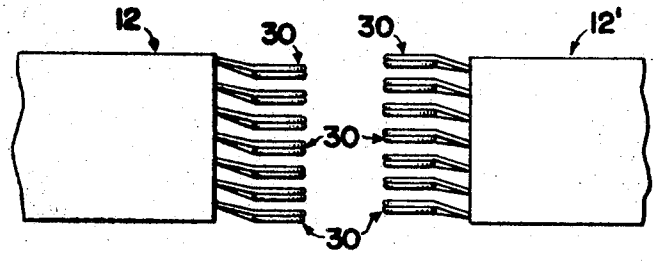


FIG. 7

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FIG. 8

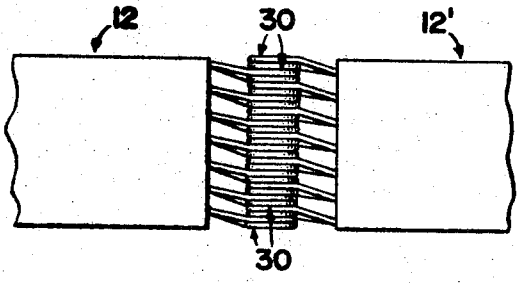


FIG. 9

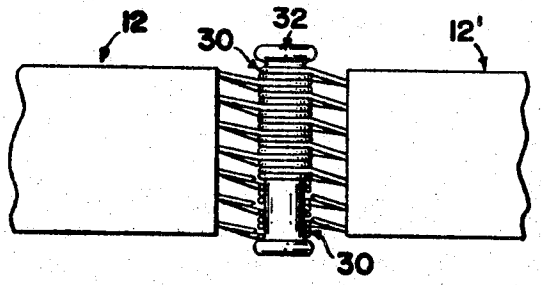


FIG. 10

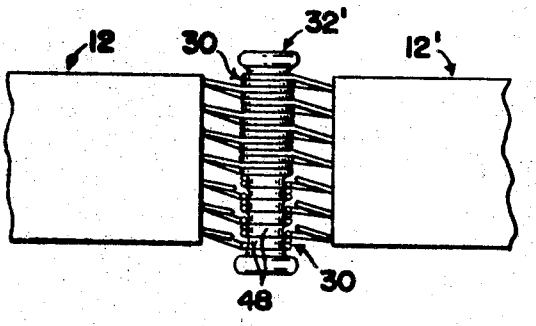
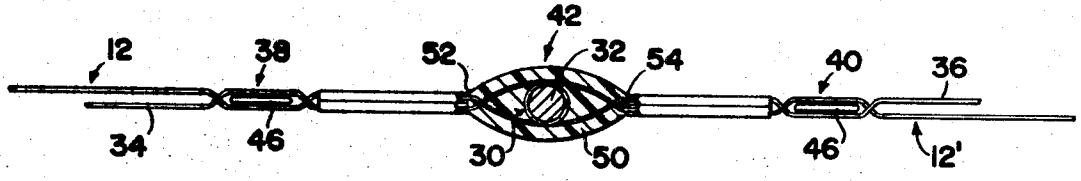


FIG. 11



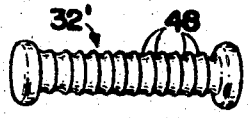


FIG. 12

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3,546,330

METHOD OF MAKING A TAPE SPLICE

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Int. Cl. B29d *29/00;* B32b *31/08*
U.S. Cl. 264—258 7 Claims

ABSTRACT OF THE DISCLOSURE

A method for splicing together two sections of tape wherein the weft strands are removed from each tape in an area of the tape spaced from the tape end. The tapes are bent backwards to provide loops in the weft-free areas, and the loops of the respective tapes are then brought together into intermeshing relationship. A pin or similar member is provided extending through the loops to hold the loops in intermeshed relationship, and to secure one tape to the other.

The present invention relates to the problem of splicing tape ends, and more particularly to a method for connecting the ends of tapes of the woven type, which have longitudinally extending warp strands and laterally extending weft strands interwoven therewith.

The present invention is particularly applicable for use with woven bands or tapes utilized with arresting gear for aircraft, and will be described with particular reference thereto. Other uses for the invention will be apparent to those skilled in the art.

In the past, the joining or splicing of sections of tape has been a difficult problem, usually solved by sewing a splice either of the lap type or the butt type. In the lap splice, the sections of the tape are simply overlapped, and sewn together. In the butt splice, the sections of the tape are butted together, and a third section of tape is overlapped with the butted sections and sewn thereto.

These methods require the availability of a sewing machine, a source of power, and a suitable location, all of which are not always readily available in areas where aircraft arresting gear may be used.

In other instances, tape joints or splices have been made with dual connection devices, which, however, may be cumbersome and may require maintenance and periodic inspection.

It is an object of the present invention to provide a tape splice, or method for splicing or joining tape, which can be readily effected in almost any location, and which simply requires easily carried and stored hand tools, and which further avoids the need for such equipment as a sewing machine, or the need for an external power source.

