Aug. 2, 1966 J. R. HOLTON 3,263,298

PRODUCTION OF INTERMITTENTLY TEXTURED YARN

Filed Nov. 12, 1963 3 Sheets-Sheet 1

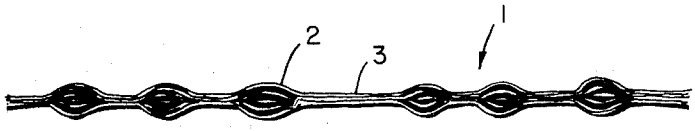

FIG. 1.

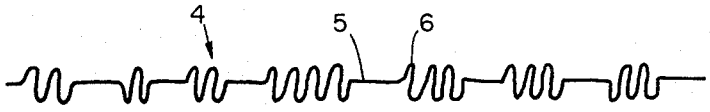

FIG. 2.

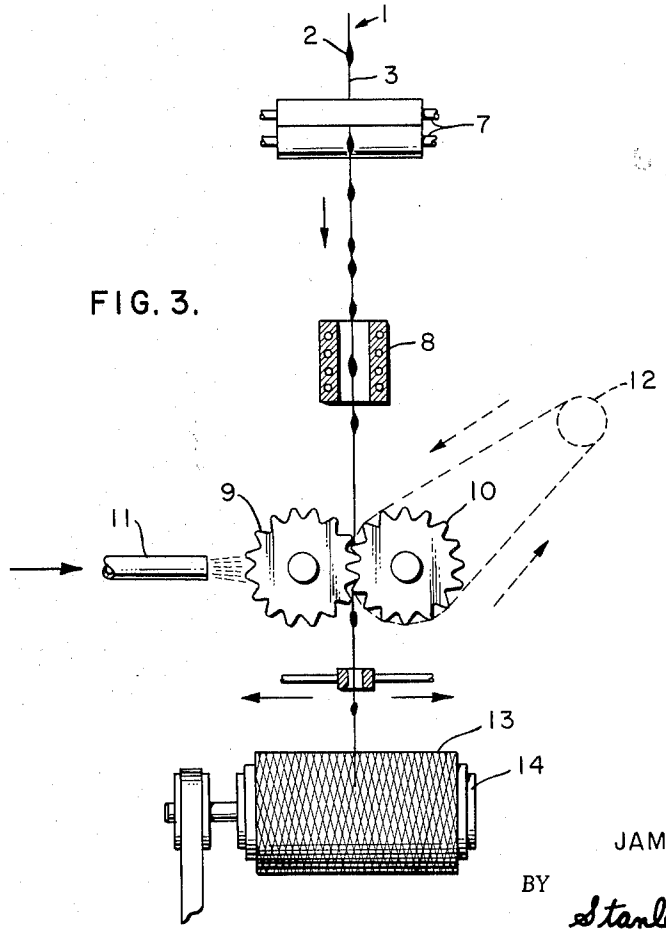

FIG. 3.

INVENTOR.
JAMES R. HOLTON
BY
Stanley M. Tarter
ATTORNEY

PRODUCTION OF INTERMITTENTLY TEXTURED YARN

Filed Nov. 12, 1963 3 Sheets-Sheet 2

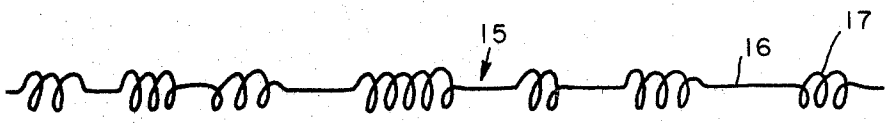

FIG. 4.

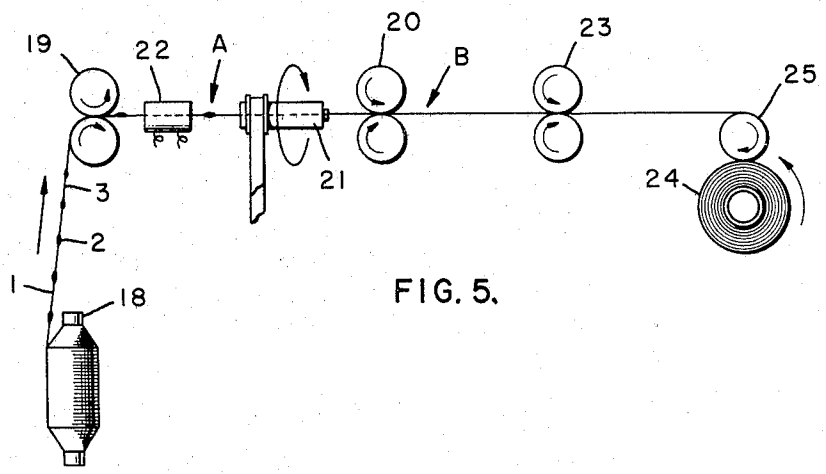

FIG. 5.

