Jan. 9, 1951 W. G. ABBOTT, JR 2,537,007

SEPARATING, POSITIONING, AND UNITING THREAD

Filed Nov. 27, 1946 3 Sheets-Sheet 1

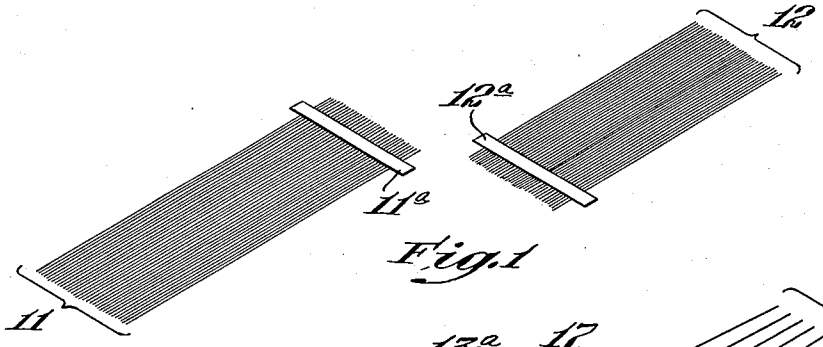


Fig. 1

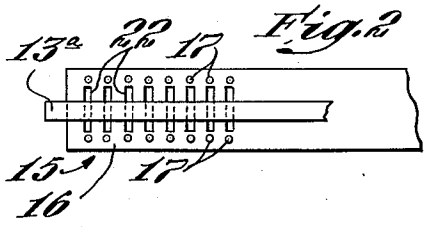


Fig. 2

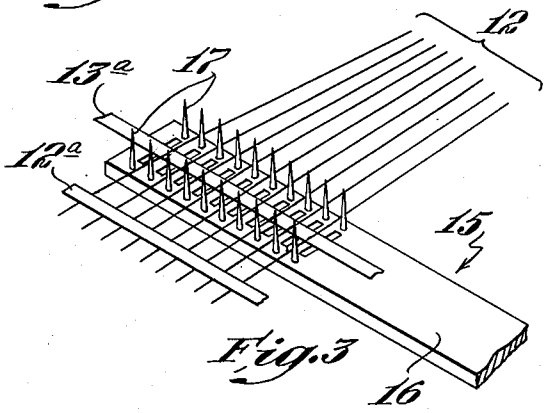


Fig. 3

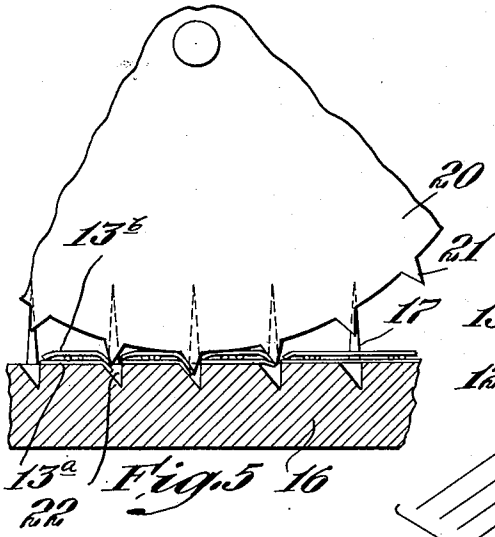


