

Sept. 19, 1967

D. G. JENKINS ET AL

3,341,913

DRAWING AND BULKING OF SYNTHETIC POLYMER YARNS

Filed Nov. 18, 1964

3 Sheets-Sheet 1

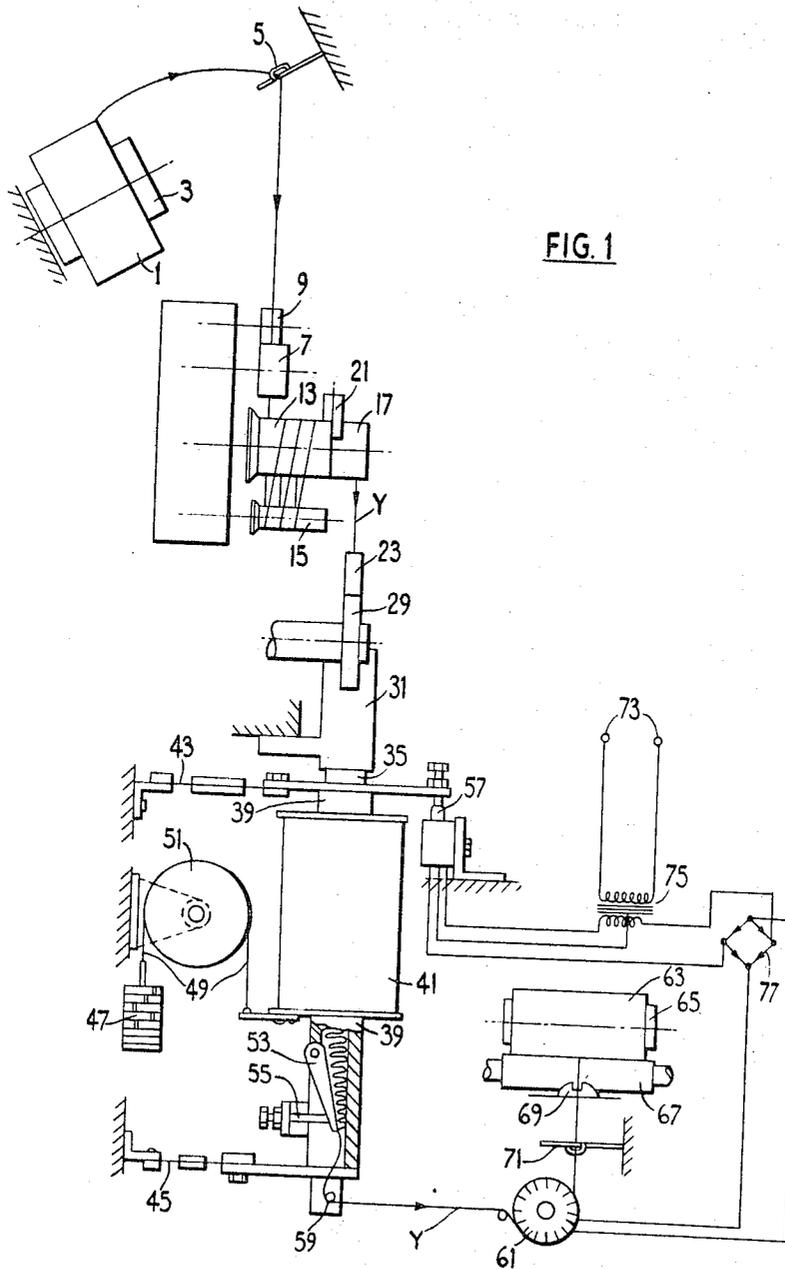


FIG. 1

Inventors
DONALD GLYN JENKINS
ANIL CHANDRAKANT PARIKH

By
Lynn L. Grim Attorney

Sept. 19, 1967

D. G. JENKINS ETAL

3,341,913

DRAWING AND BULKING OF SYNTHETIC POLYMER YARNS

Filed Nov. 18, 1964

3 Sheets-Sheet 2

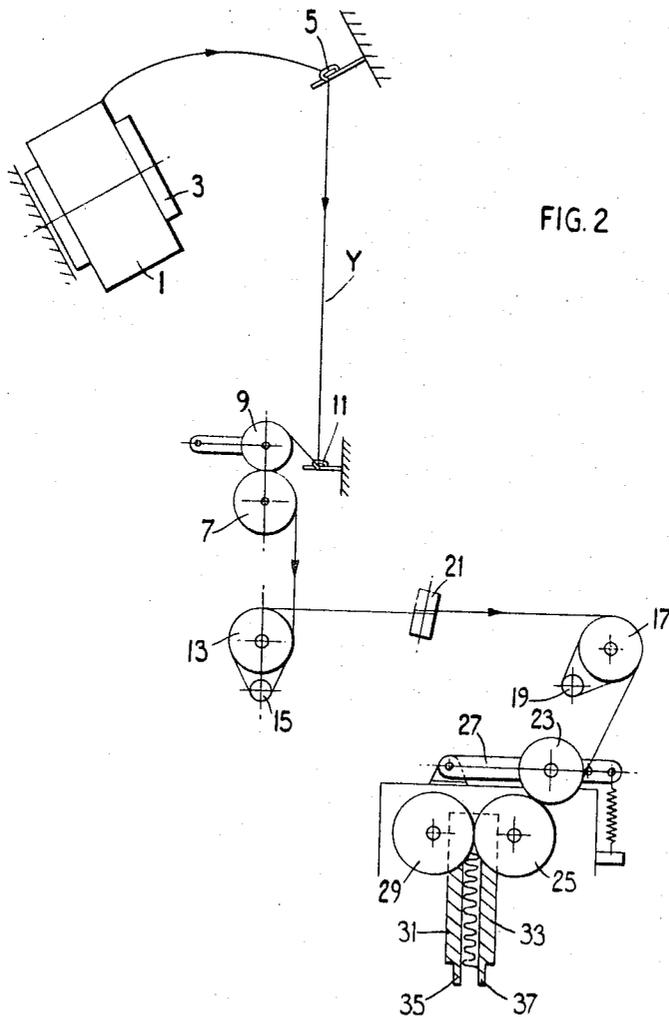


FIG. 2

Inventors
DONALD GLYN JENKINS
ANIL CHANDRAKANT PARIKH

By
Lin J. Grim Attorney

Sept. 19, 1967

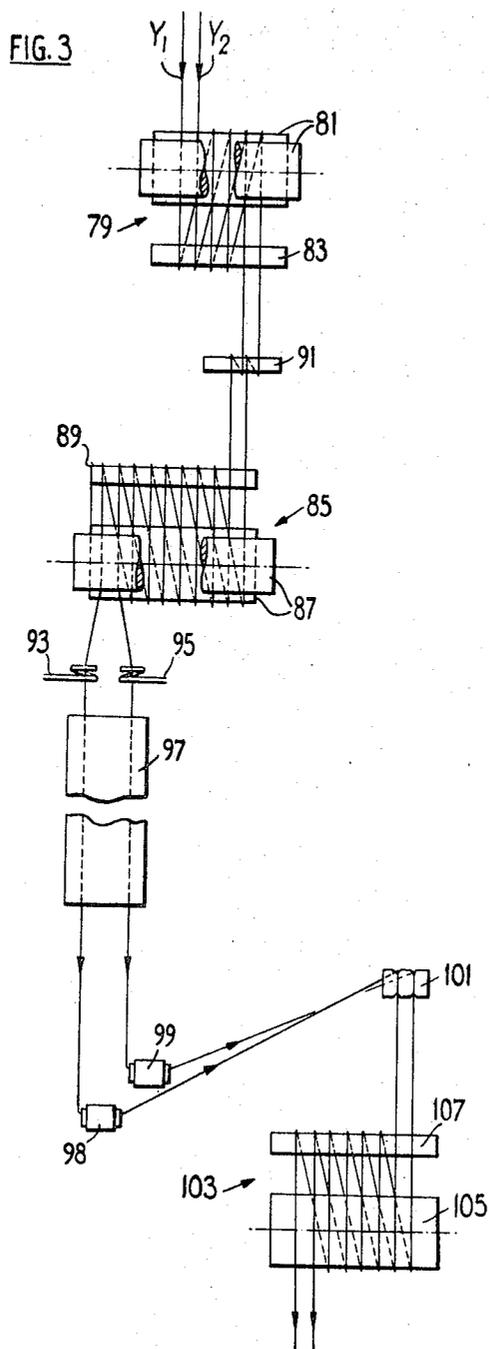
D. G. JENKINS ETAL

3,341,913

DRAWING AND BULKING OF SYNTHETIC POLYMER YARNS

Filed Nov. 18, 1964

3 Sheets-Sheet 3



Inventors
DONALD GLENN JENKINS
ANIL CHANDRAKANT PARIKH

By
Lim J. Grim Attorney

1

3,341,913

DRAWING AND BULKING OF SYNTHETIC
POLYMER YARNS

Donald Glyn Jenkins, Abersychan, and Anil Chandrakant Parikh, Caerleon, England, assignors to British Nylon Spinners Limited, Pontypool, England

Filed Nov. 18, 1964, Ser. No. 411,996

Claims priority, application Great Britain, Nov. 19, 1963, 45,560/63; June 3, 1964, 22,886/64

6 Claims. (Cl. 28—72)

The invention concerns improvements in or relating to the drawing and bulking of synthetic polymer yarns.

In order to produce bulked yarns from undrawn synthetic polymer filaments as spun by their producer, it is necessary to draw the filaments and to bulk them.

Various ways of combining drawing and crimping are already known, such as by normally drawing a false-twisted undrawn yarn and by false-twisting an undrawn yarn at a tension sufficient to draw it.

