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TWISTING OF TEXTILE YARNS

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Fig.1.

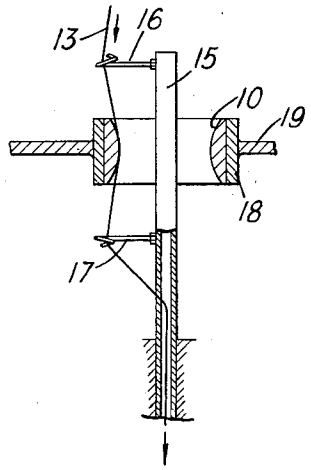

Fig.2.

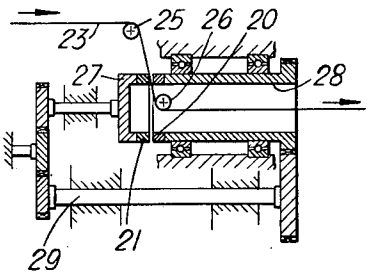

Fig.3.

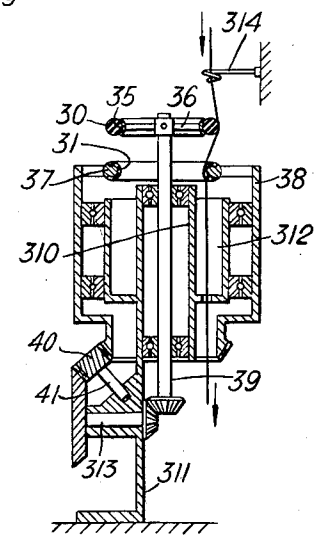

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Fig. 4

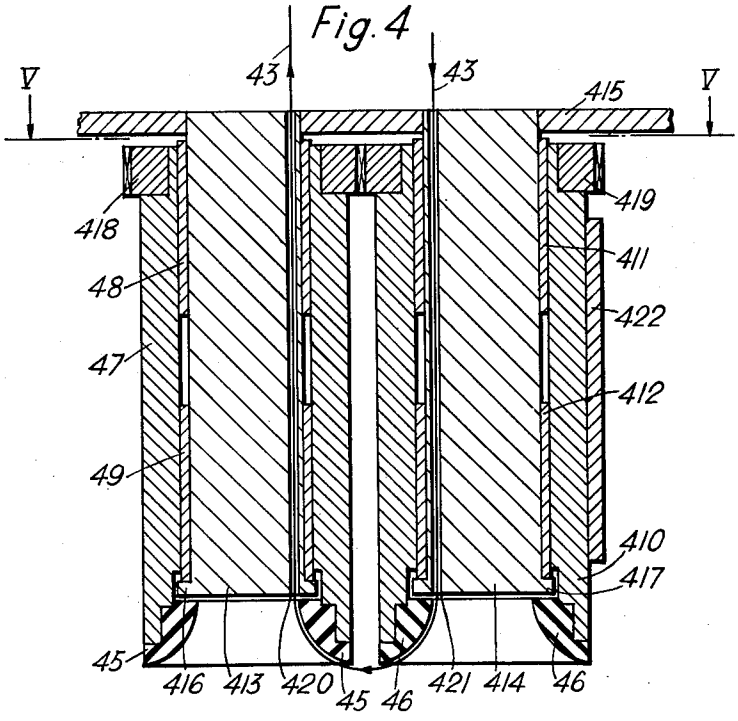

Fig. 5.

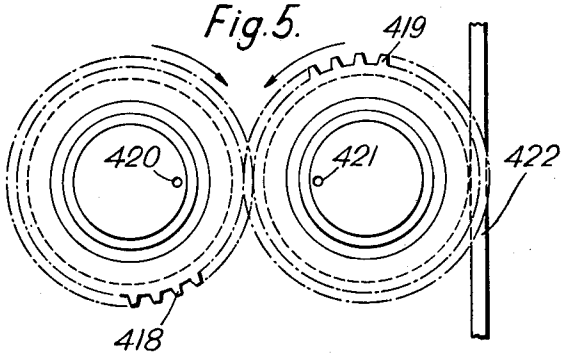

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Fig. 6.

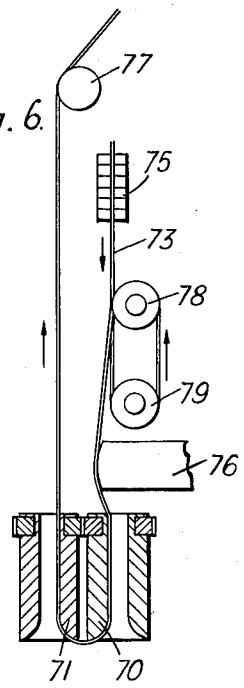


Fig. 8.