Fig. 5

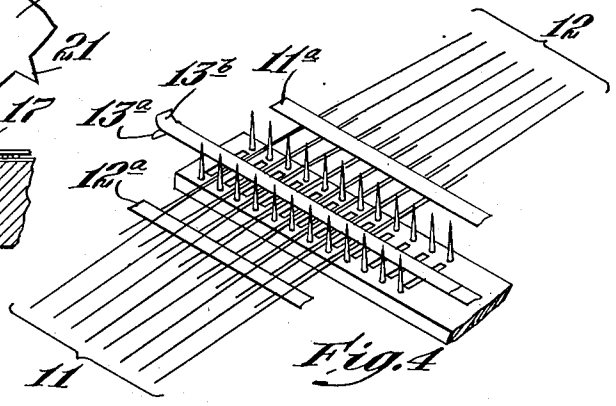


Fig. 4

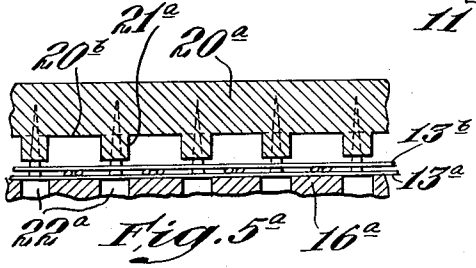


Fig. 5a

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SEPARATING, POSITIONING, AND UNITING THREAD

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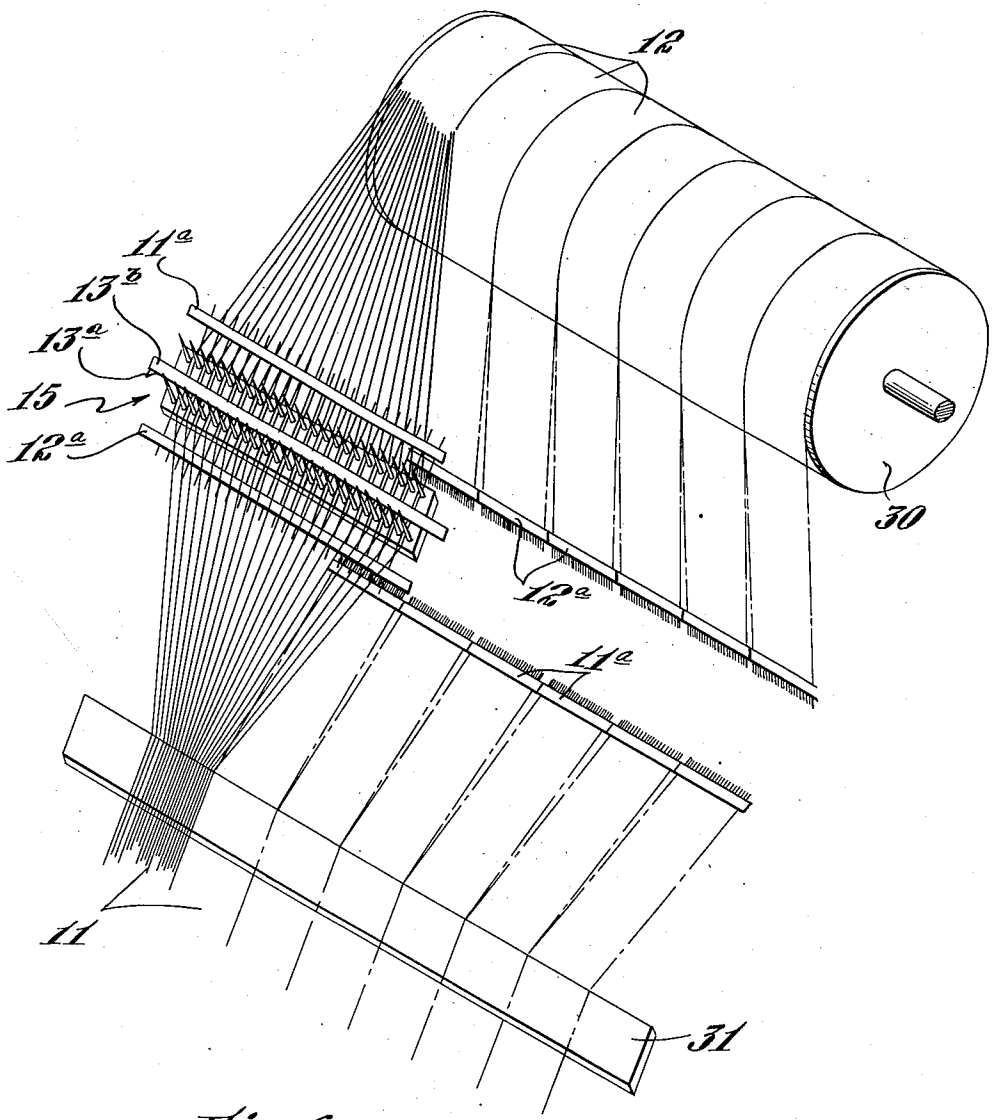


