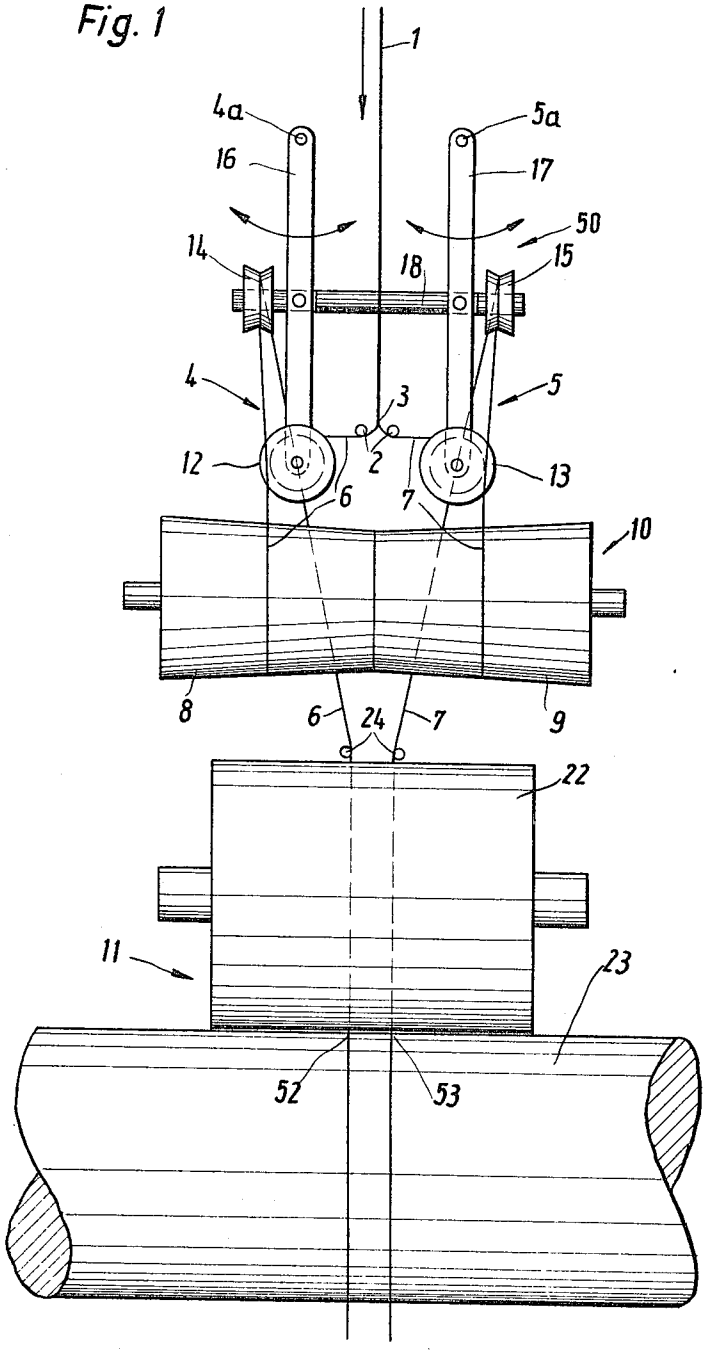
Aug. 6, 1968 I. BALASSA 3,395,524

METHOD AND APPARATUS FOR THE PRODUCTION OF CRIMPED YARNS

Filed July 28, 1966 3 Sheets-Sheet 1

Fig. 1



Aug. 6, 1968 I. BALASSA 3,395,524

METHOD AND APPARATUS FOR THE PRODUCTION OF CRIMPED YARNS

Filed July 28, 1966 3 Sheets-Sheet 2

Fig. 2

