(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 119 044
B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: 06.12.89

(51) Int. Cl.[4]: D 02 G 1/16

(21) Application number: 84301407.7

(22) Date of filing: 02.03.84

(54) Air jet texturing system.

(30) Priority: 02.03.83 US 471239

(43) Date of publication of application:
19.09.84 Bulletin 84/38

(45) Publication of the grant of the patent:
06.12.89 Bulletin 89/49

(84) Designated Contracting States:
BE DE FR GB IT

(56) References cited:
EP-A-0 057 583
GB-A-1 216 810
US-A-3 822 543
US-A-4 043 010
US-A-4 170 865
US-A-4 244 171
US-A-4 338 776

(73) Proprietor: ENTERPRISE MACHINE & DEVELOPMENT CORPORATION
100 Fernwood Avenue Clearview Manor
New Castle Delaware 19720 (US)

(72) Inventor: Price, Samuel T.
42 Golf View Drive Sugar Mill Woods
Homosassa Florida 32646 (US)

(74) Representative: Corin, Christopher John et al
Mathisen Macara & Co. The Coach House 6-8
Swakeleys Road
Ickenham Uxbridge UB10 8BZ (GB)

EP 0 119 044 B1

Courier Press, Leamington Spa, England.

Description

This invention relates to a process for the production of a continuous filament yarn of very high shrinkage potential including the steps of feeding a continuous filament, at least partially-orientated, synthetic, polymeric, feed yarn to and through a feed roll system and thence to and through a draw roll system and guiding the drawn yarn to a take-up system.

Bulky or crimped yarns composed of continuous synthetic fibre-forming polymers such as polyester and polyamide can be produced by feeding yarn filaments with overfeed to an air jet texturizer to produce a large number of random loops or crimps in the yarn. The type and degree of texture in the product yarn produced by such techniques depends upon the amount of twist in the feed yarn and on the amount of overfeed in the texturing jet. The product yarn is generally spooled under tension but this product generally has poor linear stability and high boiling shrinkage values. The yarns are characterised by the presence of many ring-like or crunodal loops at irregular intervals along the surface of the yarn and internally in the yarn bundle.

When such prior air jet texturing techniques are employed, a certain number of unstable or "wild" loops is generated in a random fashion along the yarn. These unstable loops can extend outwardly from the yarn bundle and adversely affect the yarn take off in subsequent textile mill operations. In fabrics made from such yarns, a hook-like or picky type characteristic may appear, and this is generally distasteful in apparel.

Processes are known for controlling these unstable loops to varying degrees. U.S. Patent specification 4,338,776 (Krenzer) describes a process and apparatus for producing a crimped continuous multifilament yarn by the sequential steps of air-jet texturizing to form multiple, random, filamentary loops, immediately pulling out metastable loops formed in the yarn without heating and without stretching or deforming the yarn filaments, next shrinking and heat setting the yarn at a temperature of about 150°—245°C., and then winding the yarn on to a spool at a predetermined yarn tension. The non-crimped, multifilament, feed yarn is conducted through an air jet texturizing nozzle at an overfeed rate said to be sufficient to form multiple random loops in the individual filaments, including some proportion of unstable loops. Following passage through the air jet, the yarn is conducted to feed and draw rolls in a heat-free condition such that at least some of the unstable loops are pulled out of the yarn.

U.S. Patent Specification 4,244,171 describes a method for the preparation of bulkable filamentary yarn, the method including the steps of introducing a drawn yarn into a fluid turbulency jet to create intermittent arc-like loops along the length of the yarn and then subjecting the yarn, under tension, to heat treatment whereby the arc-like loops are caused to shrink freely, becoming parallel to a major portion of the yarn.

By way of contrast, British Patent No. 1,216,810 describes a quite different process wherein steam treatment is used to cause activation and development of a latent crimping characteristic of the yarn, producing a bulky textured yarn.

Prior methods of controlling the unstable or wild loops are generally expensive but only marginally effective. The present invention provides an effective and inexpensive method for producing air jet textured yarns with substantially no unstable or wild loops. One product of this invention results from the high shrinkage inherent in cold-drawn, partially orientated, polyester, polyamide and similar yarns. The linear behaviour of these yarns produced by a process embodying the invention is controlled by tension at the entrance and exit ends of a steam chamber wherein a modest latent stretch is deliberately retained in order to improve the transverse fibre properties resulting in enhanced fabric resilience.

The following definitions apply to terms of the art as used in this specification. The term "fully-orientated yarn" denotes a polymeric yarn drawn to such an extent that its molecules are fully orientated and very little further extensibility is possible in a cold, i.e. unheated, condition without breaking. This is the most stable yarn condition, total recovery or relaxation occurring on heating in an unrestrained state; however, there is a loss of transverse quality or resilience of the yarn.

