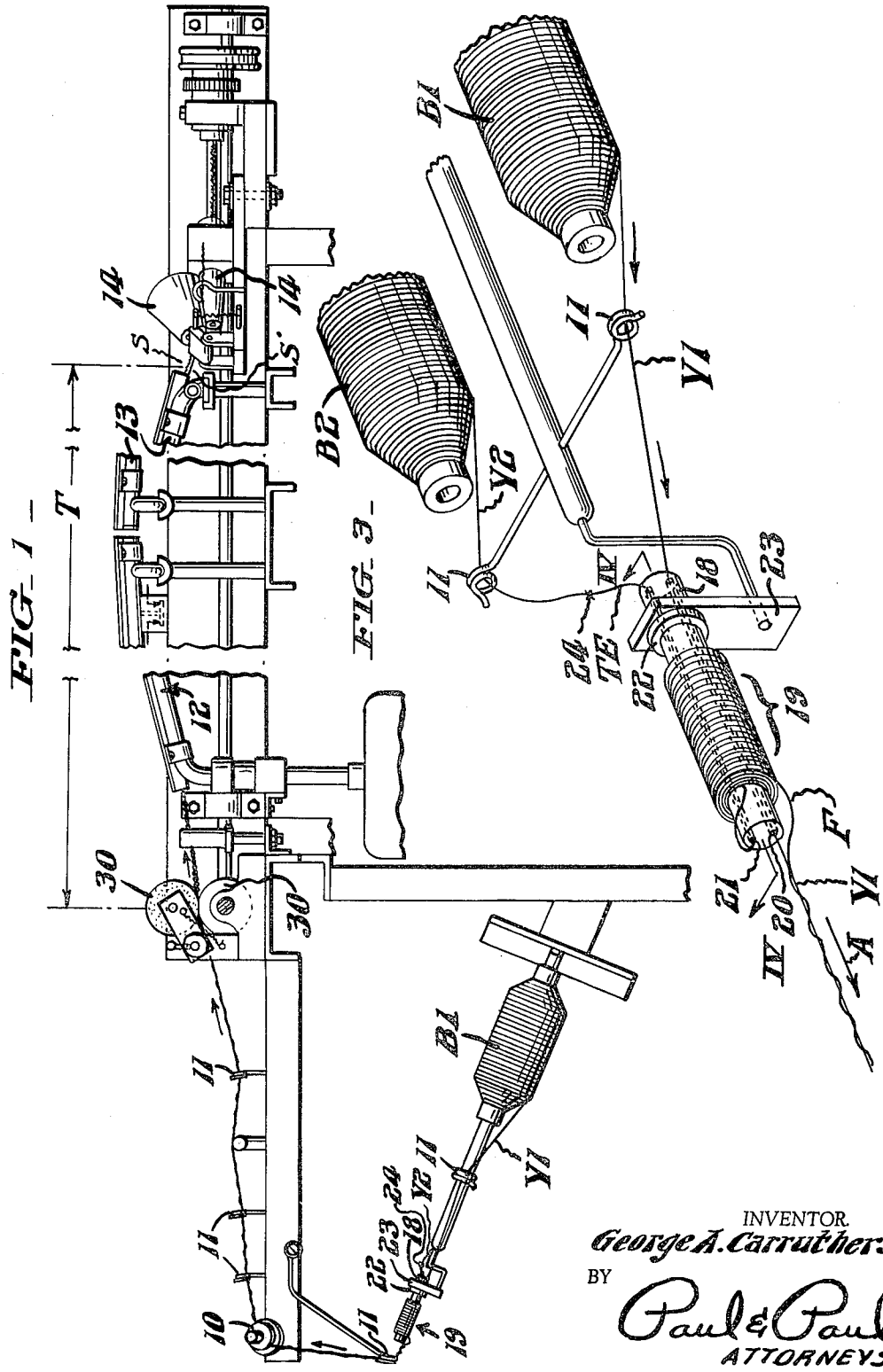
March 1, 1966 G. A. CARRUTHERS 3,237,391

PRETWISTING APPARATUS AND METHOD

Original Filed Aug. 26, 1963 3 Sheets-Sheet 1



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PRETWISTING APPARATUS AND METHOD