Fig. 6

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SEPARATING, POSITIONING, AND UNITING THREAD

Filed Nov. 27, 1946 3 Sheets-Sheet 3

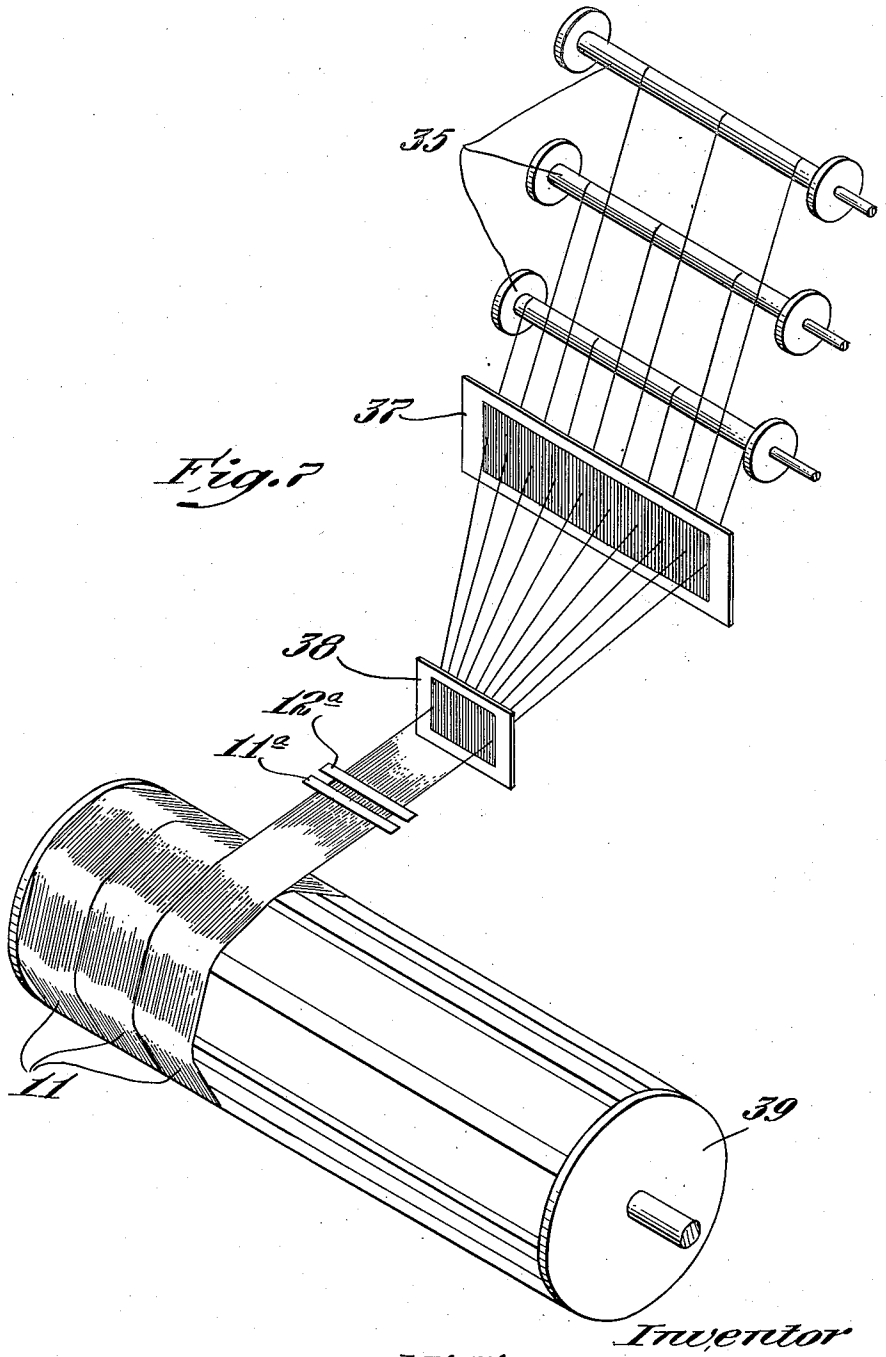


Fig. 7

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Patented Jan. 9, 1951 2,537,007

UNITED STATES PATENT OFFICE

2,537,007

SEPARATING, POSITIONING, AND UNITING THREAD

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Application November 27, 1946, Serial No. 712,639

23 Claims. (Cl. 28—47)

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This invention relates to separating, positioning and uniting threads.

In various textile operations it is necessary to unite the respective threads of one group with the respective threads of another group. For example, this operation is often performed in connection with the changing of the warps of a loom and also in connection with the preparation of warps for use in a loom.

It will be understood that in most textile operations in which a large number of threads are handled side by side, the threads lie very close together. Accordingly, manually picking out the corresponding threads of the two groups, preparatory to uniting these corresponding threads, is ordinarily a slow and tedious operation.

Also in every case in which the threads of the two groups lie in patterns, much care must be used to avoid picking out any wrong or non-corresponding threads of the two groups and consequent alteration of the pattern.

This problem of maintaining the pattern is especially acute when the two groups of threads are each arranged in a predetermined similar pattern but a variation as to color and/or character of certain threads is intentionally introduced between the two groups in that some threads of the new group have a different color and/or character from the corresponding threads of the old group. This situation is encountered in preparing warps for the weaving of sample pieces of patterned goods where it is desired to try out the effect of color variation upon a basic pattern. In this case the operator cannot rely upon identity of color as indicating whether the threads are correctly paired, but on the contrary must be sure to pair corresponding threads notwithstanding color variation.