Another way of combining drawing and crimping has been described in which undrawn yarn is drawn by the nip rolls of a stuffer-box crimper and the yarn is crimped and the crimp set within the crimper.

Again, yet another way of combining drawing and crimping has been described in which yarn is crimped by means of intermeshing gear wheels whilst under tension between the snubbing-pin and the draw-roll of a normal drawing arrangement for such synthetic polymer yarns.

In most of the above processes, the emphasis has been on the assimilation of the bulking process to the standard drawing process, with a view to obtaining the economic advantage of doing away with the bulking step as a separate step in the process of making bulked yarns.

Certain other side advantages may also accrue, particularly in regard to setting the crimp imparted in the bulking step. In many cases, the heat of drawing will be sufficiently high to enable any specific heat-setting apparatus to be dispensed with.

Economically and technically, however, not all arguments are in favour of bulking at drawing. Rather is productivity, from a given factory floor space, sometimes greater when drawing is performed at bulking; and the limitations of space imposed by adaptation of bulking devices to draw twisting machinery can be avoided if the adaptation is the other way round.

Thus, in practice a better bulked yarn may be made more economically by first drawing undrawn yarn at bulking than can be made by bulking a yarn whilst drawing it.

Our invention is concerned specifically with both drawing undrawn yarn, and then bulking it, on e.g. a stuffer-box crimping machine. Such a process, to be defined hereinafter, not only has economic and technical usefulness of its own, but it enables a novel type of bulked yarn to be made, such being the subject of an application U.S. Serial No. 412,248, filed on even date hereto.

According to the invention, in a process for drawing and bulking drawable synthetic polymer yarns, undrawn yarn of a drawable synthetic polymer material is forwarded by feed means at a predetermined rate to a drawing zone, the yarn is drawn in said zone by drawing means operating at a drawing rate at least twice that of said predetermined rate, the drawn yarn is forwarded from said drawing means substantially at said drawing rate and at a low degree of mechanical overfeed, i.e. not greater than about 20%, to a bulking mechanism, and the drawn yarn is then bulked thereby.

Preferably the feed means and the drawing means comprise roll assemblies; and preferably the drawing is located at a snubbing-pin positioned in the drawing zone, where heat may optionally be applied to the yarn to assist drawing. Optionally, also, the feed means may com-

2

prise nip rolls positioned to act on the yarn upstream of an accompanying feed-roll assembly, the purpose of the nip rolls being to avoid tension non-uniformities in the yarn at the feed roll assembly. In fact, a minor (e.g. 0.1% to 10%) degree of drawing may take place between the nip rolls and the feed roll assembly.

By "mechanical overfeed" we mean that the speed ratio of the respective rolls is such as to bring about an overfeed of the amount specified, although the freshly-drawn yarn itself will on account of its nature, contract lengthwise by an equal amount.