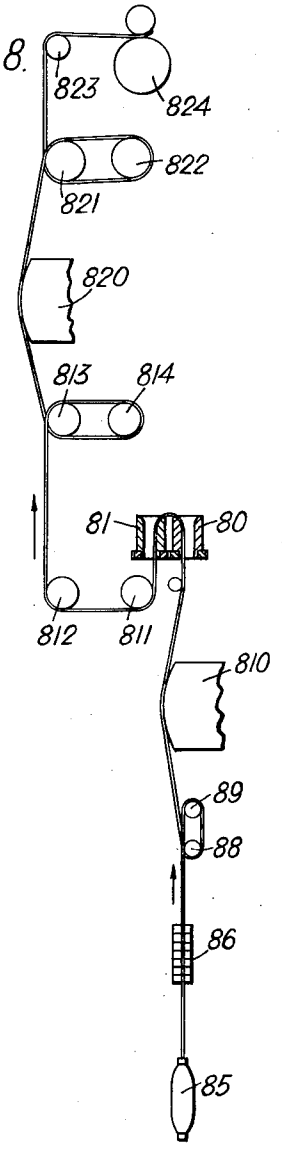
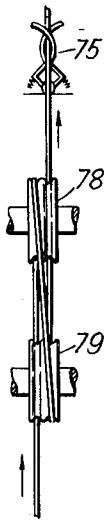


Fig. 7.



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TWISTING OF TEXTILE YARNS

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8 Claims. (Cl. 57—157)

The present invention concerns the twisting of textile yarns, and is more especially concerned with imparting so-called false twist for purposes such as the production of crimped yarns from yarns composed of endless synthetic filaments.

False twisting has hitherto been effected by passing a yarn over a member attached to a hollow spindle through which the yarn is continuously drawn during rotation thereof. Since this arrangement imparts one turn of false twist for each revolution of the spindle, the rate of twisting is limited by the maximum spindle speed attainable in practice.

An object of the present invention is to remove the above limitation and thereby to enable higher values of twist to be imparted to yarns moving at a given longitudinal speed than has been practicable heretofore.

According to the present invention, a longitudinally moving yarn is twisted by frictional engagement between it and a surface moving substantially at right angles to the yarn axis at the locus of contact. The yarn is thus rolled round about its own axis relative to the frictional surface so that the amount of twist will depend directly upon the linear relative speed and inversely upon the circumference of the yarn.

In order to ensure adequate frictional engagement, the yarn may be urged by its own longitudinal tension into rolling contact with a moving friction surface of convex arcuate profile, or it may be more positively engaged by the provision of a pressure surface urged towards the friction surface with the yarn therebetween. Two friction surfaces moving in opposite directions may be used and these may, if desired, be arranged so that each constitutes a pressure surface relative to the other.

The friction surface may be presented by a body of rotation, or by a longitudinally displaced flexible member such as a belt.

Preferably the friction surface is presented by a body of rotation at least in part concave relative to its own rotary axis and the yarn is guided so as to tend to move in a fixed direction towards or away from the said axis. By such an arrangement the yarn tends to assume a stabilised position at the nearest point on the surface to its direction of guiding. For this purpose two friction surfaces, convex in profile and partially concave relative to their axes, may be presented by members carried by hollow rotary spindles disposed side by side and rotating in opposite angular directions whereby the yarn is led in one axial direction through one spindle and in the opposite axial direction through the other spindle.

As an alternative the friction surfaces of the two spindles may face one another, the spindle axes being offset to such an extent that the yarn must pass through the first spindle and then be deflected in a radially outward direction relative thereto to enter the second spindle in a radially inward direction and thereafter to pass through the second spindle in a direction parallel to its direction of travel through the first spindle.

The invention will be described further by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary vertical section showing a simple arrangement having a single friction surface;

FIG. 2 is a similar view of an arrangement including two friction surfaces;

FIG. 3 is a similar view showing another arrangement including two friction surfaces;

FIG. 4 is a similar view showing a further arrangement including two friction surfaces;

FIG. 5 is a horizontal section on the line V—V of FIG. 4;

FIG. 6 is a diagrammatic vertical section showing parts of a false twist unit incorporating an arrangement such as that of FIGS. 4 and 5;

FIG. 7 is a detail on an enlarged scale viewed from the right of FIG. 6; and

FIG. 8 is a diagrammatic vertical section of a machine comprising combined false twist and yarn modifying units incorporating an arrangement similar to that of FIGS. 4 and 5.