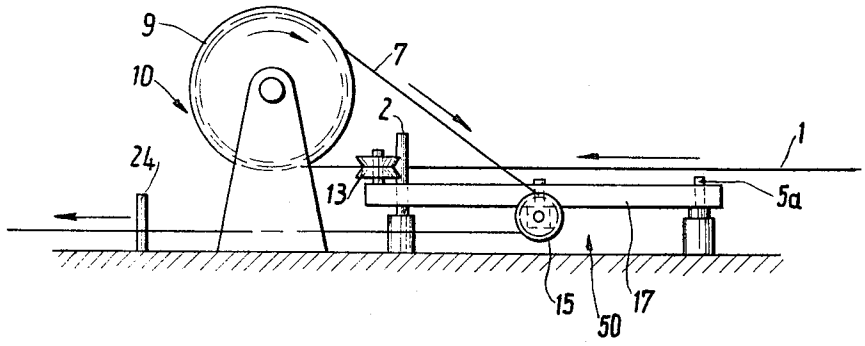


Fig. 3

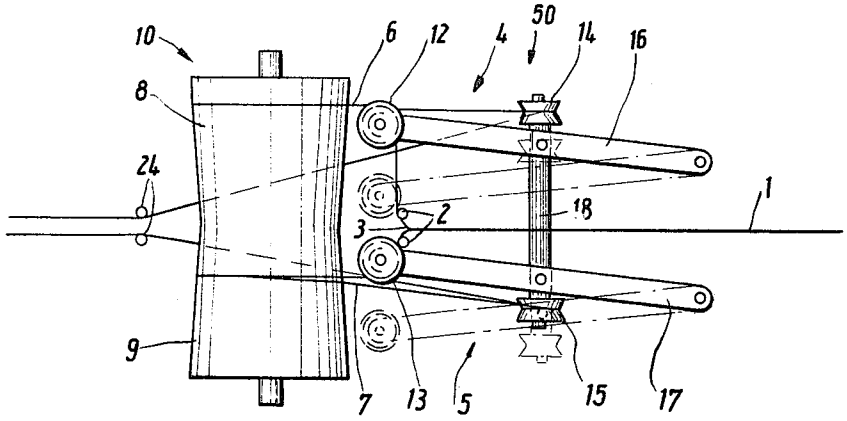
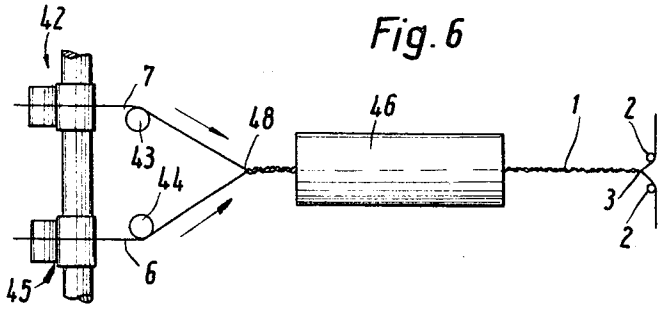


Fig. 6



METHOD AND APPARATUS FOR THE PRODUCTION OF CRIMPED YARNS

Filed July 28, 1966 3 Sheets-Sheet 3

Fig. 4

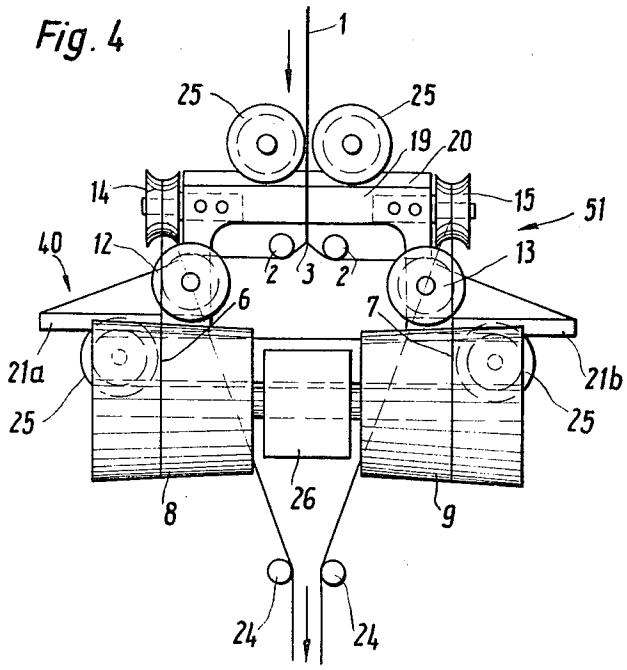
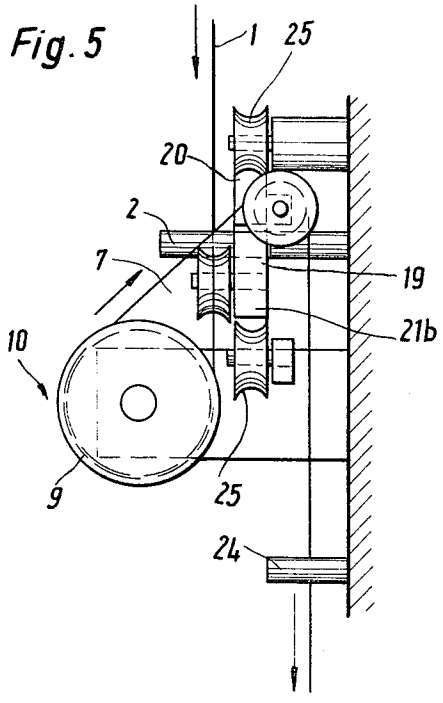