By arranging that the drawing shall have been completed just prior to arrival of the yarn at the bulking mechanism the benefits accruing from such propinquity can be obtained with a great measure of control and without the difficulty, for instance, of slip between the nip rolls of a stuffer-box and the yarn, as may occur when such rolls are employed as the drawing means itself. An overfeed of greater than 20% is unlikely to be achieved; and, when a stuffer-box crimper is the bulking mechanism, the overfed yarn may have to be heated to assist the lengthwise contraction, that will otherwise occur to a lesser extent, if overfeeds approaching 12% are required to be obtained.

The subsequent bulking stage may comprise, for instance, one of those kinds of false twist crimping process that depend on positive feed, air jet bulking, or stuffer-box crimping.

In all such processes, it is of importance to the nature of the crimping effect imparted to the freshly-drawn yarn that the tension in that yarn as supplied from the draw rolls to the subsequent processing stage shall be accurately controlled, preferably at a low value. However, the nature of the freshly-drawn yarn, as for instance that of nylon, is such as to accommodate for any small discrepancy in the matching of the speed of the draw roll with that of the roll or rolls employed in the subsequent processing stage.

Not only is the process capable of producing a novel variety of yarn, but also, in practice, as it is one way by which bulking of twistless yarns can be carried out in a stuffer-box, it lends itself to the production of those better integrated composite bulked yarns, made from a plurality of twistless singles supply yarns, compared with those that can be produced by stuffer-box crimping a similar number of drawn and twisted supply yarns. Such better integrated yarns, when twisted subsequently to bulking, are rounder than their post-twisted counterparts made from a plurality of drawn and twisted supply yarns.

A novel yarn of the stuffer-box type described in our application U.S. Serial No. 412,248 of even date hereto, is characterised by an increased bulk, an improved degree of set crimp and an enhanced uniformity of crimp along the yarn, compared with bulked yarns of the stuffer-box type produced heretofore. The above properties arise from the propinquity of the drawing and bulking steps, and the measure of control afforded by the process particularly in regard to the tension and temperature of the yarn, as well as to its state of molecular order, at the instant of crimping.

The overfeed of yarn from the drawing means is necessary in order to control the tension, and particularly to avoid a high tension, in the yarn at the instant of crimping. Control of the tension will, inter alia, control the temperature to which the yarn is heated at the instant of crimping in a stuffer-box, and such is important owing to the effect of temperature on crimp frequency: the higher the temperature, the higher the crimp frequency.

The tension in the running yarn is the result of the establishment of equilibrium conditions between the linear contraction that takes place in the yarn immediately on release from the drawing tension and the linear relaxa-

tion afforded to it by the circumstance of the mechanical overfeed. Such tension, and the freshly-drawn state of the yarn, are responsible for the enhanced crimping propensity of the yarn, according to the invention.

In the case of a subsequent stuffer-box crimping stage, we have discovered that a low input tension, corresponding to a moderately high amount of overfeed, is responsible to a certain extent for an enhanced propensity of the yarn to crimp in the stuffer-box.

Such enhanced propensity to crimp, in the particular case of stuffer-box crimping, is, it is thought, the cause of a narrower column of crimped yarn being formed according to the invention for a given crimping pressure, compared with that formed in ordinary stuffer-box crimping.

A narrower column of crimped yarn within a stuffer-box of given internal dimensions will tend to collapse more frequently than a column of ordinary width filling the box. Frequent collapses of the column in irregular directions give rise to rapid local pressure fluctuations just below the nip of the rolls, at that point where the nature of the crimp in the filaments is determined. The yarn at that point is folded to-and-fro in the plane parallel to the axes of the nip rolls, only fractionally later, as the lateral boundaries of the crimping chamber, being the peripheries of the rolls, separate from one another, re-orienting to form a column of crimped yarn having a folded lay that is in the plane perpendicular to the axes of the rolls.

The above-mentioned rapid fluctuations in pressure at the point of crimping donate a certain degree of irregularity to the form of crimp imparted, which irregularity, has some advantages, particularly in regard to the degree of bulk of the yarn.

The degree of irregularity is a function of the degree of overfeed and also of the crimping load set for the stuffer-box.

