

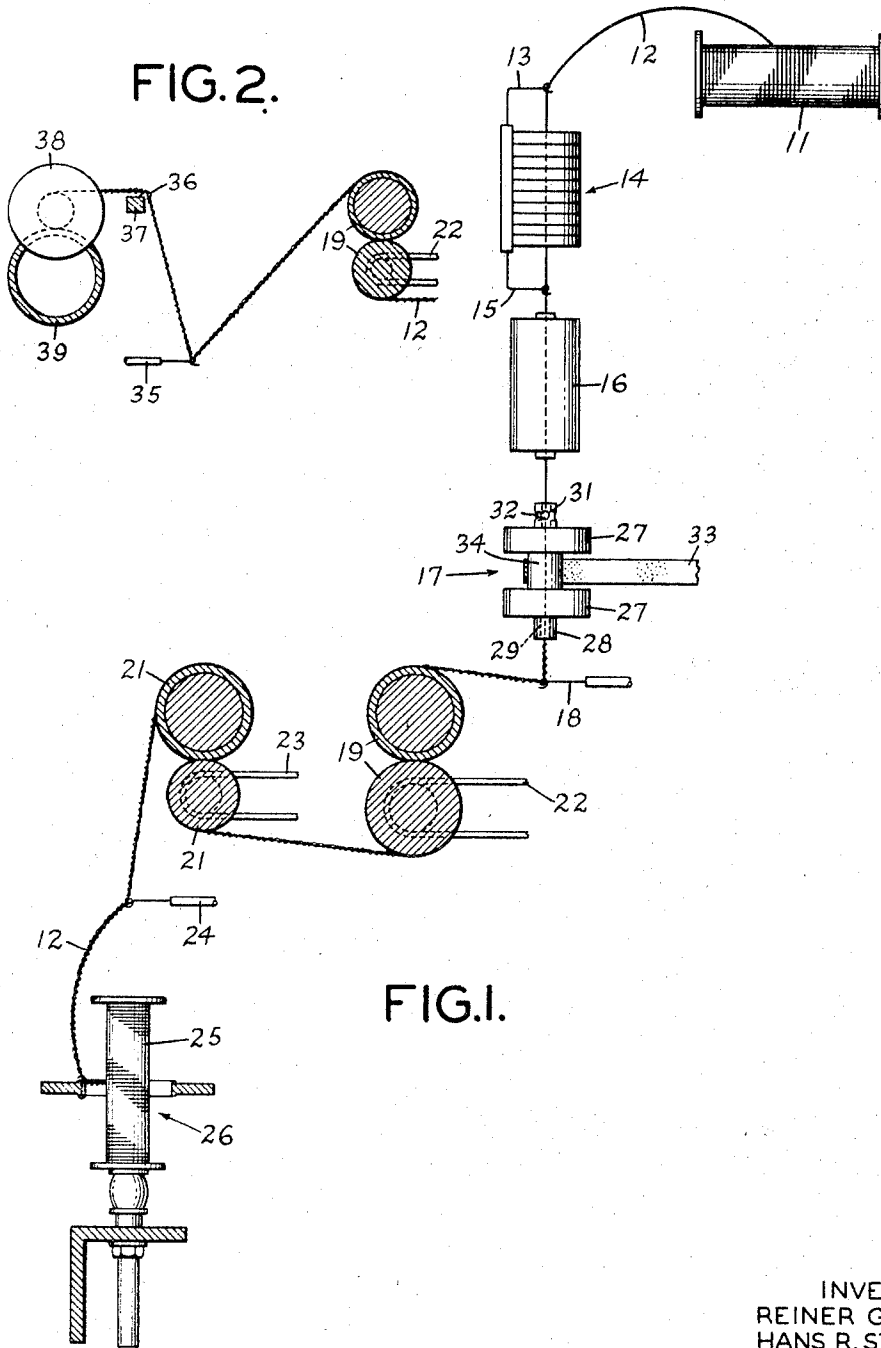
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PROCESS AND APPARATUS FOR MAKING VOLUMINOUS YARN

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PROCESS AND APPARATUS FOR MAKING
VOLUMINOUS YARN

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 6 Claims. (Cl. 57-34)

Yarn Denier	Twist Range of False Twist Spindle
50	98-122
75	80-100
100	70-87
150	56-71
300	40-50
450	33-41
600	28-35
900	23-29

This application is a continuation of application Ser. No. 376,434, filed Aug. 25, 1953, and now abandoned.