Fig. 5



United States Patent Office 3,395,524 Patented Aug. 6, 1968

3,395,524

METHOD AND APPARATUS FOR THE PRODUCTION OF CRIMPED YARNS

Imre Balassa, Buhl, Baden, Germany, assignor to Zinser-Textilmaschinen Gesellschaft mit beschrankter Haftung, Ebersbach an der Fils, Germany, a German company

Filed July 28, 1966, Ser. No. 568,564
Claims priority, application Germany, July 28, 1965, B 83,006
18 Claims. (Cl. 57—34)

ABSTRACT OF THE DISCLOSURE

The production of crimped yarns in which at least two separate yarns are fed under tension to a common twisting zone wherein the yarns are twisted together. After a heat setting of the false twist produced, the yarns are separated and drawn off under tension with equal drawing off speeds. Each separated yarn runs through at least one extension zone wherein the tension of the yarns are so controlled within their elastic range that when a relative difference in length of the yarns occurs, the tension of the shorter yarn is increased and that of the longer yarn decreased.

This invention relates to a method and an apparatus for the production of crimped yarns.

The term "crimped yarns" is to be understood as including yarns which may consist of one or more endless filaments or of fibers. The yarn material of such yarns consists at least in part of synthetic thermoplastic materials especially polyacrylonitriles, polyamides, polyesters and the like.

More particularly, the present invention relates to a method of said type in which at least two separate yarns are fed by feeding means under tension to a common twisting zone, are twisted together in this twisting zone, and after heat-setting of the false twist thus produced, are separated at a separating point and drawn off under tension by drawing off means with equal speeds, and are subsequently spooled. In this method, the difficulty is encountered that the yarns in the range between the feeding means and the drawing-off means unavoidably experience different changes in length and consequently in tension, which if they are not constantly compensated for lead to stoppages and thread breakages.

In a known apparatus, it is provided for equalizing the unavoidable differences in tension of the threads that the lateral displacement of the point of separation arising with the different yarn tensions is detected and the shorter thread is braked by means of a thread brake which can be activated or deactivated if the lateral displacement of the point of separation exceeds a predetermined limit. When the thread brake is activated, the yarn tension drops in the zone between the point of separation and the thread brake whereby the equalization of tension is achieved. In addition, in the zone between the thread brake and the draw-off means, a yieldingly mounted thread guide roller is provided which prevents the occurrence of excessive tensions in this zone. This apparatus has a number of disadvantages. Among other things, only an incomplete equalization of the tension can be achieved because the thread brake can only be either fully activated or deactivated. Further, since only the tension of one thread is affected, the equalization of length takes place very slowly.

The object of the invention is the provision of a method of the type referred to at the beginning of which the variations in length of the threads can be equalized rapidly and reliably. The present method for solving this problem is characterized mainly in that the two separated threads

each run through at least one extension zone in which the tensions of the yarns are so controlled or regulated within their elastic range, that when a relative difference in length of the yarns to one another occurs, the tension of the shorter yarn is increased and the tension of the longer yarn is diminished. The expression "relative difference in length" is to be understood as meaning the difference of the lengths of the two yarns in the range between the point of separation and the withdrawal point. Each relative length difference which occurs is rapidly equalized according to the invention by control of the regulation of the tension of the threads in the extension zones in that at each relative length difference which occurs, the tensions of the two yarns in the extension zone are varied in opposite directions. Preferably, it is provided that the difference in tension between the two yarns increases as the relative length difference increases, with the variation in the tension difference occurring steadily.

The present method can, for example, be carried out in such a manner that a feeler for measuring the relative length difference is provided, and the signal of which is applied to a control or regulating appliance for controlling the tension of the threads in the extension zones.

Since the tensions of the two threads when relative length differences occur are varied in opposite directions, in many cases the advantage of increasing the tension in the shorter thread in the extension zone can be used for diminishing the tension of the longer thread by means of a suitable coupled means.