The higher the overfeed in the general range 3%–9%, the greater the degree of irregularity at low crimping loads, e.g. 1–3 lbs. An overfeed of, say, 5–7%, will tend to produce a desirable irregularity in crimp geometry.

A high crimping load e.g. 4–6 lb. will, due to the enhanced propensity to crimp of the freshly-drawn, low-tensioned yarn, tend to over-crimp the yarn, i.e. the crimp will be of higher frequency and of greater regularity than usual, leading to too compact a bulked yarn for some purposes.

There is sometimes no need to apply heat to the yarn during or subsequent to crimping, to set the crimp, because the heat of drawing is such as to raise the temperature of the yarn to a figure that donates an adequate set to the crimp for certain purposes. Hence, if for instance a stuffer-box crimper is fitted with heating means, as it usually will be, it will only be necessary in such circumstances to employ it as a means for reducing the friction between the walls of the crimper and the yarn within it, and for speeding-up the attainment of temperature equilibrium at the start of the process.

It is possible for the operation of the process to be continuous, as the trailing end of one undrawn supply yarn can simply be knotted to the leading end of a fresh package. Such knots are capable of passing through the drawing step; and being of only very local effect they are not apparent when the yarn has been bulked. Naturally, it is desirable to have some arrangement for the continuous collection of the bulked yarns as well; and a suitable apparatus for such purposes is described in our copending patent application No. 404,108, filed Oct. 15, 1964.

In the case of a subsequent positive-feed false twist crimping stage, the draw roll combines that function with the one of positive overfeed into the twisting (and setting) zone, say, by some 7%–15% overall. The effect of false twist crimping freshly-drawn, overfed yarn is to enable crimped yarn of the required properties to be obtained at a greater throughput than when ordinary drawn yarn is used as the supply (at a considerably lower degree of overfeed).

For instance, crimped multifilament yarn of polyhexamethylene adipamide, having a drawn denier of 70 can be produced 50% faster if drawing at a draw ratio of 3.18 takes place immediately prior to false twist crimping by a conventional false-twist spindle with allied heater and the drawn yarn is overfed to the twisting zone by the draw roll at an overfeed of 13½%, compared with an overfeed of 2.7% normally employed when crimping drawn yarn. The essential characteristics of the crimped yarn, for instance its crimp rigidity, are unimpaired by the higher speed, whereas those of yarn ordinarily drawn for use as a drawn supply yarn on package are reduced below an acceptable value when crimped at the above-mentioned overfeed of 2.7% at such higher speed.

An optional feature of the invention is the inclusion of air-jet means to act on the low tension span of yarn between the supply cakes and the feed rolls of the drawing means or on the low tension span between the drawing means and the bulking mechanism, to effect some intermingling of the filaments of a single yarn, or of all the filaments of a plurality of such yarns and hence to compact such yarns into a uniform entity, prior to bulking.

Alternatively, or in addition, such as air-jet means can be positioned downstream of the bulking mechanism for the same function, together with the function of cooling the filaments after bulking, and before wind-up.

The invention will now be described with reference to the accompanying drawings, in which:

FIGURE 1 is a line diagram of the yarn path and the drawing and bulking instrumentalities in the invention, in respect of a stuffer-box bulking mechanism;

FIGURE 2 is a view at 90° to that of FIGURE 1, in respect of part of the diagram;

FIGURE 3 is a line diagram of the yarn path and the drawing and bulking instrumentalities in the invention, in respect of a false twist bulking mechanism.

FIGURES 1 and 2 show the general arrangement of a process according to the invention in which undrawn yarn is withdrawn from a package, drawn, bulked in a stuffer-box and finally wound up.

Undrawn yarn Y is withdrawn over the end of package 1 on spinning cylinder 3, passing through thread-guide 5 on the axis of cylinder 3, by the forwarding action of driven roll 7 and its complementary pivoted nip roll 9. The yarn passes around the periphery of nip roll 9 from thread-guide 11 and thence passes through the nip of nip roll 9 and the roll 7.

From the feed roll 7, the yarn passes into the drawing stage. This stage comprises feed roll 13 with its separator roll 15, and draw roll 17 with its separator roll 19. Between the feed roll and the draw roll, the yarn is wrapped around non-rotatable snubbing-pin 21, by which the point of draw is located.