The invention aims to provide for easily and quickly separating the threads of a group and easily and quickly positioning them for pairing with the threads of another group.

In order to insure that corresponding threads of two groups are united, it is advantageous first to pair all the threads of the two groups, and then to unite the various paired threads. However, even when paired threads lie somewhat separated as in a comb, usual uniting operations require more space than is available between adjacent pairs, thus requiring displacement of neighboring threads during uniting or displacement of the pair of threads being united, and consequently requiring individual treatment of each pair of threads.

The invention therefore further aims to provide

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for uniting pairs of threads which lie in a sheet, without need for relative displacement of the various paired threads during the uniting. The invention also aims to provide for treating the pairs of threads en masse during uniting, reducing the extent to which pairs of threads are handled individually.

Further objects of the invention and advantageous features will be seen from this specification and its drawings wherein the invention is explained by way of example.

In the drawings,

Fig. 1 is a diagrammatic view showing two groups of threads and showing the first step of the full procedure described in this specification;

Fig. 2 is a plan view of a comb having two sets of teeth adapted for use in the present invention;

Fig. 3 is a diagram showing one of the groups of threads of Fig. 1 as separated and positioned in the comb of Fig. 2;

Fig. 4 is a diagram showing both groups of threads of Fig. 1 as separated and positioned in the comb;

Fig. 5 is a diagrammatic view, partly in vertical section, illustrating the severing of tape employed to unite the respective pairs of threads within the comb;

Fig. 5[a] is a diagrammatic view similar to Fig. 5, illustrating an alternative way of severing tape employed to unite the respective pairs of threads within the comb;

Fig. 6 is a diagram showing the application of the invention to the uniting of one section of a new warp to the corresponding section of an old warp; and

Fig. 7 is a diagram showing the application of the invention to the preparation of a special warp upon a swift.