"Undrawn yarn" denotes continuous filament yarn in a totally undrawn state or as-spun condition.

The term "partially orientated yarn" denotes a polymeric yarn drawn to an extent such that its molecules are somewhat or "partially" orientated, but the extent of draw is less than that for fully drawn yarn. The resilience of partially drawn yarn is improved compared to fully drawn yarn, resulting in improved wrinkle resistance in fabrics made from such yarn.

The term "spun yarn" as used herein denotes any yarn made from relatively short discontinuous yarn ends that are reconstituted by twist or other means to form continuous lengths of yarn of commercial usefulness. These yarns can be made of synthetics or of nature fibres such as cotton or wool.

The process of the present invention is characterised by the steps of conducting said drawn yarn prior to take up to and through a second feed roll system which feeds said yarn at a controlled rate into and through a steam chamber containing saturated steam, the yarn exiting the steam chamber being conducted to and through a fourth feed roll system in cooperation with said second feed roll system to restrain and control the linear shrinkage of said yarn within the steam chamber and thence guiding the drawn and steam treated yarn to the take-up system, thereby producing a highly resilient filament yarn exhibiting less than fully orientated fibre birefringence.

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

Fig. 1 is a diagram illustrating the preferred yarn drawing, texturing and steam treating process embodying the invention;

Fig. 2 is a highly enlarged diagram of a conventional textured multifilament yarn having stable and unstable loops;

Fig. 3 is a highly enlarged diagram of a textured multifilament yarn produced by a process according to the invention having no unstable loops.

Fig. 4 is a schematic side elevation of apparatus for carrying out the process in accordance with the invention for making a core and effect yarn; and

Fig. 5 is an end elevation of the apparatus of Fig. 4.

The process hereinafter described serves to produce highly-resilient, textured, continuous, multifilament, polymeric yarns and combinations of such yarns with other continuous filament yarns and with spun yarns. The unstable or wild loops which form in conventional air jet textured yarns are substantially eliminated in the product yarns of the novel process. The product yarns are preferably formed by continuously drawing polymeric yarn under controlled temperature conditions, texturing the yarn in an air jet texturizer and subjecting the textured yarn to saturated steam while restraining the linear shrinkage of the yarn in the presence of the steam, followed by continuous take-up of the yarn on a package.

A fundamental physical concept relevant to the process is the recognition of the substantial shrinkage which takes place when partially orientated or fully orientated polyester yarn is exposed to a hot wet medium. Initial experiments indicated that cold drawn polyester yarn samples drawn to approximately a 1.45 or as much as 1.6 draw ratio and exposed to boiling water at open atmospheric conditions (approximately 99°C) shrank virtually instantaneously and wild loops present in the yarn prior to immersion disappeared completely.

In a continuous process, which is preferred, it was determined that partially orientated polyester yarn could be cold drawn, i.e. in the absence of heat, bulked with an air jet texturizer and then passed through a steam chamber using steam at (25 to 30 pounds per square inch), there being restraining rolls at the entrance and exit ends of the steam chamber to restrain and control the shrinkage of the yarn while in the steam chamber. Preferably, the linear speed of the yarn through the exit rolls is in the range of about 0.8 to 2.0 times the linear speed of the yarn through the entrance rolls, the linear shrinkage of the yarn being in the range of about 20 to about 100 per cent.

The highly resilient yarns produced by processes according to this invention are characterized by having less than complete fibre orientation as manifested, for example, by exhibiting less than fully drawn fibre birefringence. This characteristic is defined as the difference between the principal refractive index in the stretch direction and the principal refractive index perpendicular to the stretch direction.

The yarn produced by processes according to this invention may be combined with virtually any other yarn including, without limitation, continuous filament polyester, polyamide, polyolefin, cellulose acetate, and other similar yarns, as well as spun yarns including synthetics and natural fibres such as cotton. While not fully understood, it is believed that upon restrained linear shrinkage in the steam chamber, the wild loops in the drawn yarn gather in the companion yarn such as cotton and hold the latter in intimate contact.

Cold drawn, untextured but steam-treated yarns produced by processes according to this invention are believed to be useful in otherwise conventional core effect yarn systems to produce economically synthetic yarns which are silk-like both in tactile and in visual character. In general, the yarns produced by processes according to this invention include conventional fine denier applications of single or multiple ends of continuous filaments for use in apparel and other applications including sewing thread and fenestration yarns. Spun yarns can be combined with continuous filament yarns by employing the shrinkage of the filament loops to trap filament ends in the spun yarn and establish an integrated product. Processes in accordance with the invention can also be applied to destabilized fully drawn yarns by drawing with a subsequent reduction of the wild loops by steam treating resulting in improved yarns for sewing thread, upholstery and fenestration yarns. Means are further provided by which short, but random, non-uniformities can be introduced to overcome the plastics-like appearance of conventional continuous filament products.