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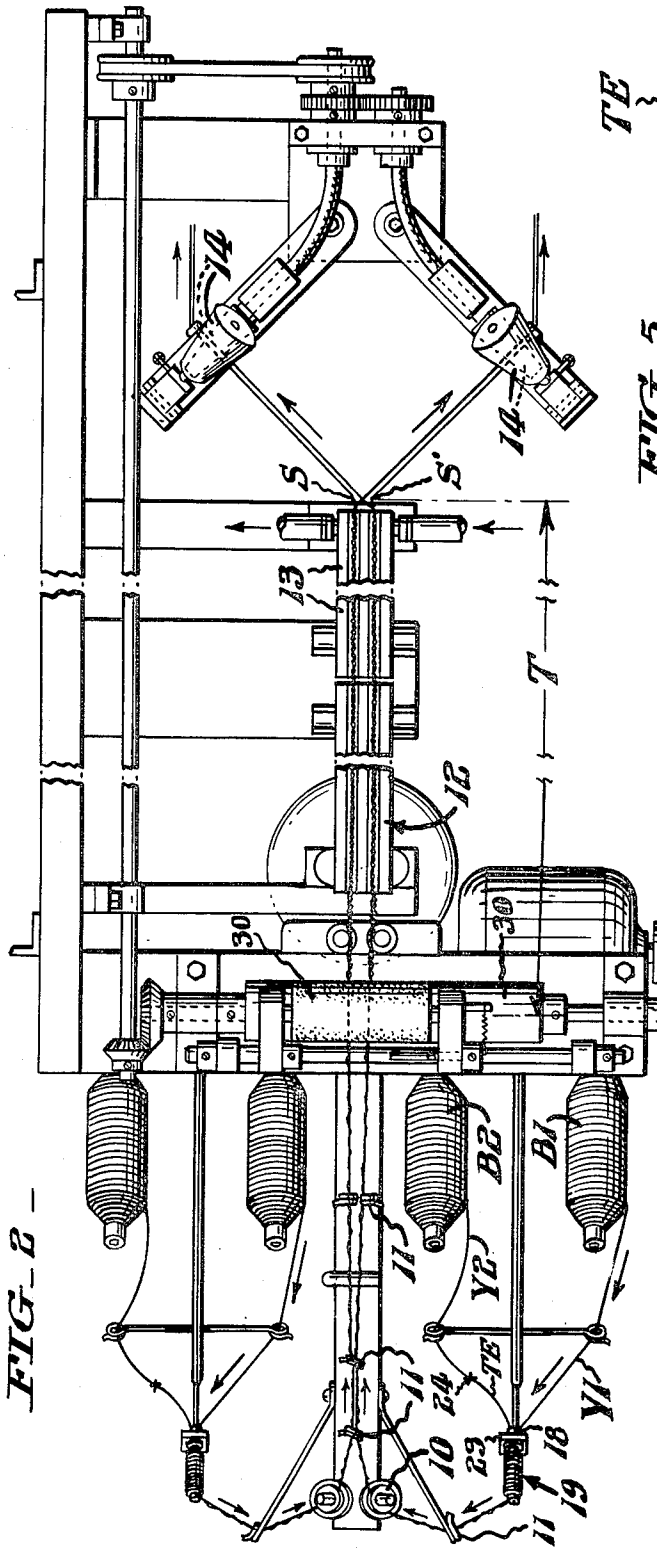