In a preferred further embodiment of the present method, it is provided that the extension zones are associated with a common equalization zone in which the ratio of the tension of the yarns is approximately equal to one. The equalization member producing the equalization of the tensions in the equalization zone may preferably be constructed in the form of a feeler for detecting the relative length difference of the two yarns.

The apparatus for carrying out the present method can preferably be constructed in such a manner that each of the two yarns bears on a non-driven coupled rotatable roller means defined by two co-axially arranged conical rollers, the rollers being connected together for rotation and forming input rollers for the extension zone, and that a thread guide device is provided through which the two threads in dependence on their relative lengths are so displaced along the axial direction of the conical rollers that with increasing relative length difference of the two threads the point at which the shorter thread runs on to the coupled roller means is displaced in the direction of the reducing diameter of the conical rollers while the running on point of the longer thread is displaced in the direction of increasing diameter of the conical rollers. The apparatus is characterized by a particularly simple and reliable construction. Also, it makes possible a very sensitive and continuous control of the tensions in the extension zones so that any relative length differences which occur are constantly very quickly equalized and large relative length differences cannot occur at all. The latter has among others the advantage that it is possible to dispense with additional means for taking up relative length differences exceeding the elastic range of the yarns. A particluar advantage of the apparatus consists also in, that it can be subsequently incorporated with little expense in practically all existing types of false twist crimping machines. This applies also for the replacement of false twist rotating tubes by the present arrangement.

Further important objects and advantages of the invention will become more readily apparent to persons skilled in the art from the following detailed description and annexed drawings and in which drawings:

FIGURE 1 is a plan view of a yarn separating appli-

ance provided with withdrawal rollers, according to the invention.

FIGURE 2 is a view in side elevation of the arrangement according to FIGURE 1, but with the withdrawal rollers omitted.

FIGURE 3 is a view on part elevation according to FIGURE 1, but in a different operative position.

FIGURE 4 is a plan view of another construction of the separating appliance, according to the invention.

FIGURE 5 is a view in side elevation of the apparatus according to FIGURE 4.

FIGURE 6 is a diagrammatic illustration of an apparatus for crimping the yarns.

In FIGURE 1 only the end section of a twisted yarn **1** is shown whereas in FIGURE 6 the supply zone and the twisting zone are illustrated in an example. Yarns **6**, **7** to be crimped are fed by feeding means defined by pairs of rollers **42**, **45** with constant speed over guide rollers **43**, **44**, which are not driven, to a twisting zone in which the yarns between points **48** and **3** are twisted together and which is provided with a heating appliance **46** by means of which the false twist (crimping) applied to the yarns by the common twisting is heat set. The point **3** is the separation point of the yarns which, after separation, run through a stationary yarn guide **2** into a common equalization zone where the tensions of the two yarns are equalized by means of a yarn guide appliance **50** (FIGURES 1 to 3) which is movable transversely to the yarn run, and which consists essentially of the two parallelogram links **16** and **17** which at one side have stationary pivots at *4a* and *5a* and at their free ends have guide rollers **12** and **13** so that in this zone the ratio of the tensions is equal to one. The parallelogram links **16** and **17** are pivotally connected together by a coupling rod **18** and carry laterally further guide rollers **14** and **15**. In the directon of travel of the yarns behind guides **4** and **5**, there is a coupled rotatable roller means **10** having its axis of rotation transverse to the direction of the run of the yarn **1**. The coupled roller means **10** has two symmetrically arranged and constructed conical rollers **8**, **9** which are in the form of conical frustrums and which increase in diameter outwardly in relatively opposite directions The angle of the conical frustrums may be, for example, about three degrees. The total length of both conical frustrums is equal to the spacing of the guide rollers **12** and **13** together with a length section for the lateral displacement of the yarns, and the required size of which can easily be determined by experiment. Beyond the coupled rotatable roller **10** an ordinary withdrawal device **11** provided with draw-off rollers **22** and **23** is arranged. The zones between the conical rollers **8**, **9** and the corresponding draw-off rollers **22**, **23** in this example correspond to the extension zones. According to FIGURES 1 and 2, the course of the yarn between the twisting stretch and the draw-off appliance is as follows. From the point of separation **3**, the yarns **6** and **7** run through the yarn guides **2** consisting of hard metal or hard ceramic to the guide rollers **12**, **13** and here they are deflected at right angles again parallel to the direction of travel of the twisted yarn. Then each of the yarns runs over the periphery of one of the conical frustrums **8** and **9** which, according to FIGURE 2, are surrounded by the yarns over an angle of more than 180°. The conical frustroms **8** and **9** preferably have a roughened surface or a suitable covering which has a high coefficient of friction with respect to the yarns. Together with the large angle of contact this provides for reliable driving of the coupled rotatable roller **10** by the travelling yarns whereby the relative movement between the roller surface and the yarns and possible wear of the roller surface is avoided. From the upper side of the coupling roller **10** the yarns run over the guide rollers **14** and **15** and over guiding pins **24** to the draw-off rollers **22** and **23** of the withdrawal or draw-off device **11**, the draw-off speed of which is constant.