Referring now to the drawings, Fig. 1 shows continuous filament polymeric yarns 32 and 34 being fed from supply yarn packages 4 and 2 respectively to feed rolls 10 and 10′ and thence to and through draw rolls 12 and 12′ which run at a higher speed than the feed rolls and thereby impart draw to the yarn. Preferred draw ratios range from about 1.45 to about 1.6 when partially orientated yarn is used as the feed yarn. If fully orientated yarn is fed as filaments 32 and 34, this yarn is preferably drawn about 20 to about 35% at an elevated temperature in the range of about 101°C to about 138°C for polyester yarns. The heating can be accomplished by using heated feed rolls 10 and 10′ and draw rolls 12 and 12′ (or a heating device intermediate the sets of rolls) and wrapping the filaments about these rolls several times to provide residence time under temperature. Following drawing, the drawn yarn is guided to an air jet texturizer 14 by guides 8 where it may be combined with another yarn 30 fed from package 6 which may be a spun yarn, not drawn, for example. The textured multifilament yarn 36 exciting the air jet texturizer is guided to and through second feed rolls 16 and 16′ and into and through the steam chamber 18 where it is subjected to saturated steam at about 104°C to about 148°C. The steam treated yarn passes through rolls 20 and 20′ which, as aforesaid, control the speed, tension and thus the linear shrinkage of the yarn bundle at desired degrees. The highly resilient drawn, textured and steam-treated yarn 38 is then wound upon yarn package 22, with the aid of stabilizer roll 24, thus providing the product yarn according to this invention.

Fig. 2 illustrates schematically the stable crunodal loops 39 in multifilament yarn 36 produced by conventional texturing means and random unstable loops 37. Following steam treatment the unstable loops are substantially eliminated as depicted in Fig. 3.

In another embodiment of a process in accordance with this invention, a core and effect yarn is produced as depicted in Figs. 4 and 5. Therein, feed yarns 44 and 46 fed from yarn supplies 40 and 42, respectively, proceed through otherwise conventional core and effect yarn apparatus. At least one of the feed yarns is made as described in connection with Fig. 1 but eliminating the air jet texturing. That is, at least one of the feed yarns in Fig. 4 has been drawn but not steam treated or textured as shown in Fig. 1. The core yarn 44 in Fig. 4 is fed at a constant rate through the roll system and to and through the air jet texturizer 66. The effect yarn 46 is caused to create thick sections by overfeeding this yarn, that is to say overfeeding the effect yarn 46 with respect to the core yarn 44, at desired time intervals by means of roll 60 and roll 58 causing yarn 46 to overfeed to jet 66. When thin sections are desired, rocker arm 56 is caused to disengage roll 58 from roll 60 and roll 54 in cooperation with roll 52 slows the speed of filament 46, thereby producing a thin section. It will be appreciated that, alternatively, core yarn 44 may be caused to create the thick sections, this being achieved by overfeeding core yarn 44 with respect to effect yarn 46. The engagement or disengagement of rolls 54 and 58 can be controlled as desired using known fluidics techniques, not shown except for air signal tube 55. Upon removal of the air signal, spring mechanism 57 causes rolls 52 and 54 to disengage and rolls 58 and 60 to engage to overfeed yarn 46. The textured yarn 68 exiting the air jet is guided to and through feed rolls 16 and 16′ and into and through the steam chamber 18 where it is subjected to saturated steam. The steam treated yarn passes through rolls 20 and 20′ which control the speed, tension and linear shrinkage of the yarn at desired degrees. The thick and thin core and effect yarn 68 produced according to this method is collected on take-up roll 70 with the aid of stabilizer roll 72. This yarn so produced should have a broad range of more exotic end uses, with a broad range of appearance and slub density tailored for style, having tactile and visual characteristics of silk.

Claims

1. A process for the production of a continuous filament yarn of very high shrinkage potential including the steps of feeding a continuous filament, at least partially-orientated, synthetic, polymeric, feed yarn to and through a feed roll system (10, 10′) and thence to and through a draw roll system (12, 12′) and guiding the drawn yarn to a take-up system (22, 24), characterised by the steps of conducting said drawn yarn prior to take up to and through a second feed roll system (16, 16′) which feeds said yarn at a controlled rate into and through a steam chamber (18) containing saturated steam, the yarn exiting the steam chamber being conducted to and through a fourth feed roll system (20, 20′) in cooperation with said second feed roll system (16, 16′) to restrain and control the linear shrinkage of said yarn within the steam chamber and thence guiding the drawn and steam treated yarn to the take-up system (22, 24), thereby producing a highly resilient filament yarn exhibiting less than fully orientated fibre birefringence.