FIG. 2

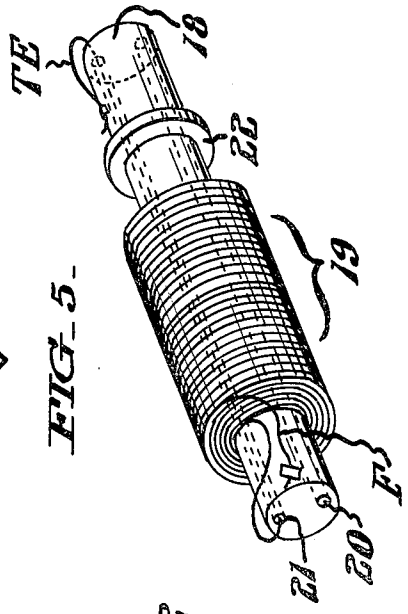


FIG. 5

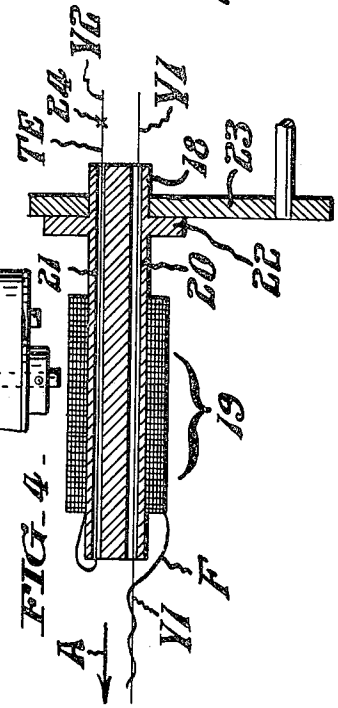


FIG. 4

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PRETWISTING APPARATUS AND METHOD