The apparatus operates as follows: the yarn guide **2** limits lateral oscillations of the thread in the twisting zone and provides for the yarns being separated smoothly and without damage. The tension of the yarns **6** and **7** deflected sideways from the yarn guide **2** is transmitted by the guide rollers **12** and **13** in opposite directions to the movable guides **4** and **5**. As long as the tensions in the two yarns are equal and the yarns between the point of separation **3** and draw-off points **52**, **53** (FIGURE 1), that is, the nips of the rollers **22**, and **23** are of equal length, the guide rollers **12**, **13** are in equilibrium in a symmetrical position on both sides of the yarn guide **2**. The yarns **6** and **7** run over corresponding portions of the conical frustrums **8** and **9** which are of equal diameters. Correspondingly, the speeds of travel of the two yarns over the coupled rotatable roller means **10** are equal.

If now, for example, the tension of the yarn **6** increases owing to shortening as compared with the other yarn, a resultant force acts upon the guides **4** and **5** which causes the parallelogram links **16**, **17** to swing to the right with reference to FIGURE 1. Then the yarn **6** reaches a zone of the conical frustrum **8** which is of smaller diameter while, for the yarn **7** on the conical frustrum **9**, the opposite is true. In the extension zones, the shorter yarn **6** is stretched since it tends to drive the coupling roller with a higher speed than the longer yarn. The result is that the shorter yarn **6** by reason of higher tension becomes additionally stretched in the extension zone while the stretching of the longer yarn is simultaneously diminished. In this way the relative length difference between the yarns is quickly equalized and the yarn guide appliance **50** returns to its central position. If the yarn **7** is shorter than the yarn **6**, the apparatus operates in the opposite manner as shown by the position of the parallelogram links **16**, **17** in broken lines in FIGURE 3.

The embodiment illustrated in FIGURES 4 and 5 differs from that described above in that yarn guide appliance **51** instead of a link guide for transverse displacement of the yarns has a guiding device **40** which is transversely displaceable by means of guide rails **20** or **21***a* and **21***b* and corresponding rollers **25**. The guide rails **20** and also **21***a* and **21***b* are united to form a rigid frame **19** on which the guide rollers **12**, **13** as well as the deflecting rollers **14**, **15** are mounted. The rollers **25** are arranged in fixed positions and support the frame **19** in its horizontal position so as to be displaceable transversely to the run of the twisted yarns. The coupled roller means **10** consists, as in the previous example, of two oppositely arranged frustrums **8** and **9** for which, however, a central bearing in a bearing block **26** is provided. The arrangement and mode of operation of the various thread guiding members and the coupled roller means is the same as in the preceding embodiment. These parts are therefore indicated by the same reference numerals as in FIGURES 1 to 3.

This invention is not to be confined to any strict conformity to the showings in the drawings but changes or modifications may be made therein so long as such changes or modifications mark no material departure from the spirit and scope of the appended claims.

What I claim is:

1. Method of producing crimped yarns in which at least two separate yarns are fed under tension to a common twisting zone, are twisted together in this zone and after heat-setting of the false twist thereby produced are separated again at a separating point and are drawn off under tension with equal drawing-off speeds, the improvement comprising running each of the two separated yarns at least through one extension zone, controlling the tensions of the yarns in said extension zone within their elastic range, so that when a relative difference in length of the yarns occurs, the tension of the shorter yarn is increased and the tension of the longer yarn is decreased.

2. Method as claimed in claim **1**, further comprising increasing the difference in tension between the two yarns

as the relative length difference increases, with the variation in the tension difference occurring steadily.