A rotary hollow spindle **15** (FIG. 1) carries upper and lower pigtail guides **16** and **17** respectively. The yarn **13** is drawn downwardly through the guides and through the lower part of the spindle **15** which it enters through an aperture below the guide **17**.

A friction surface **10** of convex profile is presented by an annulus of resilient material such as synthetic rubber fixed within a ring **18** carried by a bracket **19**.

On rotation of the spindle **15** the yarn, whilst moving downwardly is urged by its longitudinal tension into contact with the surface **10** over an arcuate locus. The rotary movement of the spindle and guide causes the yarn to be translated around the surface **10** in a direction of relative movement substantially at right angles to the downward longitudinal movement of the yarn. This relative movement causes the yarn to be rolled about its own axis thereby imparting a high degree of false twist thereto.

In a second embodiment (FIG. 2) the yarn **23** passes over a stationary guide **25** and then passes between two contra-rotating annular friction surfaces **20** and **21** and after passing over another stationary guide **26** travels in a direction coaxial with the common axis of rotation of the said surfaces. The direction defined by the yarn **23** as it passes from guide **25** to guide **26** is not quite radially of the axes of the surfaces **20**, **21** thus, the angle between the said axes and the yarn **23** is less than 90°. The surfaces are presented by resilient facings on the ends of rotary members **27** and **28** respectively which are connected by gearing and a layshaft **29** to rotate at similar speeds in opposite directions. The members **27** and **28** are arranged so that the surfaces **20** and **21** are fixed in an axial direction for rotation with a relatively small space therebetween. The yarn **23**, entering the opening between the surface **20**, **21**, contacts the inner corner of the surface **20** and the outer corner of the surface **21** because of the less than perpendicular entry angle and because of the tension in the yarn **23**. By this means, both friction surfaces **20**, **21** are effective to twist the yarn as it passes through the opening therebetween.

A third embodiment (FIG. 3) includes a first friction surface **30** presented by part of the external periphery of a resilient ring **35** carried on a pulley **36**, and a second friction surface **31** present by part of the internal periphery of a resilient facing carried on an internal bead **37** supported by a spider from a generally cylindrical casing **38**. The pulley **36** is mounted on a spindle **39** which is rotatably mounted in bearings in a cylindrical bracket portion **310** of a fixed bracket **311**. The bracket portion **310** carries a larger diameter cylindrical portion **312** upon which the casing **38** is rotatably mounted. The spindle **39** is connected by bevel pinions to a layshaft **313** which is rotatably mounted in the bracket **311** and which in turn is connected by bevel pinions to the casing **38** through the interposed, direction-reversing spur gear **40** which is

pivotally mounted on shaft 41 which is secured to the bracket 311. By means of this gearing the spindle 39 and the casing 38 must rotate in opposite directions at the same speed if either of them is driven and hence the surfaces 30 and 31 are contra-rotatory. The yarn 13 is drawn downwardly through a fixed pigtail guide 314, in contact over an external arcuate locus on the surface 30 and over an internal arcuate locus on the surface 31 and thence downwardly between the cylindrical bracket portions 310 and 312.

In a fourth embodiment (FIGS. 4 and 5) two friction surfaces are presented by rubber members 45 and 46 which are concave in plan (i.e. partially concave relative to their rotary axes) and of convex profile in vertical section. The member 45 is carried at the lower end of a hollow spindle in the form of a steel cylinder 47 provided with bronze bearing liners 48 and 49 secured as a press fit therein. Similarly the member 46 is carried by a hollow spindle in the form of a cylinder 410 having liners 411 and 412 secured therein.

Two fixed steel cylindrical guides 413 and 414 are supported from a fixed plate 415.

The lower end portions of these guides are flanged at 416 and 417 respecitvely to engage the lower end faces of the liners 49 and 412 respectively and thereby to retain the cylinders 47 and 410 in a rotatably mounted position on the guides as shown.

The upper end portions of the cylinders 47 and 410 carry intermeshing gear wheels 418 and 419 respectively so that when the cylinder 410 is rotated by frictional engagement with a belt 422 the cylinder 47 also revolves.

The guides 413 and 414 each have a vertically extending bore 420 and 421 respectively through which the yarn 43 is guided.