INVENTOR.
JAMES R. HOLTON
BY Stanley M. Tarter
ATTORNEY

PRODUCTION OF INTERMITTENTLY TEXTURED YARN

Filed Nov. 12, 1963 3 Sheets-Sheet 3

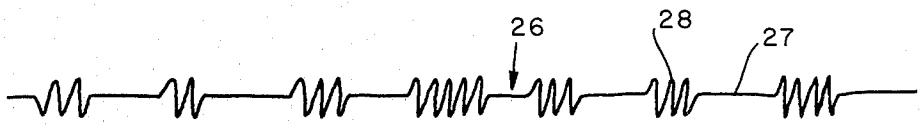

FIG. 6.

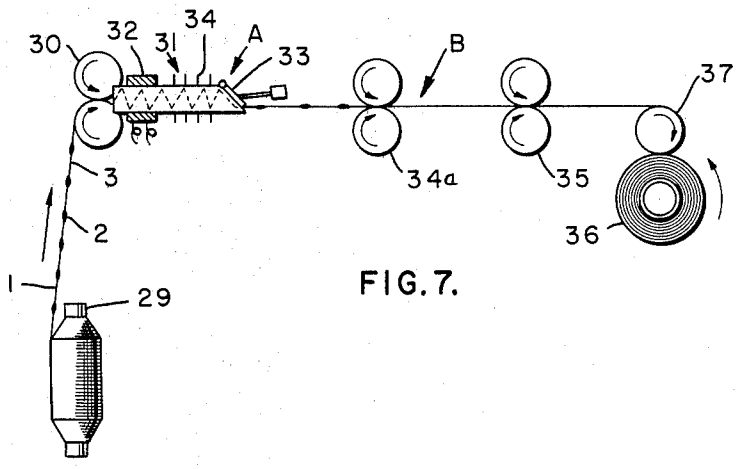

FIG. 7.

INVENTOR.
JAMES R. HOLTON
BY Stanley M. Tarter
ATTORNEY

United States Patent Office 3,263,298 Patented August 2, 1966

3,263,298

PRODUCTION OF INTERMITTENTLY TEXTURED YARN

James R. Holton, Gulf Breeze, Fla., assignor to Monsanto Company, a corporation of Delaware

Filed Nov. 12, 1963, Ser. No. 322,731
20 Claims. (Cl. 28—72)

The present invention relates to the production of thermoplastic textile yarn. More particularly, the present invention relates to a method of processing thermoplastic textile yarn of varying denier to produce yarn exhibiting intermittent texture, as well as to such yarn.

In order to impart certain desirable properties to continuous man-made filament yarn it is common practice to texture or loft same. Textured yarn possesses greater bulkiness, better heat insulating power and other improved properties while still retaining many of the desirable characteristics of spun yarn.

One method of considerable commercial significance for producing textured yarn involves the steps of hot drawing substantially undrawn thermoplastic continuous filament yarn and immediately thereafter simultaneously cooling and deforming the yarn by passing same between a pair of intermeshing gears. The thus-textured yarn has greater bulk which is more fully developed by a subsequent heat treatment while the yarn is under low tension.

Another method of considerable commercial importance produces a twist-curled yarn having lively stretch. Ordinarily, twist-curled textured yarn is made by a three step process. In the first step, the yarn is twisted a desired amount. While in the twisted condition, the yarn is heat-set during the second step. That is, the yarn is heated and cooled while twisted so as to render the yarn dimensionally stable until again heated to or above the setting temperature. Finally, the yarn is untwisted. The twist imparted and set in the yarn can be a true twist or a false twist. For economic reasons, the latter twist is preferred. False twisting is a well-known method by which a yarn is twisted and untwisted in one operation, the yarn being heat-set when twisted.

A third method of considerable commercial importance utilizes the well known stuffing box technique to induce substantially permanent crimp in the yarn. The yarn is characterized by sharp elbows between the arms of the crimps induced therein.

It has also been suggested to produce a textured continuous filament yarn by knitting the yarn into fabric, heat-setting the fabric, and unraveling the fabric. In addition hot gas-jet processes are known for texturing filament yarn.

It has been proposed to provide intermittent texture in thermoplastic continuous filaments. However, to obtain this end, it has been necessary to use expensive and complex apparatus. For example, one can provide intermittent texture by periodically interrupting the intermeshing of the gears in the above-mentioned gear crimping procedure.