2. A process according to claim 1, wherein said feed yarn is a polyester, a polyamide, a polyolefin, a vinyl or an acrylic polymer.

3. A process according to claim 1, characterised by the further steps of conducting said drawn yarn to a texturing air jet system (14), prior to feeding it to said feed roll system (16, 16′), conducting said yarn end through said jet thereby forming multiple random loops in the yarn end, including a proportion of random unstable loops, and thence conducting the yarn leaving said air jet to and through the second feed roll system (16, 16′).

4. A process according to claim 3 for the production of a resilient, textured, continuous, multi-filament yarn characterised by the steps of combining, at the entrance to said texturing air jet system (14), said drawn yarn with at least one other yarn, conducting the combined yarns through said air jet system, thereby forming multiple random loops in the individual filaments, including a proportion of random unstable loops, and conducting the multifilament yarn leaving said air jet system to and through the second feed roll system (16, 16′).

5. A process according to claim 4 characterised in that said other feed yarn is a continuous filament, synthetic polymeric feed yarn, and by the further steps of feeding at least one end of said other feed yarn to and through a second feed roll system (10, 10′) and thence to and through a second draw roll system (12, 12′), whereby said other feed yarn is drawn, and conducting said drawn other feed yarn to the entrance of said jet system for combination with said drawn yarn.

6. A process according to any one of claims 1 to 3 characterised in that said feed yarn is partially orientated yarn which is drawn under unheated conditions in said process.

7. A process according to any one of claims 1 to 3 characterised in that said feed yarn is fully orientated yarn and is drawn by about 20 to about 35 per cent at elevated temperature.

8. A process according to claim 4 characterised in that said other yarn is continuous filament polyester, polyamide, polyolefin, cellulose acetate or a spun yarn.

9. A process according to claim 4 characterised in that said other yarn is cotton.

10. A process for the production of a highly

resilient, textured, continuous multifilament core and effect yarn including the steps of feeding a continuous filament, partially orientated synthetic, polymeric feed yarn to and through a feed roll system (52, 54) and thence to and through a draw roll system (58, 60) whereby said feed yarn is cold drawn, in the absence of heat, and guiding the drawn yarn to take up system (70, 72), the process being characterised by the further steps of conducting said feed yarn and at least one other yarn in combination to a core and effect yarn system having means for overfeeding either the core or the effect yarn relative to the effect yarn or the core yarn respectively, thence conducting the combined yarn ends to and through a texturing air jet (66), conducting the yarn 68 leaving said air jet to and through a second feed roll system (16, 16') which feeds said yarn at a controlled rate into and through a steam chamber (18) containing saturated steam, the yarn exiting the steam chamber (18) being conducted to and through a fourth roll system (20, 20') cooperating with said second feed roll system (16, 16') to restrain and control the linear shrinkage of said yarn within the steam chamber (18), wherein said core and effect is produced by overfeeding either the core yarn or the effect yarn, relative to the effect yarn or the core yarn respectively, at desired and controlled time intervals, and guiding the textured core and effect yarn to a take-up system (70, 72), thereby producing a highly resilient textured core and effect yarn, said feed yarn exhibiting less than fully orientated fibre birefringence.

Patentansprüche

1. Verfahren für die Herstellung eines zusammenhängenden Fadengarns von sehr hoher Schrumpfungsfähigkeit, wobei Verfahrensschritte, bei denen ein einen zusammenhängenden Faden aufweisendes, teilweise ausgerichtetes, synthetisches, polymeres Beschickungsgarn zu einem und durch ein Beschickungsrollensystem (10, 10') und von da zu einem und durch ein Ziehrollensystem (12, 12') und das gezogene Garn zu einem Aufnahmesystem (22, 24) geführt wird, vorgesehen sind, gekennzeichnet durch Verfahrensschritte, bei denen das gezogene Garn vor der Aufnahme zu einem und durch ein zweites Beschickungsrollensystem (16, 16'), das das Garn mit einer gesteuerten Geschwindigkeit in und durch eine Dampfkammer (18), die gesättigten Dampf enthält, führt, und das aus der Dampfkammer austretende Garn zu einem und durch ein viertes Beschickungsrollensystem (20, 20') geführt wird, um im Zusammenwirken mit dem zweiten Beschickungsrollensystem (16, 16') die Lineare Schrumpfung des Garns innerhalb der Dampfkammer zu unterdrücken und zu steuern, und das gezogene und dampfbehandelte Garn dann zu dem Aufnahmesystem (22, 24) geführt wird, wobei ein hochelastisches Fadengarn, das weniger Doppelbrechung als bei voll ausgerichteter Faser zeigt, produziert wird.

