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METHOD AND APPARATUS FOR TREATING YARN

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2 Sheets-Sheet 1

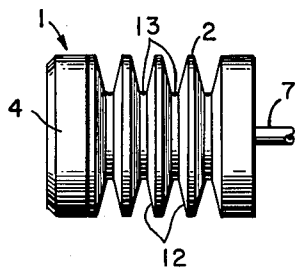


FIG. 1.

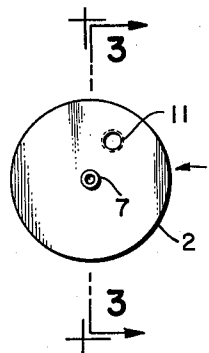


FIG. 2.

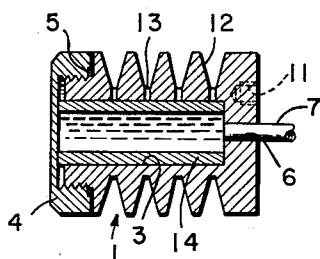


FIG. 3.

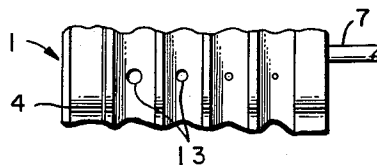


FIG. 4.

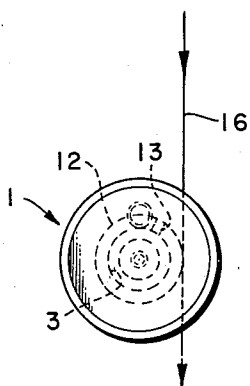


FIG. 5.

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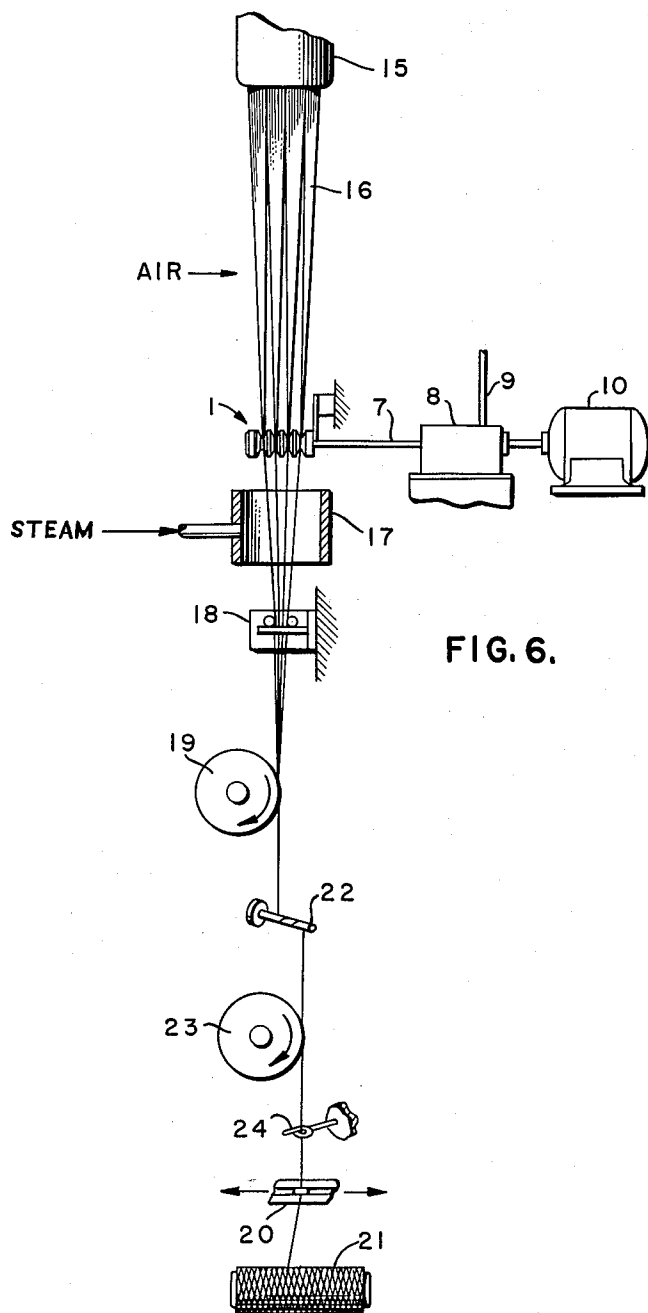
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## METHOD AND APPARATUS FOR TREATING YARN

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This invention relates to a method and apparatus for producing a treated yarn, preferably a yarn of nylon composition. More particularly, this invention relates to a method and guide for separating a group of filaments into subdivided bundles while simultaneously applying a treating agent thereto.