Mechanical problems render known approaches to intermittent texturing unattractive from an economic standpoint. In addition, it has long been desired to produce a yarn having both an intermittent texture and an intermittent two-tone such that some portions of the yarn have a different shade of the same color from the other portions.

It is an object of the present invention to provide a method of producing intermittently textured man-made continuous filament yarn.

It is another object to provide a method of producing intermittently gear-crimped continuous filament yarn.

Another object is to provide a method of producing intermittently twist-curled continuous filament yarn.

Another object is to provide a method of producing intermittently stuffing box crimped continuous filament yarn.

It is another object to provide an intermittently textured and two tone man-made continuous filament yarn.

Other objects may be apparent from the following detailed description.

In accordance with the present invention there is provided a novel method of producing intermittently textured yarn wherein the lofted portions thereof are periodic or random. A source of thermoplastic man-made continuous filament yarn is provided. The yarn is drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof. The yarn is subjected to a texturing or lofting operation after which the yarn is stretched to complete the natural draw thereof.

In one embodiment the under drawn yarn having the thick and thin portions is forwarded longitudinally through a zone wherein the yarn is heated to render same more amenable to being textured. The thus-heated yarn is simultaneously cooled and deformed. The cooling and deformation are accomplished by passing the yarn between intermeshing toothed wheels. Although the gears will stretch the yarn a minor amount, the yarn ordinarily is stretched in a separate operation to complete the natural draw thereof. The thin portions of the yarn are textured presenting a crimpy appearance; and the thick portions of the yarn are thereby lastingly stretched presenting a substantially uncrimped appearance. When the yarn is dyed before having the stretch removed therefrom, the uncrimped sections will imbibe considerably more dye and, therefore, will exhibit a more deeply or darker dyed appearance than the crimped sections. The resulting intermittently textured yarn can be used to construct fabric having novelty effects and desirable properties.

In a second embodiment yarn drawn below the natural draw ratio so that it exhibits thick and thin portions along the length thereof is forwarded longitudinally through a zone wherein the yarn is twist-curled by being twisted, heated and cooled while twisted and then is untwisted. Thereafter, the yarn is stretched to complete the draw thereof. The thin portions of the yarn remain twist-curled; and the thick portions of the yarn are thereby lastingly stretched presenting a substantially straight, uncurled appearance. Finally, the yarn is connected in an orderly manner. The resulting intermittently textured yarn can be used to construct fabric having novelty effects and desirable properties. When the yarn is dyed before having the stretch removed therefrom, the uncurled sections exhibit a more deeply or darker dyed appearance than the twist-curled sections.

In yet another embodiment yarn drawn below the natural draw ratio so that it exhibits thick and thin portions along the length thereof is forwarded longitudinally through a confined zone wherein the yarn is stuffing box crimped. This is accomplished by cramming the yarn longitudinally through the confined zone in the form of accordion-like folds having the crimp frequency and crimp amplitude of conventional stuffing box crimping. The cramming crumples successive lengths into folds and pushes the yarn in the folded condition through the zone. While in the zone and in the folded state, the yarn is heated and then cooled to set the crimp therein. After being withdrawn from the zone, the yarn is stretched to complete the draw thereof. The thin portions of the yarn remain crimped; and the thick portions of the yarn are thereby lastingly stretched presenting a substantially straight, uncrimped apperance. Finally, the yarn is collected in an orderly manner. The resulting textured yarn can be used to construct fabric having novelty effects and desirable properties. Again, when the yarn is dyed before having the stretch removed therefrom, the

uncrimped sections exhibit a more deeply or darker dyed appearance than the crimped sections.

In still another embodiment the yarn drawn below the natural drawn ratio so that it exhibits thick and thin portions along the length thereof is knitted into a fabric. The resulting fabric is heat-set and then unraveled. The yarn thereafter is stretched to complete the draw thereof. The thin portions of the yarn remain crimped; and the thick portions of the yarn are thereby lastingly stretched presenting a substantially straight, uncrimped appearance. The resulting textured yarn can be used to construct fabric having novelty effects and desirable properties. Again, when the yarn is dyed before having the stretch removed therefrom, the uncrimped sections exhibit a more deeply or darker dyed appearance than the crimped sections.