In Fig. 1 two groups of threads 11 and 12 are shown in the usual sheet-like and closely spaced form in which such groups of threads lie in various textile operations.

For purposes of explanation it will be assumed that it is desired to unite the leading ends of the threads of group 12 to the trailing ends of the threads of group 11.

As an initial step, which can be performed while the threads of each group are closely spaced, tapes 11[a] and 12[a] of extensible material are transversely disposed across the respective groups 11 and 12 and adhesively secured thereto. This adhesion may most easily be accomplished by use of extensible tapes 11[a] and 12[a] which have an adhesive face or coating or a face or coating which is potentially adhesive and becomes ad-

hesive by the action of suitably applied heat, pressure or solvent or any combination of these actions. After adhesion of the extensible tapes to their groups of threads, the ends of the two groups may then, for convenience, be trimmed off close to the tapes, as indicated in Fig. 1.

Tape 12a, with the threads of group 12 adhering to its continuous extensible surface, can now be extended lengthwise (transversely of the group) to say four or five hundred per cent of its original length, whereupon the threads of group 12 lie sufficiently separated to enable them conveniently to be set in between the teeth of a comb. As indicated in Figs. 2 and 3, a comb 15 having a base 16 and front and back rows of equally spaced teeth 17 is preferably employed.

As shown in Fig. 3, each thread of group 12 is set between adjacent teeth of the front row and between corresponding adjacent teeth of the back row.

Similarly the threads of group 11 are separated by extending the tape 11a and then set into the comb 15, as shown in Fig. 4, each thread of group 11 thus becoming paired with the corresponding thread of group 12. The comb then holds a web comprising spaced pairs of threads of the two groups to be united.

The threads are now in a paired arrangement convenient for uniting. The uniting operation may be performed by a hand knotter or by an automatic knotter operating successively upon the pairs of threads.

Instead of being knotted, the paired threads may be united by adhesive action. For instance, a suitable cement-dispensing means can be provided to apply liquid adhesive or thermoplastic adhesive to each thread of each pair while the pairs are held by the comb, and suitable means can be provided to press the threads of each pair together and provide a firm adherent joint between them.

Joining the threads by adhesive action can most expeditiously be accomplished by a procedure which involves adhesively securing a tape to the several pairs of threads and severing this tape between adjacent pairs. The tape for this uniting procedure need not be extensible.

Preparatory to setting the threads of group 12 in the comb a tape 13a presenting an adhesive or potentially adhesive upper surface can be laid across the comb between the rows of teeth, as shown in Fig. 2, the threads of group 12 then overlying this tape when set into the comb. After the threads of group 11 are set into the comb a further tape 13b presenting an adhesive or potentially adhesive lower surface can be laid across the comb directly above the tape 13a, as shown in Fig. 4. Any suitable action such as pressure, heat, or solvent or combination of these actions, can be employed for the purpose of promoting adhesion of the paired threads to the tapes 13a and 13b. In some cases it may be desirable to omit either tape 13a or tape 13b, that is, employ tape only above or only below the threads.

The transversely extending tape comprised of the superposed tapes 13a and 13b can now be severed in short pieces, each serving to hold a single pair of threads. This may conveniently be done by passing over the tape a roller 20, Fig. 5, equipped with cutting knives 21 which coincide with the spacing of the teeth 17. Preferably the upper surface of the base 16 of the comb is slotted or grooved at 22, with the slots or grooves extending in substantial alignment with the pairs of corresponding teeth of the front and back rows, as shown in Figs. 2 and 5 to receive the knives 21 and cooperate therewith in cutting the tape. The knives 21 make cuts transversely of the tape, that is, longitudinally of the webs of threads, in between each adjacent pair of threads, leaving each pair joined by tape but unattached to any of the other pairs. Simultaneously the pressure of the roller 20 aids in securing a strong joint between the threads of each pair. No displacement of the paired threads in the comb is necessary, and the roller 20 and its knives 21 can be quickly rolled from end to end of the comb. The threads of the sheet are thus dealt with en masse both in joining the threads by tapes 13a and 13b and in severing these tapes between adjacent pairs of joined threads.