From this drawing stage, the drawn yarn now passes to the bulking stage. The feed to the stuffer-box comprises feed roll 23, which is peripherally driven by the periphery of crimper roll 25. Feed roll 23 is pivotally mounted on arm 27. After passing through the nip of rolls 23 and 25, the yarn passes in contact with the periphery of crimper roll 25 down through the nip between that roll and corresponding crimper roll 29. The side walls 31 and 33 of the stuffer-box are shown in FIGURE 2, as are the thin extensions, 35, 37 thereof.

From the stuffer-box, the crimped yarn in a conglomerated columnar mass passes into the loaded setting chamber 39 (FIGURE 1). Although provision is made for heating the walls of the setting chamber, within jacket 41, as by electric resistance heaters, such heaters are not shown in FIGURE 1.

The setting chamber is flexibly mounted on steel spring cantilevers 43, 45 for limited movement in its lengthwise direction relative to the stuffer-box, and movements of the setting chamber are utilised as the means for controlling the tension of the yarn withdrawn from the cham-

ber. The manner of control of the stuffer-box bulking operation is not of the essence of this invention, but it will be described in some further detail to complete the description of the total operation of this one embodiment of the invention.

The setting chamber is loaded by weight 47 to provide the required back pressure for crimping, the emergence of the yarn from its discharge end being impeded by a set restriction of that end so that the load applied to the setting chamber shall be effective. Weight 47 comprises both counterbalance and crimping pressure loads, and is suspended on strand 49 which passes around pulley wheel 51. The discharge end of the setting chamber is restricted to a certain extent in the front-to-back plane of the chamber by flap 53, which is fixed in the set position by adjustment of screw 55. Microswitch 57 is adapted to operate, on small vertical movements of the setting chamber, so as to influence the electrical control circuit of the variable tensioning device to be described.

The crimped yarn, on emergence from the setting chamber, is first passed around tensioning bar 59 by which a low tension is applied to straighten the filaments somewhat and to remove any tangles. Next, it is passed around a portion of the periphery of magnetic particle brake 61 by which it is tensioned to the desired variable degree. The crimped yarn is wound up in package 63 on wind-up roll 65 which is peripherally driven by drive roll 67, the yarn being traversed by reciprocating traverse guide 69 after passage through thread-guide 71.

The electrical circuit by which the variable tensioning device 61 is controlled, dependent on the level of yarn in the setting chamber, comprises the supply points 73 for alternating current from the mains. The current is fed to the primary coil of a two-tap transformer 75, between whose two tappings the micro-switch 57 selects. Whichever of the two output voltages is selected is rectified in rectifier circuit 77, and the direct current output at that voltage is fed to the variable tensioning device, magnetic particle brake 61.

The functioning of these level control arrangements is such that the small up and down movements of the setting chamber regulate the tension imparted to the yarn by the magnetic particle brake, and hence regulate the amount of yarn withdrawn in unit time from the setting chamber in a manner calculated to keep the level of yarn therein substantially constant. At the same time, the crimping back pressure generated by the load on the setting chamber remains constant, and is effectively controlled at the division between the stuffer-box and the setting chamber.

In the operation of the embodiment of the invention illustrated in FIGURES 1 and 2, the undrawn yarn is withdrawn from its package by the nip rolls, stretched very slightly between the nip rolls and the feed roll (say by between 0.1% and 10%), drawn between the feed roll and the draw roll by stretching at least 200%, and probably between 300% and 400%. The snubbing pin is usually unheated. From the draw roll, the drawn yarn is overfed to the stuffer-box at a small degree of mechanical overfeed, usually less than 10%, fixed by selection of the relative speeds of the draw roll and of the crimper rolls of the stuffer-box. The drawn yarn, still under the immediate after-effects of the action of drawing, is immediately bulked by the crimping action of the stuffer-box, and the bulking is of a permanent nature without, normally, any need for additional heating of the setting chamber. The yarn is then wound up in the usual way, as already described.