In addition, yarn drawn below the natural draw ratio so that it exhibits thick and thin portions can be distorted by a hot plasticizing fluid-jet process. In such a process a moving threadline is discomposed by a hot fluid, such as superheated steam. The process induces crimps in the yarn without crunodal loops being formed therein. After such treatment, the yarn is stretched to complete the draw thereof. The thin portions of the yarn remain crimped; and the thick portions of the yarn are thereby lastingly stretched presenting a substantially straight, uncrimped appearance. The resulting textured yarn can be used to construct fabric having novelty effects and desirable properties. Again, when the yarn is dyed before having the stretch removed therefrom, the uncrimped sections exhibit a more deeply or darker dyed appearance than the crimped sections.

The present invention further provides a dyed thermoplastic continuous filament yarn exhibiting intermittently arranged textured sections and untextured sections. The untextured sections present a different and darker shade of the same color from the textured sections. The textured sections can be in the form of crimps, curls or like distortions.

This invention is illustrated in the accompanying drawing wherein:

FIGURE 1 is a schematic view illustrating a continuous filament yarn having thick and thin portions along its length;

FIGURE 2 is a schematic view illustrating a continuous filament yarn intermittently crimped by the process of the present invention;

FIGURE 3 shows one arrangement of apparatus for processing yarn in accordance with this invention;

FIGURE 4 is a schematic view illustrating a continuous filament yarn intermittently twist-curled by the process of the present invention;

FIGURE 5 shows another arrangement of apparatus for processing yarn in accordance with this invention;

FIGURE 6 is a schematic view illustrating a continuous filament yarn intermittently stuffing box crimped by the process of the present invention; and

FIGURE 7 shows one arrangement of apparatus for processing yarn in accordance with this invention.

In FIGURE 1 continuous filament yarn **1** has a plurality of thick portions **2** and thin portions **3**. The yarn has not been fully oriented. Nascent man-made filaments, as a rule, do not show a high order of molecular orientation and have a relatively low load-bearing capacity. To orient the filaments and thereby to increase greatly the strength thereof, they are stretched a desired extent, as is well known. In order to obtain optimum physical properties, the filaments normally are stretched using a natural draw ratio. This results in an extension of the filaments which is sufficient to change them from their undrawn state to a uniformly drawn and highly oriented state without straining them to introduce surface cracks or filament breaks. When one employs a draw ratio lower than the natural draw ratio, some sections of the filaments will draw at the natural draw ratio while other sections, in the main, will not draw at all.

In FIGURE 1 the yarn **1** has been drawn by means of two thread advancing devices operated at a peripheral speed differential predetermined to provide a draw ratio less than the natural draw ratio under the drawing conditions employed. The thin portions **3** exhibit considerably greater molecular orientation than the thick portions **2**.

In FIGURE 2 intermittently textured fully drawn yarn **4** is shown. It will be noted that the yarn exhibits uncrimped sections **5** and crimped sections **6**. Generally, the uncrimped sections **5** correspond to the thick portions **2**; and the crimped sections **6** correspond to the thin portions **3**. When the yarn has been dyed by conventional yarn dyeing before completion of the natural draw, the yarn is two-toned presenting different shades of the same color. The uncrimped sections possess a different and darker shade from the same color of the crimped sections.

One form of apparatus for converting the thin portions into the crimped sections is shown in FIGURE 3. A thermoplastic yarn **1** previously drawn below the natural draw ratio to provide thick portions **2** and thin portions **3** therein is supplied from a suitable source. The source can be from a yarn holder on which the yarn has been packaged. In addition, the yarn can be supplied directly from a filament-forming device without the yarn having been packaged provided the yarn has the required thick and thin portions. The yarn is passed through a pair of feed rolls **7** to supply it at a predetermined delivery speed.

From the feed rolls **7** the yarn **1** is led through a heated zone provided by a circumferential heater **8**. As illustrated this heater is a tubular device having an electrical resistant heater element imbedded therein. Obviously other heating devices for suitably raising the temperature of the thick and thin yarn **1** can be used as well. Next, the yarn is directed between rotatably mounted, driven crimping gears **9** and **10** that mesh.

As the teeth of the gears mesh, the yarn is subjected to laterally applied stresses increasing and decreasing in intensity as the yarn approaches and leaves the horizontal plane in which the axes of the crimping gears lie. While subjected to the action of the teeth, the undrawn or thick portions **2** are sligthly drawn and the drawn or thin portions are deformed. While being so-drawn and deformed, the yarn is cooled. To provide this cooling which is of importance to obtain the intermittent crimp, gears **9** and **10** can be positively cooled. As illustrated a nozzle **11** is positioned to direct a stream of coolant onto gear **9**. Under certain conditions it can be advantageous to pass the yarn through the mesh of the gears a plurality of times. To do this, a separator roll **12** can be positioned adjacent one of the gears.