2. Verfahren nach Anspruch 1, wobei das Beschickungsgarn ein Polyester, ein Polyamid, ein Polyolefin, ein Vinyl- oder ein Acrylsäurepolymer ist.

3. Verfahren nach Anspruch 1, gekennzeichnet durch weitere Verfahrensschritte, bei denen das gezogene Garn vor der Zuführung zu dem Beschickungsrollensystem (16, 16') zu einem texturierenden Luftstrahlsystem (14), wobei das Garnende durch den Strahl geführt und dabei eine Vielfachheit von Zufallsschleifen, die einen Anteil von instabilen Zufallsschleifen enthält, in dem Garnende gebildet wird, und von da das den Luftstrahl verlassende Garn von da zu dem und durch das zweite Beschickungsrollensystem (16, 16') geführt wird.

4. Verfahren nach Anspruch 3, für die Herstellung eines elastischen, texturierten, zusammenhängenden, vielfädigen Garns, gekennzeichnet durch Verfahrensschritte, bei denen am Eingang zu dem texturierenden Luftstrahlsystem (14) das gezogene Garn mit wenigstens einem weiteren Garn kombiniert wird, das kombinierte Garn durch das Luftstrahlsystem geführt wird, wobei eine Vielfachheit von Zufallsschleifen in den einzelnen Fäden gebildet wird, die einen Anteil von instabilen Zufallsschleifen enthält, und das vielfädige Garn, das das Luftstrahlsystem verläßt, zu dem und durch das zweite Beschickungsrollensystem (16, 16') geführt wird.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß das andere Beschickungsgarn ein einen zusammenhängenden Faden aufweisendes, synthetisches, polymeres Beschickungsgarn ist und daß weitere Verfahrensschritte, bei denen wenigstens ein Ende des anderen Beschickungsgarns zu dem und durch das zweite Beschickungsrollensystem (10, 10') und von da zu einem und durch ein zweites Ziehrollensystem (12, 12') geführt wird, wobei das andere Garn gezogen wird, und das gezogene andere Beschickungsgarn zu dem Eingang des Strahlsystems zur Kombination mit dem gezogenen Garn geführt wird.

6. Verfahren nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß das Beschickungsgarn ein teilweise ausgerichtetes Garn, das in dem Verfahren im unerhitzen Zustand gezogen wird, ist.

7. Verfahren nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß das Beschickungsgarn ein voll ausgerichtetes Garn ist und zu etwa 20 bis 35% bei erhöhter Temperatur gezogen wird.

8. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß das andere Garn ein einen zusammenhängenden Faden aufweisendes Polyester-, Polyamid-, Polyolefin-, Zelluloseazetat oder ein gesponnenes Garn ist.

9. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß das andere Garn Baumwolle ist.

10. Verfahren zur Herstellung eines hochelastischen, texturierten eine Vielzahl von zusammenhängenden Fäden aufweisenden Kern-

und Effektgarns, wobei das Verfahren Verfahrensschritte enthält, bei denen ein einen zusammenhängenden Faden aufweisendes teilweise ausgerichtetes, synthetisches, polymeres Beschickungsgarn zu einem und durch ein Beschickungsrollensystem (52, 54) und von da zu einem und durch ein Ziehrollensystem (58, 60) geführt wird, wobei das Beschickungsgarn bei Abwesenheit von Wärme kaltgezogen wird, und der gezogene Faden einem Aufnahmesystem (70, 72) zugeleitet wird, gekennzeichnet durch weitere Verfahrensschritte, bei denen das Beschickungsgarn und wenigstens ein anderes Garn in Kombination einem Kern- und Effektgarnsystem, das eine Einrichtung zum schnelleren Zuführen entweder des Kerngarns oder des Effektgarns jeweils relativ zu dem Effektgarn oder dem Kerngarn aufweist, zugeführt wird, von da die kombinierten Garnenden zu einem und durch einen texturierenden Luftstrahl (66) geführt werden, das den Luftstrahl verlassende Garn (68) zu einem und durch ein zweites Beschickungsrollensystem (16, 16'), das das Garn mit einer gesteuerten Geschwindigkeit in und durch eine Dampfkammer (18), die gesättigten Dampf enthält, führt, und daß aus der Dampfkammer (18) austretende Garn zu einem und durch ein viertes Rollensystem (20, 20'), das mit dem zweiten Beschickungsrollensystem (16, 16') zusammenarbeitet, geführt wird, um die lineare Eshrumpfung den Garns innerhalb der Dampfkammer (18) zu unterdrücken und zu steuern, wobei das Kern- und Effektgarn durch schnelleres Zuführen entweder des Kerngarns oder Effektgarns jeweils relativ zum Kerngarn oder Effektgarn in gewünschten und gesteuerten Zeitintervallen hergestellt wird, und das texturierte Kern- und Effektgarn zu einem Aufnahmesystem (70, 72) geführt wird, wobei ein hochelastisches, texturiertes Kernund Effektgarn hergestellt wird, wobei Beschickungsgarn weniger Doppelbrechung als bei voll ausgerichteten Fasern zeigt.