It is also an object of the invention to provide a strong, high quality joint or splice between woven tape ends.

A further object of the invention is to provide a tape joint or splice which is light in weight, which is neither bulky nor cumbersome, and which is of superior wear-resistance.

In accordance with the present invention, there is provided a method for splicing together woven tape sections, the tape section comprising longitudinally extending warp strands and laterally extending weft strands interwoven therewith. The weft strands are removed from portions or areas of the tape sections, which portions or areas are spaced from the tape ends. The tape sections are then bent backwards to form end loops in the weft-free portions thereof. The tape sections are brought together so that the loops of one of the sections intermesh with the loops of the other section. A pin or similar means is provided extending through the intermeshed loops to hold the loops

in intermeshed relationship and to secure or splice one loop to the other.

The invention will become apparent upon consideration of the following specification, with reference to the accompanying drawings, in which

FIG. 1 is a top view of a woven tape illustrating the structure thereof;

FIG. 2 is a top view of the tape of FIG. 1 illustrating weft strands removed from a portion or area thereof;

FIGS 3–6 illustrate a preferred method for forming looped ends in the weft-free area or portion of a tape;

FIG. 7 shows the positioning of two tape sections to be spliced together prior to splicing;

FIG. 8 shows the tape sections of FIG. 7 in intermeshed relationship;

FIG. 9 illustrates a splice between two tape sections in accordance with an embodiment of the invention;

FIG. 10 illustrates a splice between two tape sections in accordance with a further embodiment of the invention;

FIG. 11 illustrates a splice between two tape sections in accordance with a still further embodiment of the invention; and

FIG. 12 is a perspective view of a pin in accordance with a preferred embodiment of the invention.

Referring now to the drawings, FIG. 1 shows a woven band, indicated generally by the numeral **12**, formed of a multitude of longitudinally extending warp strands **14** interwoven with a multitude of laterally extending weft strands **16**. It will be understood that it is difficult to accurately show the numbers of warp and weft strands in the drawings since the woven band or tape normally used in an arresting gear assembly is on the order of twelve to fourteen inches in width and up to an inch in thickness. The warp and weft strands are each formed of a large number of nylon filaments of a size and a magnitude of a human hair bundled together to form the strands. The strands or bundles of filaments are roughly the thickness of picture wire. Thus, the drawing is illustrative only.

For preparing a woven tape for splicing with another tape, or connection with another tape, the weft strands **16** are removed from an area **18** of the tape, across the full width of the tape, and for several inches along the tape. The weft-free area is spaced from the end **20** of the tape by several inches, lying between the major portion or body **22** of the tape and the end **20**. The flexibility of the tape in the weft-free area **18** permits the tape to be easily bent into a loop in this area, as illustrated at **24** in FIG. 3, so that the end **20** of the tape underlies or overlies the major portion or body **22** thereof.

Referring to FIG. 4, individual loops, or bundles of loops or strands, are twisted about 180° to form a point of twist or intersection **26** between the strand loops **24** and the tape overlapping portions, close to the overlapping portions and at the base of the loops. The loops or bundles are further twisted another 180°, as shown in FIG. 5, to form a second point of twist or intersection **28** spaced from said first point of twist and now encompassed by two loops **24***a* and **24***b*, the loop **24***b* being the furthest spaced from the overlapping portions of the tape, and the loop **24***a* being between the two points of twist **26** and **28**. The looped strands are then bent at the second point of twist or intersection **28** so that the two loops **24***a* and **24***b* overlap each other and define a double loop **30** and a single opening **24***c*.

For the purpose of joining or splicing two tape ends, the tapes **12** and **12'** are aligned and the double looped strands of each tape are oriented so that the openings defined thereby are in lateral alignment, as shown in FIG. 7. The above steps are undertaken for both tape ends, and as shown in FIG. 8, the tapes are brought together so that the weft-free looped strands of one of the tapes to be spliced intermesh with the weft-free looped strands

of the other tape. The intermeshing is effected so that the openings defined by the looped ends of both of the tapes are in alignment.

With the looped ends as so aligned, the splice or joint is completed by positioning a pin or similar means **32** laterally through the loop openings and then drawing tight on the tapes to tighten the loops onto the pin.

If it is desired to form a joint or a splice which is separable, no further steps need be taken and the joint is complete.

It may be desired to tie the bitter ends **34** and **36** of the joined or spliced tapes, and this can be accomplished in the manner shown in FIG. 11 by removing the weft strands from overlapping portions of each tape, in the areas **38** and **40** removed from the joint **42**, and then intertwining the remaining warp strands of the overlapping portions. A bar or other suitable member **46** may be inserted between the intertwined strands to hold them in this relationship and to effectively tie the bitter ends of the tapes.