Fig. 5a illustrates an alternative way of severing the tape. In this figure the base of the comb, indicated at 16a, is provided with grooves 22a located between and aligned with corresponding front and back teeth, as in Fig. 2, these grooves 22a having vertical side walls. A multiple punch 20a having straight-sided punch elements 21a adapted to fit in the grooves 22a can be placed over the base 16a, as shown in Fig. 5a. Upon applying downward pressure to the punch, the punch elements 21a cooperate with the grooved base 16a to sever the tape in between each adjacent pair of threads simultaneously. The lower surface 20b of the punch also applies pressure to all of the joints to strengthen them.

The originally applied extensible tapes 11a and 12a can be left on the threads while the paired threads are being united in the comb, in which case these tapes can be held extended by hand, or by suitable clamps, weights or other holding devices. The tail portions of the united threads and their attached tapes 11a and 12a can be cut off before removal of the united threads from the comb.

While I have described the several tapes as presenting an adhesive or potentially adhesive surface to the threads, tape which does not initially have such an adhesive or potentially adhesive surface can be used, and liquid or semi-liquid cement can be applied to secure the tape adhesively to the threads.

Fig. 6 diagrammatically shows the use of the invention as above described in changing the warps of the loom, the new warp beam being indicated at 30 and the entering end of the loom being indicated at 31. The new warp may comprise for example seven sections, each comprising a group 12 of say 200 threads, although for clarity of illustration a lesser number of threads are shown in Fig. 6. The old warp of which the trailing end extends from the entering end of the loom comprises a similar number of groups 11. In changing the warp it is necessary to unite each thread of each section of the new warp to the corresponding thread of the corresponding section of the old warp.

In preparation of the new warp upon the beam 30, each section 12 is finished off by adhesively securing an extensible tape 12a to all of the threads of such section 12. Before cutting off the old warp sections 11 from their beam in the loom, each section 11 is finished off by adhesively securing an extensible tape 11a to all of the threads of such section 11.

Fig. 6 shows the first section 12 of the new warp being secured to the corresponding section 11 of the old warp, as shown in more detail in Fig. 4, the threads of these two sections being shown in Fig. 6 as having been set into the comb

15 and adhesively joined by tapes 13a and 13b, after extension of the initially applied extensible tapes 11a and 12a. After joining these two sections, severing their connecting tapes 13a and 13b and trimming off their tail ends and the extensible tapes 11a and 12a, the united threads are removed from the comb. The comb can then be shifted lengthwise and the next two sections of new and old warps similarly united, continuing in this manner until all threads of the new and old warps have been united.

Fig. 7 shows diagrammatically the general arrangement of apparatus adapted for preparing a special warp for weaving sample or short pieces of fabric with a predetermined general warp pattern running through all of the pieces but with thread color or thread character variations introduced as between successive pieces.

In preparing such a warp a plurality of spools 35 can carry threads of various colors and/or characters, which threads together form a certain pattern. These threads are led through a reed 37 and are condensed in a hackstand 38 into a closely disposed web for winding in sections onto a swift 39.

A plurality of turns of this web are wound onto the swift to form a section 11. The winding is then stopped and the threads of the web are leveled by pressing a thin blade against them. Extensible tapes 11a and 12a are then secured to the threads transversely of the web, on opposite sides of the blade, and the web is severed between the two tapes.