Revendications

1. Procédé de production d'un fil à filaments continus d'une très haute force de rétrécissement, comprenant les phases d'amenée d'un fil d'alimentation polymère, synthétique, au moins partiellement orienté, à filaments continus, à et à travers un système de cylindres entraîneurs (10, 10') et de là à et à travers un système de cylindres d'étirage (12, 12'), et de guidage du fil étiré vers un système de renvidage (22, 24), caractérisé par les phases suivantes: l'envoi du fil étiré susdit, avant le renvidage, vers et à travers un second système de cylindres entraîneurs (16, 16'), qui alimente ce fil à une vitesse contrôlée vers et à travers une chambre à vapeur (18) contenant de la vapeur saturée, le fil sortant de la chambre à vapeur étant envoyé à et à travers un quatrième système de cylindres entraîneurs (20, 20') en coopération avec le second système susdit de cylindres entraîneurs (16, 16') pour limiter et contrôler le rétrécissement linéaire du fil susdit dans la chambre à vapeur, et ensuite le guidage du fil étiré et traité à la vapeur vers le système de renvidage (22, 24), en produisant de la sorte un fil à filaments très élastique, montrant une biréfringence inférieure à celle de fibres totalement orientées.

2. Procédé suivant la revendication 1, caractérisé en ce que le fil d'alimentation est un polyester, un polyamide, une polyoléfine, un polymère vinylique ou un polymère acrylique.

3. Procédé suivant la revendication 1, caractérisé en ce qu'il comprend les phases suivantes: l'envoi du fil étiré susdit à un système de texturation par jet d'air (14), avant son alimentation au système susdit de cylindres entraîneurs (16, 16'), le passage du bout de fil susdit à travers ce jet pour former ainsi des boucles désordonnées multiples dans ce bout de fil, notamment une certaine proportion de boucles instables désordonnées, et ensuite l'envoi du fil quittant le jet d'air susdit vers et à travers le second système de cylindres entraîneurs (16, 16').

4. Procédé suivant la revendication 3 pour la production d'un fil multifilamentaire, continu, texturé, élastique, caractérisé par les phases suivantes: la combinaison, à l'entrée du système de texturation par jet d'air (14), du fil étiré susdit avec au moins un autre fil, l'envoi des fils combinés à travers le système à jet d'air précité, en formant de la sorte des boucles désordonnées multiples dans les filaments individuels, y compris certaines proportions de boucles instables désordonnées, et l'envoi du fil multifilamentaire quittant le système à jet d'air vers et à travers le second système de cylindres entraîneurs (16, 16').

5. Procédé suivant la revendication 4, caractérisé en ce que l'autre fil d'alimentation susdit est un fil d'alimentation polymère, synthétique, à filaments continus, et en ce qu'il comprend les phases supplémentaires suivantes: l'alimentation d'au moins un bout de cet autre fil d'alimentation à et à travers un second système de cylindres entraîneurs (10, 10') et de là vers et à travers un second système de cylindres d'étirage (12, 12'), de sorte que cet autre fil d'alimentation est étiré, et l'envoi de cet autre fil d'alimentation étiré vers l'entrée du système à jet d'air en vue de le combiner avec le fil étiré précité.

6. Procédé suivant l'une quelconque des revendications 1 à 3, caractérisé en ce que le fil d'alimentation susdit est un fil partiellement orienté qui est étiré sous des conditions sans chauffage dans ce procédé.

7. Procédé suivant l'une quelconque des revendications 1 à 3, caractérisé en ce que le fil d'alimentation susdit est un fil pleinement orienté et en ce qu'il est étiré d'environ 20 à environ 35% à température élevée.

8. Procédé suivant la revendication 4, caractérisé en ce que cet autre fil est un fil à filaments continus de polyester, de polyamide, de polyoléfine, d'acétate de cellulose ou un filé.