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FIG. 6

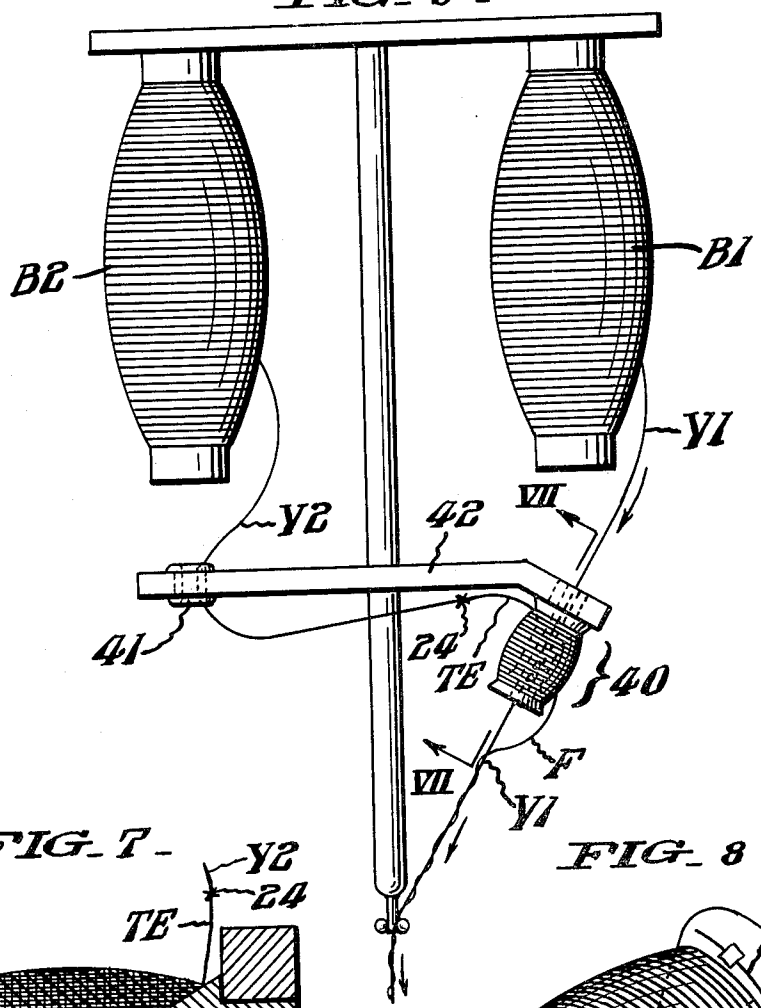


FIG. 7

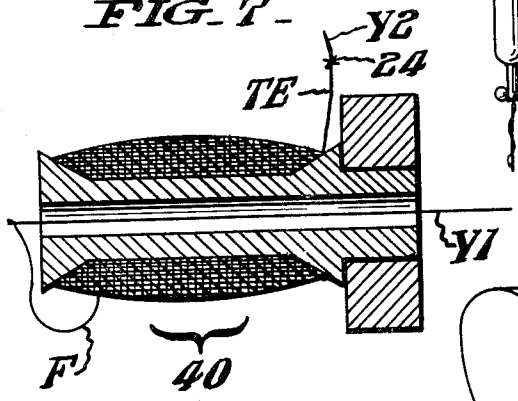
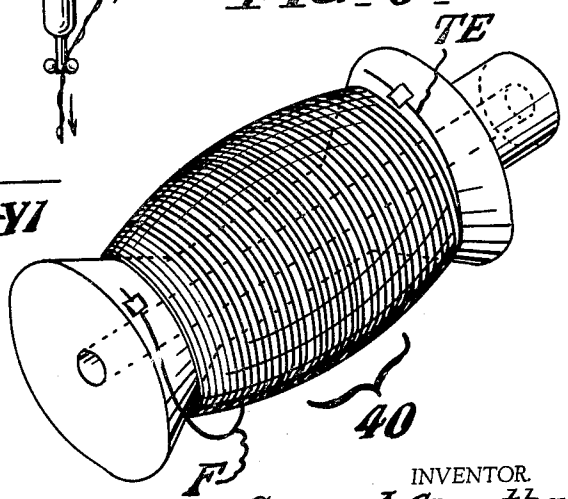


FIG. 8



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United States Patent Office 3,237,391 Patented Mar. 1, 1966

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PRETWISTING APPARATUS AND METHOD

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Continuation of application Ser. No. 304,575, Aug. 26, 1963. This application Dec. 30, 1964, Ser. No. 425,373
15 Claims. (Cl. 57—18)

This application is a continuation of my copending application, Serial No. 304,575, filed August 26, 1963.

This invention relates to an apparatus and method for pretwisting yarn and has particular reference to the pretwisting of yarn for the manufacture of false twist yarn utilizing an apparatus and method as disclosed in my United States Patent No. 3,091,908, granted June 4, 1963. In accordance with that apparatus and method, a pretwisted yarn is drawn along a predetermined path through a heating zone in a manner to provide heat-setting for the yarn in a twisted condition; after cooling, the yarns are separated from one another and in this manner acquire many of the advantageous properties of natural fibers such as wool, cotton and the like.

It has been found highly advantageous in utilizing a false twisting process with pretwisted yarn, to provide a heating means for the yarn which is quite long in relation to the diameter of the yarn. Thus, it is advantageous to provide a length of yarn which has many thousands of twists all of which are in contact with either a heating means or a cooling means, and to draw the yarn through such heating or cooling zone at an extremely high speed. This concept is the basis for production rates which far surpass those heretofore obtainable.

Although my false twisting process which utilizes pretwisted yarn experiences far fewer breakages then the earlier false twisting process using false twisting spindles, such breakages do nevertheless occur and upon such an occasion it frequently becomes necessary to pretwist the yarn in preparation for starting up the machine again. Manual pretwisting is slow and laborious and is unduly expensive because of the machine shut-down time involved.

I have heretofore endeavored to pretwist the yarn by providing a means for swinging a pair of yarn bobbins bodily relative to each other around an intermediate axis, but even this pretwisting method requires a considerable amount of time because of limitations as to the speed with which bobbins of yarn can be rotated.

Accordingly, it is an object of this invention to provide a highly efficient and very rapid apparatus and method for pretwisting yarns together, wherein many thousands of twists are required in a very minimum of time.

Still another object of this invention is to provide a highly compact and simple method and means for providing an exact number of turns of pretwist in a pair of yarns.

Other objects and advantages of this invention including the simplicity and economy of the same and the ease with which it may be applied to existing equipment will become apparent further hereinafter and in the drawings of which:

FIG. 1 represents a view in side elevation showing one form of apparatus in accordance with this invention;

FIG. 2 is a plan view of the apparatus appearing in FIG. 1;

FIG. 3 is an enlarged perspective view of a pretwisting portion of the apparatus appearing in FIG. 1;

FIG. 4 is a sectional view taken as indicated by the lines and arrows IV—IV which appear in FIG. 3;

FIG. 5 is a view in perspective of a prewound spool which is useful in accordance with this invention;

FIG. 6 is a plan view of a pretwisting portion of a modified form of apparatus in accordance with this invention;

FIG. 7 is a sectional view taken as indicated by the lines and arrows VII—VII which appear in FIG. 6;

FIG. 8 is a view in perspective showing the modified form of a prewound spool.

In the description which follows specific terms are utilized for the sake of clarity, but it is to be understood that this description is directed to the specific forms of the invention selected for illustration in the drawings, and is not intended to limit the scope of the invention, which is defined in the appended claims.