The swift is then shifted lengthwise the width of one section, the leading end of the web attached thereto, and a further plurality of turns wound thereon to form a second section 11, and the web is then finished off with extensible tapes and severed as described above. Fig. 7 shows the completion of winding of the third such section 11 on the swift.

After winding the desired number of sections 11 of threads having the initial combination of color and/or character of threads, some or all of the spools 35 are replaced by spools carrying threads which provide a second combination as to color and/or character, but yield the same general pattern as the original threads. The new threads are threaded through the reed 37 and hackstand 38, are leveled, and an extensible tape 12a is adhesively secured thereto.

The swift is then moved back to bring the first wound section 11 thereon opposite to the leading end of the newly threaded web having the second combination as to color and/or character. The leading end of the newly threaded web is then united to the trailing end of the first section 11 by the procedure illustrated in Fig. 4, this uniting operation being performed between the hackstand 38 and the swift 39. A plurality of turns of the web are wound on top of the first section 11. The winding is then stopped, the threads are leveled, extensible tapes are adhesively secured to the web, and the web is severed between the tapes.

The swift is then shifted lengthwise the width of one section, the leading end of the web united as illustrated in Fig. 4 to the trailing end of the underlying wound web of the second section, and a further plurality of turns wound thereon.

This sequence is continued, with a change in combination of color and/or character of the threads after each completion of winding a given combination upon all the sections of the swift.

The especially prepared warp will ordinarily be transferred from the swift to a beam, to be set into the loom. When the warp threads of one combination of color and/or character have been woven into the fabric, the threads of the next combination of color and/or character follow without the need for drawing in a new warp, fitting stop motion wires, or any other adjustment to the warp or to the loom.

I claim:

1. Method of separating the threads of a group, comprising applying an adhesive extensible tape to the group of threads, and extending the tape while the threads adhere thereto.

2. Method of separating the threads of a group comprising adhesively securing a group of threads to an extensible tape, and extending the tape while the threads adhere thereto.

3. Method of disposing the threads of a group for uniting, comprising applying an adhesive extensible tape to the group of threads, extending the tape while the threads adhere thereto, thereby separating the threads, and positioning the separated threads between teeth.

4. Method of disposing the threads of a group for uniting comprising adhesively securing a group of threads to an extensible tape, extending the tape while the threads adhere thereto, thereby separating the threads, and positioning the separated threads between teeth.

5. Method of uniting two groups of threads comprising pairing threads of the two groups, the respective pairs of threads being spaced from adjacent pairs, applying an adhesive tape to the several pairs of threads, and severing the tape between adjacent pairs.

6. Method of uniting two groups of threads comprising pairing threads of the two groups, the respective pairs of threads being spaced from adjacent pairs, adhesively securing a tape to the several pairs, and severing the tape between adjacent pairs.

7. Method of uniting two groups of threads comprising pairing threads of the two groups, the respective pairs of threads being spaced from adjacent pairs, adhesively securing a tape to the several pairs transversely thereof, and severing the tape between adjacent pairs.

8. Method of uniting two groups of threads comprising pairing threads of the two groups, the respective pairs of threads being spaced from adjacent pairs, applying an adhesive tape to the several pairs of threads, and severing the tape between adjacent pairs and applying pressure to bind the severed pieces of tape to their associated paired threads.

9. Method of uniting two groups of threads comprising disposing the threads of the two groups in the form of a web with threads of the two groups in paired relation, respective pairs of threads being spaced from adjacent pairs, adhesively securing tape to opposite faces of the web of paired threads, and severing the tape between adjacent pairs.

10. Method of uniting threads comprising adhesively securing a group of threads to an extensible tape, extending the tape while said threads adhere thereto thereby spacing said threads apart, disposing the spaced threads in paired relation to a spaced set of threads of another group, and uniting the two threads of each pair.

11. Method of uniting threads comprising adhesively securing a group of threads to an extensible tape, extending the tape while said threads adhere thereto thereby spacing said threads apart, disposing the spaced threads in

paired relation to a spaced set of threads of another group, and applying adhesive to the two threads of each pair to unite them.