In operation the yarn passes downwardly through the bore 421 and around the surface which is concave in plan presented by the rubber member 46 and radially outward therefrom to the surface presented by the member 45. The yarn passes radially inwards over the surface of the member 45 and thereafter upwardly through the bore 420. It will be seen that any tendency for the yarn to wander circumferentially around either of the members 45 or 46 is counteracted by their concave shape in plan thereby causing the yarn to follow the shortest path in the position defined by the bores 420 and 421 in the guides 413 and 414 respectively.

Crimped yarn may be produced from a plain yarn composed of a plurality of endless filaments, the yarn being false twisted in accordance with the invention, the yarn also being heated immediately before coming into contact with the friction surface, so that in the twisted condition of the yarn where it passes the friction surface its individual filaments are substantially free of twist.

A false twist unit (FIGS. 6 and 7) in a simple form comprises a gate tensioner 75, a heater 76 below the gate tensioner, two friction surfaces 70 and 71 (of the kind as shown in FIG. 4) and an outward feed roll 77. It has been found however that the action of the gate tensioner is apt to be erratic due to the twist in the yarn 73 passing upwards through the heater against the direction of movement of the yarn. In accordance with a further feature of the invention, however, twist blocking means is provided between the gate tensioner and the heater. Thus the twist may be blocked below the tensioner by passing the yarn around two grooved rolls 78 and 79 preferably twice, each roll then having two peripheral guide grooves.

The present invention, by considerably increasing the linear speed at which synthetic crimped yarns may be produced, offers the valuable possibility of subsequently modifying the properties of the yarn in a single continuous process.

Thus the plain yarn is passed from a supply bobbin 85 (FIG. 8) through a gate tensioner 86, over a pair of twist blocking rolls 88, 89, over a heater 810, over frictional twisting surfaces 80, 81, and around guide rolls

811, 812. The thus formed crimped yarn may then be passed directly into a yarn modifying unit to impart any desired combination of bulk or stretch to the crimped yarn by modifying it under the action of heat and tension. Such yarn modifying unit comprises for example feed rolls 813, 814, a heater 820, feed rolls 821, 822, a guide roll 823 and winding drum 824.

We claim:

1. A method of imparting false twist to a yarn comprising the steps of passing said yarn over the external peripheral surface of a rotatable disk and through a rotatable ring while tensing said yarn across said external peripheral surface of said disk and across the internal peripheral surface of said disk for frictional engagement of said yarn therewith and rotating said disk and ring about their respective central axes to cause twisting of said yarn.

2. A method of imparting false twist to a yarn comprising the steps of passing said yarn through two coplanar rotatable rings while tensing said yarn across the internal peripheral surfaces of both of said rings for frictional engagement of said yarn therewith and rotating both of said rings about their respective central axes to cause twisting of said yarn.

3. A method for imparting a false twist to a moving yarn comprising the steps of passing said yarn progressively through two coplanar circular rotatable devices having friction surfaces said yarn being in frictional engagement with each of said surfaces and rotating said devices such that said surfaces move substantially transverse to said yarn and thereby roll and twist said yarn about its own axis.

4. In a method of false twisting a yarn, the steps of continuously advancing the yarn longitudinally; bending the yarn, as it advances longitudinally, along a convex annular peripheral portion of a first rotating member whose peripheral portions turns transversely with respect to the longitudinally advancing yarn so as to twist the same while changing the longitudinal direction of advance thereof; then bending the longitudinally advancing yarn, as it leaves said first member, along a convex annular peripheral portion of a second rotating member whose peripheral portion also turns transversely with respect to the longitudinally advancing yarn and continues to twist the same while further changing the longitudinal direction of advance thereof; and then continuing the longitudinal advance of the yarn beyond said second member.

5. In a method as recited in claim 4, said first and second rotating members being coaxial and said peripheral portions of said members being the outer peripheral portion of one of said members and an inner peripheral portion of the other of said members so that the yarn moves along a substantially S-shaped path while being twisted by said rotating members.

6. In a method as recited in claim 4, said first and second rotating members being located beside each other.

7. In a method as recited in claim 4, said first and second rotating members being located beside each other and having substantially parallel axes of rotation, respectively.

8. In a method as recited in claim 4, said first and second rotating members being located beside each other and said peripheral portions thereof being at the inner peripheries of said rotating members so that the yarn is bent along substantially U-shaped path as it passes through said rotating members in engagement with said peripheral portions thereof.

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