9. Procédé suivant la revendication 4, caractérisé en ce que cet autre fil est un fil de coton.

10. Procédé de production d'un fil de fantaisie

et à âme, multifilamentaire, continu, texturé, très élastique, comprenant les phases suivantes: l'amenée d'un fil d'alimentation polymère, synthétique, partiellement orienté, à filaments continus, à et à travers un système de cylindres entraîneurs (52, 54) et de là à et à travers un système de cylindres d'étirage (58, 60), de sorte que le fil d'alimentation susdit est étiré à froid, en l'absence de chaleur, et le guidage du fil étiré vers un système de renvidage (70, 72), ce procédé étant caractérisé par les phases supplémentaires suivantes: l'amenée du fil d'alimentation susdit et d'au moins un autre fil en combinaison à un système à fil à âme et à fil fantaisie comportant des moyens pour suralimenter soit le fil à âme, soit le fil fantaisie respectivement par rapport au fil fantaisie ou au fil à âme, ensuite l'envoi des bouts de fil combinés vers et à travers un jet d'air de texturation (66), l'envoi du fil (68) quittant ce jet d'air vers et à travers un second système de cylindres entraîneurs (16, 16'), qui alimente le fil susdit à une vitesse contrôlée dans et à travers une chambre à vapeur (18) contenant de la vapeur saturée, le fil quittant la chambre à vapeur (18) étant envoyé à et à travers un quatrième système de cylindres (20, 20') coopérant avec le second système susdit de cylindres entraîneurs (16, 16') pour limiter et contrôler le rétrécissement linéaire de ce fil dans la chambre à vapeur (18), l'âme et l'effet fantaisie étant obtenus par suralimentation soit du fil à âme, soit du fil fantaisie, respectivement par rapport au fil fantaisie ou au fil à âme, à des intervalles de temps désirés et contrôlés, et le guidage du fil fantaisie, à âme, texturé vers un système de renvidage (70, 72), de manière à produire un fil fantaisie à âme, texturé, très élastique, ce fil d'alimentation montrant une biréfringence inférieure à celle de fibres pleinement orientées.

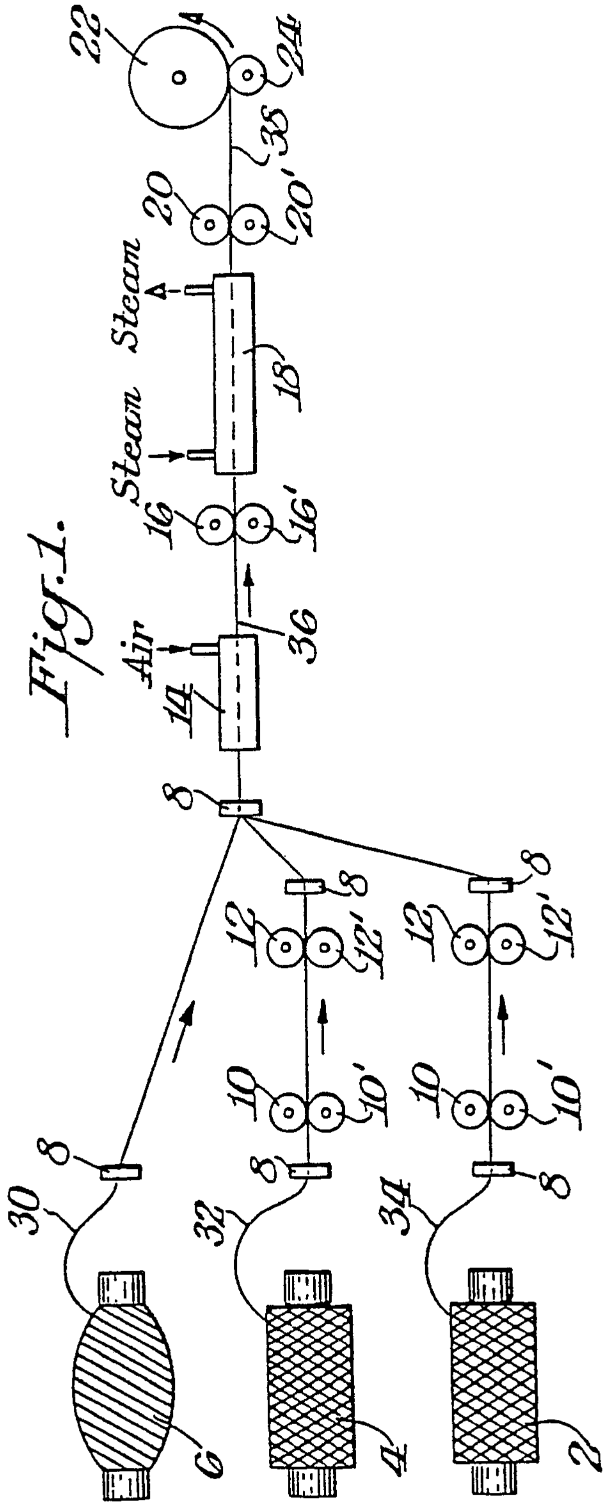


Fig.1.