This invention relates to the production of voluminous yarn and relates more particularly to an improved process and apparatus for the production of voluminous yarn.

According to one method that has been proposed for the production of voluminous yarn, tow or the like, hereinafter referred to as yarn, a yarn is subjected to a high twist, preferably while the yarn is in a somewhat plastic state, and the twist is then removed from the yarn, all in one continuous operation. The introduction and removal of the twist from the yarn is normally effected by means of a false twist spindle through which the yarn passes from a source of supply to a take up. As compared with the original yarn, the treated yarn exhibits a somewhat lower break load and a somewhat lower elongation at the break. While the extent of these losses is not very great, they do detract from the properties of the treated yarn and the products prepared therefrom. In addition, the crimp and voluminosity of the treated yarn is not as good as one produced by supertwisting and untwisting carried out in several separate operations.

It is an important object of this invention to provide a process and apparatus for the production of voluminous yarn which will be free from the foregoing and other difficulties and which will be especially efficient in operation and simple in construction.

A further object of this invention is to provide a process and apparatus for the production of voluminous yarn wherein the yarn is permitted to relax to a controlled degree following the insertion into and removal of twist therefrom.

Other objects of this invention, together with certain details of construction and combinations of parts, will be apparent from the following detailed description and claims.

According to the present invention, it has been found that the crimp, voluminosity and elasticity of a voluminous yarn which has been produced by twisting a yarn and then removing the twist therefrom may be increased by relaxing the yarn to a controlled degree before winding the yarn onto a take-up package. When the yarn is treated in this manner it is found that the crimp, voluminosity and elasticity are improved and that breaking load and elongation closely approach that of the untreated yarn.

In carrying out this invention, a yarn, which may be formed of filaments of cellulose esters such as cellulose acetate, long chain polyamides such as polyhexamethylene adipamide, polysulfones, polyaminotriazoles, long chain esters such as polyethylene terephthalate, vinyl polymers and copolymers such as vinyl chloride/vinyl acetate copolymers, and the like, is drawn from a supply package and passed through a chamber wherein it may be heated, treated with steam or subjected to any other treatments which will plasticize the filaments to at least some extent. The yarn is then passed through a false twist spindle wherein it may be twisted to at least about 35 turns per inch for a 300 denier yarn or preferably between about 40 and 50 turns per inch and then untwisted. The following table indicates the preferred twist for yarn of different deniers—

In general, the higher the twist for a yarn of a given denier, the higher will be the frequency of the crimps and the lower will be their amplitude and vice versa. The treatment of the yarn to plasticize the filaments therein need not be carried out as a separate step before the yarn reaches the false twist spindle, but may take place as the yarn goes through said spindle.

After the yarn leaves the false twist spindle, it is relaxed to a controlled degree before it is wound onto a take-up package. The extent of such relaxation may range between about 10 and 50% as measured by the decrease in length of the yarn as compared with the length of the yarn emerging from the false twist spindle. The degree of relaxation is determined by the end use in which the yarn is to be applied. A yarn of good crimp, voluminosity and elasticity for many purposes, however, is obtained when the degree of relaxation is between 20 and 30%.

The relaxation of the yarn may be accomplished readily by passing the yarn through a first means such as a pair of draw rolls which act to forward the yarn at a given speed. The yarn emerging from said first means is then passed to a second means, such as another set of draw rolls or a positively driven take-up, which acts to forward the yarn at a lower speed. As it moves from said first to said second means the desired relaxation of the yarn will take place. The yarn may then be wound onto a take-up package.

A preferred embodiment of this invention is shown in the accompanying drawing wherein

FIG. 1 is a side elevation, partly in section, of the apparatus, and

FIG. 2 is a side elevation, partly in section, of a modified take-up arrangement.

Referring now to the drawing, the reference numeral 11 designates a supply bobbin from which a yarn 12 is drawn to a pigtail guide 13. The yarn 12 next passes through a conventional tension gate 14 of the interleaved finger type which applies a light tension to the yarn so as to hold it straight. Instead of the tension gate 14 a pair of feeding rolls may also be used for feeding the supply yarn into the false twist spindle under controlled conditions. After leaving the tension gate 14, the yarn 12 passes through a pigtail guide 15 and into a chamber 16, wherein it is heated sufficiently to render it slightly plastic. The yarn 12 then passes through a false twist spindle, indicated generally by reference numeral 17, which is of the type shown in R. G. Stoll, United States application Ser. No. 376,322, filed Aug. 25, 1953, and now abandoned. As it passes through the false twist spindle 17, the yarn 12 is first twisted in one direction and is then twisted in the other direction by a like amount to have the twist removed therefrom. The insertion into and removal of the twist from the yarn 12 will impart a crimp into the filaments of the yarn so that the yarn will be voluminous.