3. Method as claimed in claim 1, further comprising coupling the tensions of the yarns in the at least one extension zone with one another in such a manner that the tension of the longer yarn is diminished by the shorter yarn while its tension is being increased.

4. Method as claimed in claim 1 further comprising establishing a common equalizing zone through which the yarns run in association with said at least one extension zone in which equalizing zone the ratio of the tension of the yarns is approximately equal to one.

5. A method as claimed in claim 4 in which the yarns run into the equalizing zone immediately after leaving the separating point and run into the associated extension zone immediately after leaving the equalizing zone.

6. Method as claimed in claim 1, including drawing off the yarns from the at least one extension zone with constant and equal velocity.

7. An apparatus for producing crimped yarn including means for feeding at least two separate yarns under tension to means constituting a common twisting zone wherein the yarns are twisted together, means for heat setting the false twist produced in the twisting zone, means for separating the yarns, means for drawing off the yarns under tension at equal drawing off speeds and means defining at least one extension zone through which each separated yarn runs, the improvement comprising a non-driven rotatable coupled roller means on which each of the two yarns bear, said rotatable coupled roller means comprising two coaxially arranged conical rollers, the two rollers being connected together for rotation and providing input rollers for the at least one extension zone, and a yarn guide appliance through which the two yarns, in accordance with their relative lengths, are so displaced in the axial direction of the conical rollers that as the relative length difference of the two yarns increases, the running point of the shorter yarn on the conical roller is displaced in the direction of decreasing diameter of the conical roller while the running on point of the longer yarn is displaced in the direction of increasing diameter of the concical roller.

8. Apparatus as claimed in claim 7, in which the two yarns at least partly surround the corresponding conical rollers, with the angle of contact being greater than 180°.

9. Apparatus as claimed in claim 7, in which the yarn guide appliance has guiding elements for the two yarns which are arranged on a guiding device which is arranged to move transversely to the direction of travel of the yarn and the co-axial conical rollers being symmetrical with respect to a common central plane perpendicular to the axis of the conical rollers, and increasing in diameter outwardly in opposite directions.

10. Apparatus as claimed in claim 7 including a stationary yarn guide, whereby the yarns pass through said stationary yarn guide after leaving the separating means.

11. Apparatus as claimed in claim 9, wherein said guiding elements are comprised of guide rollers, whereby the yarns are firstly guided from the separating means outwardly at right angles and thereafter over said guide rollers arranged symmetrically on both sides of the separating point of the transversely movable yarn guiding device parallel to the direction of travel of the twisted yarns and then to the conical rollers.

12. Apparatus as claimed in claim 11, including deflecting rollers, whereby the yarns are guided by the guide rollers of the transversely movable yarn guiding device around the conical rollers opposite to the direction of travel of the yarns in the twisting zone to said deflecting rollers connected with the transversely movable guides and arranged in front of the separation point, and over these again in the direction of travel of the yarn in the twisting zone to the drawing off means.

13. Apparatus as claimed in claim 12 in which the yarn guiding device which is movable transversely to the direction of travel of the yarn in the twisting zone is comprised of parallelogram links having opposite ends and stationary bearings at one end and a coupling rod, said links being pivotally connected together by means of said coupling rod and on said opposite ends of said parallelogram links are mounted said guide rollers for the yarns which are arranged adjacent to the point of separation of the twisted yarns.

14. Apparatus as claimed in claim 13, in which the deflecting rollers for the yarns disposed in front of the drawing off means are mounted on the coupling rod.

15. Apparatus as claimed in claim 11 in which the guide rollers and the deflecting rollers are arranged on a rigid frame mounted to be displaceable transversely to the direction of travel of the twisted yarns.

16. Apparatus as claimed in claim 15 including guiding rails and running rollers, whereby said rigid frame is provided with said guiding rails and said running rollers and is arranged transversely to the twisting zone.

17. Apparatus as claimed in claim 7 in which the conical rollers of the coupled rotatable roller means have a surface of a high coefficient of friction with respect to the yarns running thereabout and are driven by the yarns.

18. Apparatus as claimed in claim 11, in which the guide rollers are arranged on a rigid frame mounted to be displaceable transversely to the direction of travel of the twisted yarns.

References Cited

UNITED STATES PATENTS

3,261,116	7/1966	Kunzle et al.	57—34
3,261,156	7/1966	Kunzle et al.	57—34

FRANK J. COHEN, *Primary Examiner.*

WERNER H. SCHROEDER, *Assistant Examiner.*