Referring now particularly to FIGS. 1 and 2 of the drawings, it will be observed that FIG. 2 is similar in many of its aspects to FIG. 8 of my aforementioned U.S. Patent No. 3,091,908, and that it shows two pairs of pretwisted yarns, the yarns of each pair being designated **Y1** and **Y2** respectively. The pairs of yarns are wound with Z twist and S twist respectively. These yarns are fed from bobbins **B1**, **B2** through tensions **10** and the usual guides **11** to a heater **12** which is preferably an elongated heater and has been shown with major portions of its length broken away for convenience of illustration. In actual practice, the heater may be as long as twelve feet or more. The heater preferably includes a cooling section **13** downstream of the heating section, for cooling the heat-set pretwisted yarns after they have passed beyond the heater **12**. Conical rollers **14** draw the twisted yarns apart from one another, each accepting one yarn from the Z twisted pair and one yarn from the S twisted pair, thus resulting in the production of balanced yarn.

The apparatus for performing the false twisting operation may be essentially the same as that disclosed in my aforementioned issued Patent No. 3,091,908, the disclosure of which is incorporated herein by reference, and is accordingly not repeated here in detail.

In the event that either yarn Y1 or Y2 should break anywhere along the twisted length T, it then becomes necessary to shut down the machine and then to pretwist the yarn again to restart the machine. It is for this purpose that the apparatus and method in accordance with this invention are of great advantage.

The apparatus in accordance with this invention includes a small diameter spool **19** as shown in FIGS. 4 and 5 for example, such spool having a pair of radially spaced, longitudinally extending passages **20**, **21**. Spool **19** has an end **18** fitting into a supporting bracket **23**, and a flange **22** serving as a limit stop against the bracket **23**. The spool **19** carries a length of yarn which is wound uniformly for a known number of uniform turns, and this yarn has a free end F and a tail end TE which passes forwardly around the free end of spool **19**, and then rearwardly through passage **21**.

It will be observed that one yarn Y1 may be threaded directly through the bore **20** and that the other yarn Y2 may be tied as indicated at **24** to the tail end TE of the yarn which underlies the yarn wound upon the spool. The free end F of the yarn wound upon the spool is grasped by the operator and simply drawn endwise, together with the yarn Y1, away from the spool, in the direction indicated by the arrow A in FIG. 4. Drawing the two yarns together in the direction indicated by the arrow A results in an unlooping or unwinding of the yarn from the spool, thus throwing successive twists as indicated particularly in FIGS. 3 and 4.

As appears in FIG. 2, the yarn from the spool **19** is passed through the usual guides and tensions and is drawn through the nip rolls **30**, **30** whereupon all of the twists imparted to the yarn are concentrated between the

nip 30, 30 and the points of separation S, S'. In view of the fact that a predetermined number of turns can be previously wound on the spool 19, this number of turns is communicated to the yarn and is concentrated in the aforementioned area. Accordingly, utilizing the pretwisting spool in accordance with this invention, particularly when the diameter of the spool is small, as many as 7000 or more turns can be applied to the yarn in the period of a minute or less, as distinguished from more than 20 minutes which was required in rotating the bobbins B1 and B2 about an axis located midway between them.

In operation, it will become apparent that as the machine runs, loops are thrown off the end of the spool 19 and after the spool has been completely unwound the tail end TE which extends through the hole or bore 21 draws the yarn from bobbin B2, together with the knot which joins the two together, through the passage 21 and into the false twisting machine.

FIG. 5 shows a preferred form of prewound spool 19, after having been prewound and prior to usage. The free end F of the yarn is taped temporarily to the outer perimeter of the spool and the tail end TE is taped at the other end of the spool.

FIGS. 6–8 show a preferred form of the invention wherein the spool 40 has only a single bore which is of much larger diameter than the bores shown in the preceding figures and, in spite of this, may have a smaller outside diameter and therefore use less yarn per turn. In this form of the invention, the yarn Y1 from the bobbin B1 passes through the central bore but the yarn Y2 passes from its bobbin B2 through an eye 41 on bracket 42 and then along bracket 42 to the tail end TE of the prewound yarn, to which it is tied. Thus, the yarn Y2 is freed after the prewound yarn has been unwound from the spool, and is processed along with yarn Y1 as heretofore described. The advantage of this form of the invention is that the central bore can be made larger, thus making it easier for the operator to thread the yarn through the bore after a breakage occurs and while the false twisting machine is down; nevertheless the outside diameter of spool 40 may be smaller than that of spool 19.