Nylon yarn is produced by initially extruding a polymer compound through capillaries in a spinneret. The filaments issuing from the capillaries are quenched by directing a flow of air into their path and they are then converged into an unstretched or unfinished yarn. The unfinished yarn is conditioned with steam and lubricated by applying a liquid agent or finish thereto. Thereafter the yarn is passed between a differential speed feed and draw roll assembly for stretching the yarn and orienting the molecules therein. The stretched or finished yarn is subsequently collected on bobbins.

In order to more uniformly lubricate the yarn, it is not uncommon to separate the freshly spun quenched filaments into a plurality of bundles and to lubricate each bundle separately before merging them.

The lubricants or treating agents used often contain waxes, resins, dyes, etc., and are in the form of an emulsion, solution or dispersion. Lubricants impart a desired lubricity and pliability to yarns which prepares them for weaving and knitting operations. Lubricants reduce inter-filament friction during draw-down, thus enhancing the processability of the multi-filament yarns. Lubricants also improve the quality of yarns in general.

Many different kinds of devices are used in textile processing to coat yarns with a liquid finish or lubricant. Conventional constructions employ either a rotating wheel partially immersed in a lubricant or a wick of absorbing material moistened at one end thereof with a lubricant to transfer the lubricant to the filaments when the latter are passed engagingly over the wheel or the wick. In conventional equipment, multi-bundle convergence guides and finish applicators are separate devices.

It is an object of this invention to provide a convergence guide and liquid agent applicator device for processing yarns.

Another object is to provide a convergence guide having a plurality of grooves each normally supplied with a metered amount of liquid agent.

Another object is to provide a convergence guide adapted to apply a liquid agent uniformly to subdivided portions of a group of filaments.

Another object is to provide a convergence guide which is both economical to produce and simple in construction.

Another object is to provide a convergence guide for improving the spinning process of nylon yarn.

Another object is to provide a convergence guide adapted to permit a liquid agent under pressure to flow directly into contact with a moving yarn.

Another object is to provide a convergence guide hav-

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ing orifice means of different dimensions to provide uniform flow of a liquid agent to yarn passing engagingly thereover.

A further object is to provide an improved method for producing a conditioned yarn.

A still further object is to provide an improved method including simultaneously converging, lubricating, and conditioning yarn.

The convergence guide and lubricant applicator device, according to the invention, comprises a block body having a reservoir defined therein and a plurality of substantially parallel grooves formed on its exterior surface. The reservoir is normally supplied with a lubricant under pressure from a metering pump through connecting means in the block body. The lubricant flows to the grooves from the reservoir via orifices in the block body.

In operation, separate bundles of filaments are positioned in a respective groove of the convergence guide so that the bundles pass below the orifices in the grooves. A lubricant is metered from a positive displacement type metering pump to the reservoir and to the grooves via the orifices in the guide and the lubricant is thus applied to the filaments as they pass over the surfaces of the grooves.

The improved method for producing a treated yarn comprises moving longitudinally from a source thereof a group of filaments and quenching the latter. The quenched group of filaments is then converged into a plurality of separate bundles and concurrently a lubricant is applied to each bundle. The filaments are surrounded with steam at the point of convergence and lubrication, and the lubricated bundles are then combined to form a yarn.

The invention will be better understood by reference to the detailed description given hereinafter and to the drawing.

In the accompanying drawing:

FIGURE 1 is an elevation view showing the convergence guide and liquid treating applicator device embodying the invention;

FIGURE 2 is an end view of the guide shown in FIGURE 1;

FIGURE 3 is a cross-section view taken through 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary view showing a modified embodiment of the convergence guide and liquid treating applicator device embodying the invention;

FIGURE 5 is an end view showing the preferred position of the orifices in the convergence guide and liquid treating applicator device in relation to the path of yarn travel; and

FIGURE 6 is a diagrammatic view illustrating the method and apparatus of the invention.

Referring to the drawing, in which like components in each of the figures are designated by like reference numerals for convenience reasons, the preferred embodiment of the convergence guide and lubricant applicator device 1 comprises a block or casing 2 having a cavity or reservoir 3 extending inwardly from a threaded end thereof. A cap 4 having internal threads and an annular shoulder for positioning a seal 5 therein is sealingly threaded on the threaded end of casing 2. Opposite the threaded end of casing 2 a bore 6 extends inwardly from the exterior of device 1 into the reservoir 3.

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One end of a line 7, connected to a metering pump 8 at its opposite end, is press-fit into bore 6. Metering pump 8, which may be of any conventional positive displacement type, is connected by a line 9 to a source of supply of a lubricant and is operated by a motor 10. A threaded bore 11 in the end wall of casing 2 serves as one means of mounting the device 1.