The yarn 12 then goes through a pigtail guide 18 to a first set of draw rolls 19 and from said first set of draw rolls to a second set of draw rolls 21. The yarn 12 may also go directly onto the first set of draw rolls 19 from the false twist spindle 17, preferably being fed onto said rolls along a tangent. The draw rolls 19 are

driven at a given speed by any suitable means, such as a belt 22, and the draw rolls 21 are driven at a lower speed by any suitable means, such as a belt 23, so that the yarn can relax by a controlled amount as it moves between said first set of draw rolls 19 and said second set of draw rolls 21. Instead of belts 22 and 23, gears may be used to drive the draw rolls 19 and 21. After leaving the second set of draw rolls 21, the yarn 12 passes through a pigtail guide 24 and is taken up on a bobbin 25 mounted on a conventional twister spindle, designated generally by reference numeral 26.

As described more fully in the Stoll application referred to above, the false twist spindle 17 comprises a pair of bearings 27 in which is rotatably journaled a shaft 28 having a bore 29 extending longitudinally therethrough. The shaft 28 is also provided with two additional bores 31 and 32 that extend through the shaft at right angles to each other and intersect the bore 29. To drive the shaft 28, there is provided a belt 33 that is trained around a whorl 34 that is fitted to said shaft between the bearings 27. The yarn 12 is threaded into one end of the bore 29, then out through the bore 31 to the exterior of the shaft 28, back again through the bore 32 to the interior of the shaft and through the bore 29 to the other end of the false twist spindle 17. When the shaft 28 is caused to rotate by means of the belt 33, the yarn will be given a twist in one direction and then an equal twist in the opposite direction as it moves through the false twist spindle 17. As a result, the filaments in said yarn 12 will have a crimp imparted thereto to produce a voluminous yarn.

FIG. 2 shows a portion of an apparatus of modified construction employing a horizontal take-up in which the yarn 12 after leaving the first set of draw rolls 19 passes through a pigtail guide 35 and a traverse guide 36, mounted on a traverse bar 37, to a bobbin 38 which is driven by a roll 39. The traverse bar 37 is reciprocated, in a manner well known in the art, to distribute the yarn windings properly on the bobbin 38. The roll 39 is driven, by means well known in the art, at a rate such that the yarn 12 will be wound on the bobbin 38 at a somewhat lower rate than it comes from the draw rolls 19 so that the desired relaxation of the yarn may take place before it is wound on said bobbin.

The following example is given to illustrate this invention further.

Example

A 300 denier cellulose acetate continuous filament yarn is passed through the apparatus shown in FIG. 1 of the drawing. As it passes through said apparatus, it is heated to between 350 and 400° F. and is then given a false twist of 45 turns per inch. After leaving the false twist spindle, the yarn is relaxed 25% and wound on the take-up bobbin. There is obtained a highly voluminous yarn of good physical properties.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Apparatus for producing a voluminous yarn, comprising a yarn supply, means for plasticizing the yarn, a false twist spindle for twisting the yarn and removing twist from the yarn, means for forwarding the yarn at a given rate after twist is removed therefrom, second means for forwarding the yarn at a rate by between 10 and 50% slower than said first forwarding means, and yarn take-up means.

2. Apparatus for producing a voluminous yarn, comprising a yarn supply, means for plasticizing the yarn, a false twist spindle for twisting the yarn and removing twist from the yarn, means for forwarding the yarn at a given rate after twist is removed therefrom, second means for forwarding the yarn at a rate which is between 10 and 50% slower than said first forwarding means, and a twisting spindle for taking up the yarn.

3. A process for producing a voluminous yarn which comprises twisting a yarn while the yarn is in a plasticized state, removing twist from the yarn, forwarding the yarn at a given rate after twist is removed therefrom, thereafter forwarding said yarn at a rate which is between 10 and 50% slower than said first forwarding rate, and thereafter taking up said yarn in a separate operation at an independently controllable rate.

4. The process of claim 3 wherein said yarn is formed of filaments of a cellulose acetate.

5. The process of claim 3 wherein said yarn is formed of filaments of a polyethylene terephthalate.

6. The process of claim 3 wherein said yarn is formed of filaments of a polyhexamethylene adipamide.

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