The pin or other means **32** which is used to hold the tape looped ends in intermeshed relationship may be cylindrical in shape or solid, and of a large number of materials, for instance plastic or metals, the only requirement being that the pin or other means used to hold the loops in intermeshed relationship have sufficient shear and tensile strength to overcome shear loads created by the oppositely pulling loops. The shear loads are kept to a minimum by the fact that the load is spread across the entire surface of the pin or like means. In this respect, to assure uniform distribution of the shear load, the surface of the pin (identified by the numeral **32**) may be corrugated as shown in FIGS. 10 and 12, each corrugation **48** having a width sufficient to accommodate a loop. Corrugating the pin surface locks the loops against sliding, or lateral transfer and bunching of the loops.

If it is desired to effect a permanent joint or splice, the joint or splice can be simply encased or encapsulated by a moldable plastic as shown at **50**, FIG. 11. The encapsulation should have the minimum thickness necessary to cover or encase the joint, and with such, the splicer joint is pliable but fixed. No particular shape for the encapsulation is necessary, only that it should not be bulky or heavy. Generally the plastic used should have a high tensile strength and can actually be used to accommodate the shear loads created by the intermeshed oppositely pulling loops. In this respect the plastic preferably is molded as shown in FIG. 11 to extend between points **52** and **54**, namely between the overlapping contiguous portions of one tape and the corresponding portions of the other tape, so that there is an axial tensile load through the joint. Where wear is anticipated, an elastomeric or similar plastic or wear-resistant material should be used.

It is apparent that the present invention provides a connection or a splice which is light, separable, requires a minimum of parts other than the tape itself, and utilizes the full strength of the tape. Also the invention provides a joint or splice which can be readily effected without the need of sewing machines, external power sources or the like.

Embodiments or variations will be known to those skilled in the art.

For instance, the invention has been described with reference to the use of a pin which extends through intermeshed loops of the tapes to be joined, the loops tightening on the pin when tension is placed on the tape ends. An alternative way of accomplishing the same objective would be to provide a flat plate-like device with rows of pins or buttons protruding from at least one side of the plate. The loops are then placed on the upstanding pins or buttons, and tension on the tape ends tightens the loops on the pins or buttons. Preferably, the entire assembly would then be encapsulated within a suitable plastic. Accordingly, the invention contemplates any pin or pin-like

arrangement or means which will hold the loops of the tapes to be spliced and which will allow the loops to be tightened thereon.

As a further example, the bar **46** disposed in the areas **38** and **40** of the tapes to effectively tie or lock the tape bitter ends, can be provided with serrated or ribbed surfaces which keep the tape warp strands parallel or in alignment.

Although the invention has been described with reference to specific embodiments, other variations within the scope of the following claims will be apparent to those skilled in the art.

What is claimed is:

1. A method for splicing woven tape sections wherein the tapes comprise longitudinally extending warp strands and laterally extending weft strands interwoven therewith, comprising the steps of

removing the weft strands from an area of each tape section to be spliced, which areas are spaced from the tape section ends;

bending each tape section in said weft-free area so that portions of each tape section are in overlapping relationship, the warp strands of each tape section forming a plurality of laterally spaced side-by-side looped strands;

twisting each said looped warp trand at least 180° to form a first point of twist between the strand loop and the tape section overlapping portions;

further twisting said looped strand another 180° to form a second point of twist spaced from said first point of twist and encompassed by two loops;

bending said looped strand at the second point of twist so that the two loops formed thereby are in overlapping relationship defining a single opening;

orienting the looped strands so that the single openings defined thereby are in alignment;

bringing the weft-free portions of the tape sections to be spliced together so that the looped strands of one of the sections intermesh and are in alignment with the looped strands of the other section;

inserting a pin means through said intermeshed looped strands;

drawing tight on said tape sections to tighten said weft-free portions on said pin means.

2. The method according to claim **1** further including the step of encapsulating said looped strands and pin means in a high tensile strength moldable plastic.

3. The method according to claim **2** wherein said moldable plastic extends between and encapsulates portions of the overlapping portions of both said tape sections.

4. The method according to claim **2** wherein said plastic is an elastomeric material.

5. The method according to claim **1** wherein said pin means is corrugated on the surface thereof with each corrugation extending circumferentially around the pin means and accommodating a looped strand.

6. A method for splicing woven tapes wherein the tapes comprise longitudinally extending warp strands and laterally extending weft strands interwoven therewith, comprising the steps of:

removing the weft strands from an area of each tape spaced from the tape end;

bending each tape in the weft-free area thereof to form said warp strands into a plurality of loops;

twisting each loop intermediate the ends thereof to form a point of twist encompassed by two loops of approximately equal size;

bending each warp strand at the point of twist to overlap said loops;

positioning the tape ends in a predetermined end-to-end relationship with the loops of one tape facing the loops of the other tape;

providing a pin means to engage each of the formed loops;

pulling said tape ends in opposite directions to tighten said loops onto said pin means.

7. The method according to claim 6 wherein said loops and pin means are encapsulated within a high tensile-strength plastic molded around said loops and pin means.

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U.S. Cl. X.R.

24—33, 205.19; 29—460, 526; 264—263