In the spool 40 it is desirable to locate the tail end TE rearwardly of the spool, since the free end F tends to balloon out while it is unwound over the free end of spool 40. In fact, it is important to keep the tail end TE and the yarn Y2 free of the spool during the unwinding operation, for that reason. In contrast, the tail end TE in the form of the invention shown in FIGS. 1–5 is intentionally carried forwardly over the free end of the spool, and then rearwardly through the bore 21 provided for that purpose, and is thus kept away from the ballooning yarn as the loops are thrown over the free end of the spool 19.

Although this invention has been described with reference to specific forms thereof, it will be appreciated that equivalent elements may be substituted for those specifically shown and described, that parts may be reversed, and that certain features may be used independently of other features, all without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In an apparatus for pretwisting yarn carried on two separate yarn packages, the combination comprising a spool carrying a predetermined number of turns of wound yarn, said spool having a free end over which said yarn turns may be withdrawn, said wound yarn having a free end and a tail end, means forming a pair of spaced passages extending through said spool, the yarn from one of said packages being a free yarn extending through one of said passages, said tail end of said wound yarn passing forwardly over the free end of said spool and rearwardly through the other of said passages and connected to the yarn from the other package, and means for drawing said free yarn and said free end of said wound yarn together away from said spool, thereby looping said wound yarn around said free yarn and twisting said yarns together.

2. The method of restoring a pair of yarns (continuously issuing from separate sources) to a normal initial twisted condition (wherein said pair of yarns are twisted about each other a predetermined number of times) after one yarn of the pair thereof has broken and the initial twisted condition of said pair of yarns has been lost, comprising the steps of establishing a reserve yarn source in the form of a plurality of reserve yarn turns corresponding in number to the number of times said pair of yarns are normally twisted about each other and through which reserve yarn turns at least one of the yarns of said pair thereof normally extends to a zone in advance of said reserve yarn source wherein said pair of yarns are twisted about each other said predetermined number of times, joining the free end of the broken yarn to the tail end of the reserve yarn, advancing said reserve yarn by its free end with said unbroken yarn without extending it through said reserve yarn turns thereby to loop said reserve yarn turns about said unbroken yarn and twist the same together, continuously separating said twisted yarns from each other by withdrawing the same in different directions at the downstream end of said zone, and advancing said twisted yarns until the full length of said reserve yarn has traversed said zone and passed the point of separation, at which time said pair of yarns will be restored to their initial twisted condition.

3. The method of restoring a pair of yarns (continuously issuing from separate sources) to a normal initial twisted condition (wherein said pair of yarns are twisted about each other a predetermined number of times) after either yarn of the pair thereof has broken and the initial twisted condition of said pair of yarns has been lost, comprising the steps of establishing a reserve yarn source in the form of a plurality of reserve yarn turns corresponding in number to the number of times said pair of yarns are normally twisted about each other and through which reserve yarn turns said pair of yarns normally extend in untwisted condition to a zone in advance of said reserve yarn source wherein said pair of yarns are twisted about each other said predetermined number of times, joining the free end of the broken yarn to the tail end of the reserve yarn with the joined yarn ends extending through said reserve yarn turns, advancing said reserve yarn by its free end with said unbroken yarn without extending it through said reserve yarn turns thereby to loop said reserve yarn turns about said unbroken yarn and twist the same together, continuously separating said twisted yarns from each other by withdrawing the same in different directions at the downstream end of said zone, and advancing said twisted yarns until the full length of said reserve yarn has traversed said zone and passed the point of separation, at which time said pair of yarns will be twisted once again as in the normal initial condition thereof.