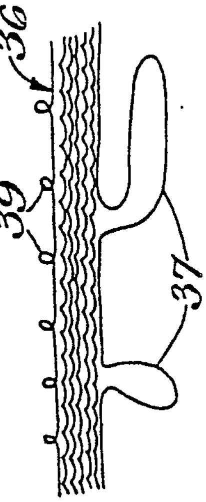


Fig.2.

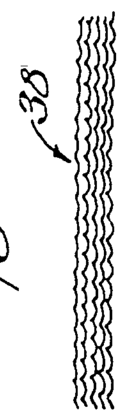


Fig.3.

Fig. 4.

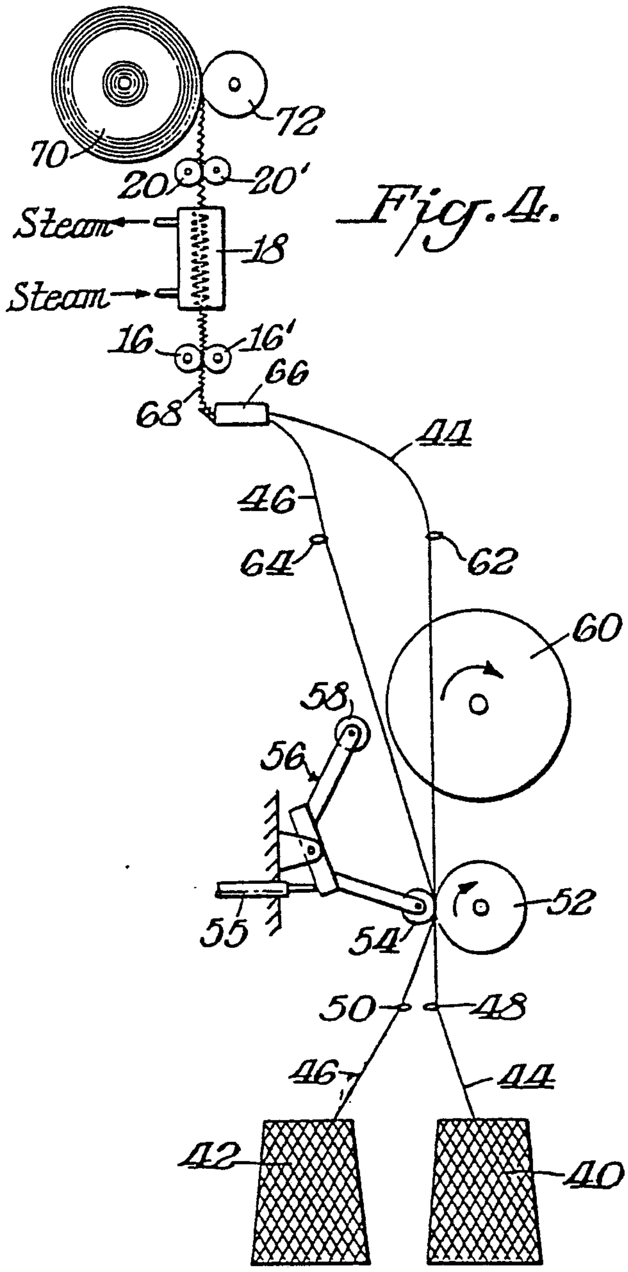
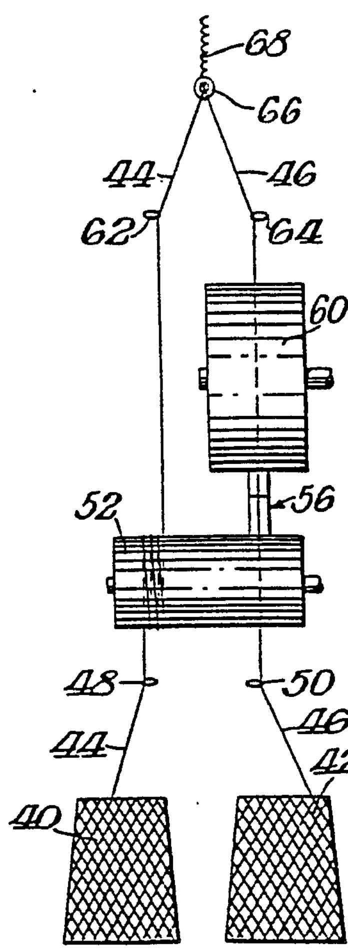

70
72
20
20'
Steam
Steam
18
16
16'
68
66
44
46
64
62
60
58
56
55
54
52
50
48
46
44
42
40

Fig. 5.


68
66
44
46
62
64
60
52
56
48
50
44
46
42
40