A plurality of substantially parallel circular grooves 12 are formed on the outer periphery of casing 2. For purposes of illustration device 1 is shown with four grooves 12. Each groove 12 has tapered sidewalls which join to form the base or bottom of the groove. In the base of each groove 12 there is an orifice 13 that extends through the wall of casing 2 and opens into reservoir 3.

Reservoir 3 is provided with a porous filter 14 preferably of the cartridge type as illustrated in the drawing.

In operation (FIG. 6) a molten polymeric compound is extruded through a spinneret 15 having a multiplicity of holes. The filaments 16 issuing from the spinneret are quenched by a cross-flow of air and are divided into a number of bundles corresponding to the number of grooves 12 in device 1 by means of a separator device employed by an operator. The operator locates each bundle within a respective groove 12.

From device 1 filaments 16 are forwarded through a conditioning tube 17 located below the device. Conditioning tube 17 is normally filled with steam or conditioning air from a source thereof. The yarn then travels to a single-bundle convergence guide 18 for combining the bundles to form a yarn. From convergence guide 18 the yarn may be laced so as to move to a driven feed roll 19 and then directly into a traverse device 20 and later is collected on a rotatable bobbin 21. By another lace-up as shown in FIG. 6, the yarn is moved from feed roll 19 to a draw pin 22, to a driven draw roll 23 driven at a faster peripheral rate of speed than the feed roll 19 to stretch the yarn. The stretched yarn then moves through a pigtail guide 24, into the traverse device 20, and is then collected on the bobbin 21. While the yarn is being spun, drawn, and collected, pump 8 is operated by motor 10 so as to supply a metered amount of lubricant to reservoir 3 and orifices 13 of guide 1.

Preferably, as shown in FIG. 5, device 1 is positioned so that the bundles travel tangentially to the base of the grooves 12 and below the orifices 13 to prevent contact of the filament bundles with the orifices 13 and to allow the lubricant to flow down the grooves 12 and into contact with the moving bundles. As each bundle of filaments travels below an orifice 13, the filaments are coated with the lubricant supplied from an orifice 13. The steam from the conditioner tube 17 surrounds the device 1 and imparts heat to the lubricant gathered by the filaments and reduces the viscosity of the lubricant.

Grooves 12 are shown as circular. It will be understood that this configuration is desirable from ease of machining and an economy standpoint. An arcuate groove is preferred, although not necessarily circular, over a longitudinal type groove for the reason that contact of filaments with a round or arcuate surface may be tangential and offers less frictional contact than would a parallel contact of the filaments with the surface of a longitudinal groove.

In FIGURE 4 a modified embodiment of device 1 is shown wherein each orifice 13 is of a different size, the orifice nearest the line 7 being the smallest in diameter and the others therefrom increasing progressively in diameter so as to account for a pressure gradient in the flow of the lubricant.

The guide device 1 provides a simple apparatus and method for simultaneously separating a group of filaments into bundles and lubricating the latter. The guide device 1 also provides means for permitting more uniform lubrication of yarn than in the past.

The device 1 is particularly applicable to the lubrication of heavy denier yarns comprised of a large number

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of filaments. In this case, device 1 may be constructed with a large number of grooves 12 to accommodate a large number of small bundles of filaments, as would be necessary in the lubrication of heavy denier yarns. Although a large number of grooves 12 may be provided, nevertheless, each bundle of filaments will be substantially uniformly lubricated because the lubricant pressure at each orifice 13 will be substantially equal since all the orifices 13 have a common reservoir 3.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for spinning and drawing yarn comprising in combination:

- a. a spinneret for longitudinally extruding a group of filament yarn from a polymer supplied thereto,
- b. a first guide fixedly positioned in the group filament yarn path below said spinneret,
- c. said first guide comprising hollow casing means having a reservoir defined therein,
- d. means defining a port extending through the wall of said casing means,
- e. said port opening at one end thereof into said reservoir and outwardly of said hollow casing means at its opposite end thereby providing a passage for normally flowing a treating agent therethrough from a source thereof to said reservoir,
- f. a plurality of grooves formed on the outer periphery of said casing means for dividing the group of filament yarn normally delivered thereto into a plurality of separated filament yarn bundles each having surface engagement with a respective one of said plurality of grooves,
- g. means defining a plurality of orifices in said casing means interconnecting said reservoir with said plurality of grooves for permitting the treating agent to flow from said reservoir to said plurality of grooves into contact with said filament yarn bundles for coating the latter,
- h. metering means supplied with a treating agent and operatively connected to said port of said first guide for supplying said reservoir with a treating agent under pressure,
- i. conditioning means normally supplied with steam from a source thereof located in the filament yarn bundle path adjacent said first guide for conditioning said bundles of filament yarn and for heating the area surrounding said first guide,
- j. a second guide positioned in the path of the plurality of bundles of filament yarn near said conditioning means for reuniting said filament yarn bundles to form a filament yarn end,
- k. drawing means positioned in the filament yarn end path near said second guide for stretching said yarn end, and
- l. take-up means for collecting the stretched yarn end.