If a greater degree of mechanical overfeed than, say, 10% with nylon 66 is required (and the greater the overfeed the finer the crimp imparted in the stuffer-box), it can be tolerated only if the draw roll is heated, to thereby provide accelerated retraction in the drawn yarn. Without such an expedient, the process will go out of control.

FIGURE 3 shows the general arrangement of a process according to the invention in which undrawn yarn is with-

drawn from a package, drawn, bulked by a false twist bulking mechanism and wound up.

Undrawn yarns Y_1 and Y_2 are withdrawn from supply packages (not shown) by feed roll assembly 79, comprising nip rolls 81 and separator roll 83 from which they pass into the drawing stage. Drawing takes place between the feed roll assembly and a draw roll assembly 85, comprising nip rolls 87 and separator roll 89, the point of draw being located by non-rotatable snubbing pin 91 around which the yarns are wrapped with one complete turn.

From the drawing stage, the drawn yarns now pass to the bulking stage consisting of false twisting and heat setting means. The yarn paths are separated from one another by thread guides 93, 95; and the separated yarns are then passed through electrical contact heater 97. From the heater, the yarns proceed to two contra-rotating friction false-twisting tubes 98, 99 which impart false twist to the yarns in opposite directions, the twists running back in the yarns, through the heat-setting zone, to the nip of the draw roll assembly. The twists are then set on the upstream side of the twist-tubes; and the yarns are de-twisted immediately on leaving the tubes. The false-twisted, latently-bulked yarns are then led separately over grooves in a freely-rotatable guide roller 101, and are withdrawn from the bulking zone by the take-off roll assembly 103, comprising driven roll 105 and its separator roll 107. The yarns are then passed to a wind-up assembly (not shown).

In the operation of the embodiment of the invention illustrated in FIGURE 3, the undrawn yarns are withdrawn from their packages by the feed roll assembly, and then drawn between that assembly and the draw roll assembly by being stretched some 200%–400%. From the draw roll assembly, the drawn yarns are overfed to the false twist bulking stage, the overfeed being arranged by the lower peripheral speed of the take-off roll assembly compared with that of the draw roll assembly, itself functioning additionally as the positive feed for the false twist bulking mechanism. The extent of overfeed between the draw-roll assembly and the false twist tubes themselves will generally be different from that between the two sets of rolls, owing to the tension imparted by the false twist tubes, whether such be of the friction variety shown or of the conventional type. The false twist imparted, say 80 times per inch, runs back to the nip of the draw roll assembly and is set into the yarns by the contact heater, which is heated to, say, 230° C. for nylon 66 yarns. Nip rolls are required for the draw roll assembly to snub the false twist and prevent it running back to the separator roll, where its presence otherwise would cause the yarns to collide. From the take-off assembly, the two oppositely-twisted, bulked yarns are positively forwarded to a wind-up, where the yarns are either plied or wound-up separately. A degree of overfeed, to allow some contraction of the yarns before wind-up, is normally afforded.

In an example of the invention comprising bulking in a stuffer-box, three supply yarns each of 3600 denier/68 filament undrawn polyhexamethylene adipamide (as spun) were withdrawn over-end from their spinning-cylinder packages mounted on a creel, withdrawal being effected by the feed rolls of a yarn-drawing stage. The yarns were led together at the feed rolls, and from them they were passed together with one or more wraps around a stationary, unheated snubbing-pin and thence to draw rolls by which they were drawn at a draw ratio of 3.7. From the draw-rolls the combined yarn structure was over-fed by 5.4% to the nip-rolls of a stuffer-box crimper, of the type described with reference to FIGURE 1 of the accompanying drawings, which nip-rolls were rotating at a peripheral speed of 1000 feet/minute. The temperature of the heaters of the setting chamber portion of the stuffer-box crimper was maintained at 180° C.; and the load on that portion, representing the crimping back pressure, was 2 lb. The bulked yarn, of some 3650 denier, was withdrawn from the crimper by means of the wind-up

roll, which is of the transfer variety described in our co-
pending patent application No. 404,108, filed Oct. 15,
1964. The process was thus continuous until such time
as maintenance had to be carried out on some part of the
machinery. The yarn was eminently suitable for use as the
pile of a carpet.

When the temperature of the heaters of the setting
chamber portion was maintained at 75° C., instead of
180° C., the load required was some 4-5 lb. instead of
the 2 lb. quoted above.