4. The method of restoring a pair of yarns (continuously issuing from separate sources) to a normal initial twisted condition (wherein said pair of yarns are twisted about each other a predetermined number of times) after one yarn of the pair thereof has broken and the initial twisted condition of said pair of yarns has been lost, comprising the steps of establishing a reserve yarn source in the form of a plurality of reserve yarn turns corresponding in number to the number of times said pair of yarns are normally twisted about each other and through which reserve yarn turns only one of the yarns of said pair thereof normally extends to a zone in advance of said reserve yarn source wherein said pair of yarns are twisted about each other said predetermined number of times, joining the free end of the broken yarn to the tail end of the reserve yarn, said tail end being disposed at the upstream end of said reserve yarn source, advancing said reserve yarn by its free end with said unbroken yarn without extending it through said reserve yarn turns

thereby to loop said reserve yarn turns about said unbroken yarn and twist the same together, continuously separating said twisted yarns from each other by withdrawing the same in different directions at the downstream end of said zone, and advancing said twisted yarns until the full length of said reserve yarn has traversed said zone and passed the point of separation, at which time said pair of yarns will be restored to their initial twisted condition.

5. In apparatus for continuously drawing yarns from separate sources, initially bringing them together and twisting them about each other a predetermined number of times and thereafter drawing the yarns from said sources and bringing them together without twisting them about each other, the combination comprising a pair of yarns arranged for being drawn from two separate sources thereof, the leading portion of the yarn of one of said sources being formed into a package provided with an opening through which the yarn from the other source extends freely, completely by-passing the trailing portion of the yarn of said one source, said package being made up of turns of yarn extending about said opening and corresponding in number to the number of times said yarns are to be twisted about each other, and means for drawing said other yarn through said opening, and drawing said packaged yarn over one end of said package to twist said packaged yarn and other yarn about each other and thereafter to bring the trailing portion of the yarn of said one source and said other yarn together without twisting them about each other.

6. The combination defined in claim 5 wherein the leading and trailing portions of the yarn of the one source are wound respectively about a spool and a bobbin separate from said spool, the yarn of the other source is wound about a bobbin, and said bobbins and spool are fixed relative to each other.

7. The combination defined in claim 6 wherein the bobbins are disposed in laterally spaced generally parallel relation, the yarns are drawn over corresponding ends of said bobbins, and the spool is disposed on the downstream side of said bobbins, in position for receiving the yarn drawn over the end of one of said bobbins.

8. The combination defined in claim 6 wherein a tail end extending from the smaller turns of yarn wound about the spool and a free end extending from the larger turns of yarn wound about one of said bobbins are tied together.

9. The combination defined in claim 8 wherein the tail end extending from the smaller turns of yarn wound about the spool extends from the upstream end of the spool to the tie point.

10. The combination defined in claim 8 wherein the tail end extending from the smaller turns of yarn wound about the spool extends from the downstream end of the spool and passes back through the spool to the tie point.

11. The combination defined in claim 5 wherein a tail end extending from the smaller turns of yarn wound into the package and a free end extending from the trailing portion of the yarn of the one source are joined together.

12. The combination defined in claim 11 wherein the tail end extending from the smaller turns of yarn wound into the package extends from the upstream end of the package.

13. The combination defined in claim 11 wherein the tail end extending from the smaller turns of yarn wound about the package extends from the downstream end of the package and passes back through the package to the joining point.

14. In the continuous processing of yarns, the method of twisting a pair of yarns from separate sources about each other a predetermined number of times comprising the steps of forming a package of yarn having a passage extending therethrough, having turns of yarn extending about said passage and corresponding in number to the number of times said yarns are to be twisted about each other and having free and tail ends, connecting the yarn from one of said sources to said tail end, extending the yarn from the other of said sources freely through said passage, completely by-passing said one yarn source, drawing the yarn from said other source and said free end away from said package initially to loop said yarn turns around the yarn from said other source and twist the same about each other, and thereafter to bring the yarns from said separate sources together without twisting them about each other.

15. The method of twisting a pair of yarns continuously issuing from separate sources about each other a predetermined number of times, comprising the steps of establishing a reserve yarn source in the form of a plurality of reserve yarn turns corresponding in number to the number of times said pair of yarns are to be twisted about each other, joining the free end of one yarn of said pair thereof to the tail end of the reserve yarn, completely by-passing said one yarn of the pair thereof with said other yarn of the pair thereof and extending the latter through said reserve yarn turns, advancing said reserve yarn by its free end with said other yarn of the pair thereof without extending the free end through said reserve yarn turns thereby to loop said reserve turns about said other yarn of the pair thereof and twist the same about each other, and thereafter to bring the yarns from said separate sources together without twisting them about each other.

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