2. Apparatus for spinning and drawing yarn comprising in combination:

- a. a spinneret for longitudinally extruding a group of filament yarn from a polymer supplied thereto,
- b. a first guide fixedly positioned in the group filament yarn path below said spinneret,
- c. said first guide comprising an elongate hollow casing having a reservoir defined therein,
- d. port means formed at one end of said hollow casing, said port means being open at one end to said reservoir and open exteriorly of said hollow casing at its opposite end for flowing a treating agent under pressure delivered from a source thereof to said reservoir,
- e. a plurality of grooves formed contiguously along the peripheral length of said hollow casing for dividing the group filament yarn into a plurality of separate filament yarn bundles each having surface con-

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- tact with a respective one of said plurality of grooves,
- f.* means defining a plurality of orifices in said hollow casing, each of said plurality of orifices interconnecting a respective one of said plurality of grooves to said reservoir and each increasing in diameter progressively from said one end of said hollow casing to the opposite end thereof for causing said treating agent under pressure to flow from said reservoir to said plurality of grooves in uniform amounts and into contact with the filament yarn bundles for coating the latter,
- g.* metering means supplied with a treating agent and operatively connected to said port of said first guide for supplying said reservoir with a treating agent under pressure,
- h.* conditioning means normally supplied with steam from a source thereof located in the filament yarn bundle path adjacent said first guide for conditioning said bundles of filament yarn and for heating the area surrounding said first guide,
- i.* a second guide positioned in the path of the plurality of bundles of filament yarn near said conditioning means for reuniting said filament yarn bundles to form a filament yarn end,
- j.* drawing means positioned in the filament yarn end path near said second guide for stretching said yarn end, and
- k.* take-up means for collecting the stretched yarn end.
3. Apparatus for spinning and drawing yarn comprising in combination:
- a.* a spinneret for longitudinally extruding a group of filament yarn from a polymer supplied thereto,
- b.* a first guide fixedly positioned in the group filament yarn path below said spinneret,
- c.* said first guide comprising an elongate hollow casing having a reservoir defined therein which reservoir opens outwardly of said hollow casing at one end thereof,
- d.* a filter element disposed within said reservoir,
- e.* a sealing cap adapted to be secured to said hollow casing for sealingly covering said open end of said reservoir,
- f.* port means extending through the wall of said hollow casing at the opposite end of said hollow casing from said one end thereof, said port being open at one end thereof to said reservoir and exteriorly of said hollow casing at its opposite end for flowing a treating agent under pressure delivered from a source thereof to said reservoir,
- g.* a plurality of grooves formed contiguously along the

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- peripheral length of said hollow casing for dividing the group filament yarn into a plurality of separate filament yarn bundles each having surface contact with a respective one of said plurality of grooves,
- h.* means defining a plurality of orifices in said hollow casing, each of said plurality of orifices interconnecting a respective one of said plurality of grooves to said reservoir and each increasing in diameter progressively from said opposite end of said hollow casing to said one end thereof for causing said treating agent under pressure to flow from said reservoir to said plurality of grooves in uniform amounts and into contact with the filament yarn bundles for coating the latter,
- i.* metering means supplied with a treating agent and operatively connected to said port of said first guide for supplying said reservoir with a treating agent under pressure,
- j.* conditioning means normally supplied with steam from a source thereof located in the filament yarn bundle path adjacent said first guide for conditioning said bundles of filament yarn and for heating the area surrounding said first guide,
- k.* a second guide positioned in the path of the plurality of bundles of filament yarn near said conditioning means for reuniting said filament yarn bundles to form a filament yarn end,
- l.* drawing means positioned in the filament yarn end path near said second guide for stretching said yarn end, and
- m.* take-up means for collecting the stretched yarn end.
4. A method for producing treated yarn comprising:
- a.* melt spinning a group of filaments,
- b.* quenching said group of filaments,
- c.* separating said group of filaments into a plurality of bundles while simultaneously applying a lubricant,
- d.* steam conditioning each of said plurality of bundles at the point of separation thereof,
- e.* thereafter reuniting said plurality of bundles to form a yarn end,
- f.* drawing said yarn end, and
- g.* collecting said drawn yarn end.

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