12. Method of uniting threads comprising adhesively securing a group of threads to an extensible tape, extending the tape while said threads adhere thereto thereby spacing said threads apart, disposing the spaced threads in paired relation to a spaced set of threads of another group, and applying adhesive and pressure to the two threads of each group to unite them.

13. Method of uniting threads comprising adhesively securing a group of threads to an extensible tape, extending the tape while said threads adhere thereto thereby spacing said threads apart, disposing the spaced threads in paired relation to a spaced set of threads of another group, adhesively securing a further tape to the threads of both groups while mantaining such paired relation thereby uniting the two threads of each pair, and severing said further tape between the pairs of threads.

14. Methods of uniting threads comprising adhesively securing a group of threads to an extensible tape, extending the tape while said threads adhere thereto thereby spacing said threads apart, disposing the spaced threads in paired relation to a spaced set of threads of another group, adhesively securing a further tape to the threads of both groups while maintaining such paired relation thereby uniting the two threads of each pair, severing said further tape between the pairs of threads, and severing the ends of threads which extend from said further tape and are secured to said extensible tape.

15. Method of uniting threads of two groups comprising adhesively securing each group of threads to a respective extensible tape, extending said extensible tapes while said threads adhere thereto thereby spacing the threads of each group apart, disposing the two groups of spaced threads in paired relation, adhesively securing a further tape to the threads of both groups while maintaining said paired relation thereby uniting the two threads of each pair, severing said further tape between the pairs of threads, and severing the ends of threads which extend from said further tape and are secured to the respective extensible tapes.

16. Apparatus for uniting threads comprising a bed, spaced front and back rows of teeth extending therefrom in position to receive pairs of threads between adjacent teeth of each row, said bed having grooves to facilitate severing a tape between adjacent pairs of threads in the space between the two rows of teeth, each such groove extending in substantial alignment with a pair of corresponding teeth of the front and back rows.

17. Apparatus for uniting threads comprising in combination means for holding the corresponding threads of two webs in paired relation with spaces between adjacent pairs, and severing means arranged to make longitudinally extending cuts in between adjacent pairs of threads of the two webs, thereby to sever a tape extending transversely of the two webs.

18. A group of threads adapted to serve as warp, the threads having generally parallel portions individually secured to a transversely disposed extensible tape, said tape being extensible to several hundred per cent of its original length.

19. A sectional wound warp comprising a plurality of sections of which the individual threads are secured to extensible tapes, separate such tapes securing the threads of the respective sections in such manner as not to attach threads of one section to threads of another section, whereby each section is separable independently of the other sections by extension of its respective tape.

20. Method of separating closely disposed parallel unwoven threads of a warp to permit them to be operated on individually, comprising extending an extensible surface of a continuous element transversely of the threads of the warp while holding individual threads of the warp in individual contact with such extending surface, thereby to separate the threads.

21. Method of separating closely disposed parallel unwoven threads of a warp to permit them to be operated on individually, comprising extending an extensible element transversely of the threads of the warp while holding individual threads of the warp adhesively in individual contact with said element, thereby to separate the threads.

22. Method of separating closely disposed parallel unwoven threads of a warp to permit them to be operated on individually, comprising separating a plurality of the warp threads comprising less than the entire warp by extending an extensible surface of a continuous element transversely of the said plurality of threads while holding the individual threads of said plurality in individual contact with such extending surface.

23. Apparatus for uniting threads comprising in combination means for holding the corresponding threads of two webs in paired relation with spaces between adjacent pairs, and severing means arranged to make longitudinally extending cuts in between adjacent pairs of threads of the two webs, thereby to sever a tape extending transversely of the two webs, said severing means including a plurality of cutting elements and a cooperating grooved bed having grooves to receive said cutting elements in spaces between adjacent pairs of threads.

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