In another example of the invention, this time compris-
ing bulking by a false twist mechanism of the friction
false-twist tube variety, as illustrated in FIGURE 3 of the
drawings, two supply yarns of 34 filaments each, undrawn
polyhexamethylene adipamide were withdrawn over-end
from their spinning cylinder packages mounted on a creel,
withdrawal being effected by the feed rolls of a yarn-
drawing stage. The yarns were maintained separate
throughout the drawing stage, being wrapped once around
a stationary, unheated snubbing-pin and drawn at a draw
ratio of 2.71 (giving drawn deniers of 70). From the draw
rolls the two yarns were separately over-fed by 7.8%, and
at a tension of 4 grams, to the false twist bulking stage.
The overfeed was measured and maintained between the
draw rolls (acting as feed rolls for the false twist bulking-
stage) and the take-off rolls. In the false twist bulking
stage each yarn separately was led through a friction false
twist tube, 80 turns per inch S twist being inserted in one
yarn, and 80 turns per inch Z twist being inserted in the
other, between the tubes and the draw roll. The thus-
twisted yarns were led in contact with a heated metal
plate positioned upstream of the tubes at a temperature
of 230° C. The yarn speed at the take-off rolls was 400
feet/minute. Finally, the yarns were wound-up together
on a ring-spindle wind-up. The yarns had a crimp rigidity
of 41, and an equivalent steam setting temperature
(E.S.S.T.) of 111.

Although nylon is the only synthetic polymer material
instanced above, it is to be understood that the invention
is applicable to all such materials in yarn form which
are drawable and retract somewhat immediately after re-
lease from the drawing tension.

What we claim is:

1. A process for drawing and bulking drawable syn-
thetic polymer yarns comprising the steps of

- (a) forwarding undrawn yarn of a drawable synthetic
polymer material by feed means at a predetermined
rate to a drawing zone;
- (b) drawing said yarn in said drawing zone by draw-
ing means operating at a drawing rate at least twice
that of said predetermined rate;

- (c) forwarding said drawn yarn from said drawing
means substantially at the drawing rate and at a low
degree of mechanical overfeed in the range from 3
percent to 20 percent to a stuffer-box crimper; and
- (d) bulking the drawn yarn by said stuffer-box
crimper.

2. The process of claim 1 wherein the degree of over-
feed is between about 3 and about 9 percent.

3. The process of claim 1 wherein the yarn is heated
prior to bulking.

4. A process for drawing and bulking a nylon con-
tinuous filament yarn comprising the steps of

- (a) withdrawing an undrawn nylon continuous fila-
ment yarn from a supply package thereof by nip
rolls;
- (b) applying a low degree of stretch in the range from
about 0.1 percent to about 10 percent to said un-
drawn yarn between said nip rolls and the feed rolls
of a drawing zone;
- (c) drawing said undrawn yarn between said feed rolls
and the draw rolls of said drawing zone at least twice
that of the rate of said yarn supplied from the yarn
package to the drawing zone;
- (d) forwarding said drawn yarn from said draw rolls
to a stuffer-box crimper under conditions providing
an overfeed in the range from 3 percent to 20 percent
allowing for linear contraction of the yarn between
said draw rolls and said stuffer-box crimper; and
- (e) bulking the yarn at a low tension.

5. The process of claim 4 wherein the degree of over-
feed is between about 5 to about 7 percent.

6. The process of claim 5 wherein the load applied to
impart back pressure in the stuffer-box is between 1 pound
and 3 pounds.

References Cited

UNITED STATES PATENTS

2,500,690	3/1950	Lannan	28-72
2,686,339	8/1954	Holt	28-72
2,852,906	9/1958	Breen	57-23
3,024,516	3/1962	Bromley et al.	28-71.3 X
3,046,633	7/1962	Ohashi et al.	28-1
3,099,064	7/1963	Haynes	28-1
3,137,119	6/1964	Crouzet	28-72
3,154,835	11/1964	Palma et al.	28-72

FOREIGN PATENTS

679,584 2/1964 Canada.

MERVIN STEIN, *Primary Examiner*.

L. K. RIMRODT, *Assistant Examiner*.