After being cooled and deformed by the gears, the yarn is ordinarily taken up in an orderly manner. As shown the yarn is wound in the form of a package **13** by a driven spindle **14**. However, before take-up or after take-up the yarn is stretched to complete the draw thereof, resulting in removing the variation in denier originally therein. If desired, this stretch can be accomplished by use of a thread advancing means (not shown) in the path of the yarn between the gears and the take-up device. The thread advancing means is operated at a faster speed relative to the yarn forwarding speed of the gears to provide the desired stretch along the length thereof. Furthermore, the yarn can be withdrawn from package **13** and forwarded to a second take-up at a faster speed to finish the draw thereof. The crimped sections of the treated yarn can become more manifest by heating the yarn under zero or low tension. The post heat-relaxation can be carried out either before or after the yarn is taken up. Obviously, the yarn instead of being collected as continuous filaments can be cut to definite spinning lengths and baled as staple fiber.

In FIGURE 4 intermittently twist-curled yarn **15** is shown. It will be noted that the yarn exhibits uncurled

sections **16** and curled sections **17**. Generally, the uncurled sections **16** correspond to the thick portions **2**; and the curled sections **17** correspond to the thin portions **3**.

Apparatus for converting the thick portions into the uncurled sections and the thin portions into the curled sections is shown in FIGURE 5. A thermoplastic yarn **1** previously drawn below the natural draw ratio to provide thick portions **2** and thin portions **3** therein is supplied from a suitable source. The source can be from a yarn holder **18** on which the yarn has been packaged. In addition, the yarn can be supplied directly from a filament-forming device without the yarn having been packaged provided the yarn has the required thick and thin portions. The yarn is withdrawn from holder **18** and is passed through a pair of feed rolls **19** to supply it at a predetermined delivery speed.

Next, the yarn is fed through a twist-curl zone A wherein the yarn is twisted, heat-set and untwisted. The yarn is withdrawn from this zone by a second set of rolls **20**. In the yarn path in zone A a twist imparting device **21** is positioned for putting in and taking out twist in the yarn. Between rolls **19** and device **21**, a yarn heater **22** is located for heating the yarn when it is twisted. A twist of about 20–200 turns per inch gives good results.

The yarn is then fed through a drawing zone B wherein the yarn is stretched to complete the draw thereof and thereby to remove the thick portions therefrom. This is accomplished in the provision of a third set of yarn forwarding rolls **23** which is operated at a faster peripheral speed than rolls **20**.

After being twist-curled and stretched, the yarn is ordinarily taken up in an orderly manner. As shown the yarn is wound in the form of a package **24** by a driven traverse roll **25**. Obviously, the yarn instead of being collected as continuous filaments can be cut to definite spinning lengths and baled as staple fiber.

In FIGURE 6 intermittently stuffing box crimped yarn **26** is shown. It will be noted that the yarn exhibits uncrimped sections **27** and crimped sections **28**. Generally, the uncrimped sections **27** correspond to the thick portions **2**, and the crimped sections **28** correspond to the thin portions **3**.

Apparatus for converting the thick portions into the uncrimped sections and the thin portions into the stuffing box crimped sections is shown in FIGURE 7. A thermoplastic yarn **1** previously drawn below the natural draw ratio to provide thick portions **2** and thin portions **3** therein is supplied from a suitable source. The source can be from a yarn holder **29** on which the yarn has been packaged. In addition, the yarn can be supplied directly from a filament-forming device without the yarn having been packaged provided the yarn has the required thick and thin portions. The yarn is withdrawn from holder **29** and is passed through a pair of feed rolls **30** to supply it at a predetermined delivery speed.

These rolls cram the filaments in folded relation into and through the confined crimping zone A provided by stuffer box **31**. Near the entrance of the box a heater **32** is positioned for heating the crimped yarn. The yarn can be heated just before entering the zone, if desired. Between the heater and the weight biased door **33** of the box, the yarn is cooled to complete the heat-setting of the yarn. Fins **34** can be used to accomplish this cooling of the yarn. The yarn is withdrawn from the crimping zone by a second set of yarn forwarding rolls **34***a*. Rolls **30** and **34***a*, of course, are synchronized in speed to facilitate the crimping operation.

The yarn is then fed through a drawing zone B wherein the yarn is stretched to complete the draw thereof and thereby to remove the thick portions therefrom. This is accomplished in the provision of a third set of yarn forwarding rolls **35** operated at a faster peripheral speed than rolls **34***a*.

After being stuffing box crimped and stretched, the yarn is ordinarily taken up in an orderly manner. As shown, the yarn is wound in the form of a package **36** by a driven traverse roll **37**. Obviously, the yarn instead of being collected as continuous filaments can be cut to definite spinning lengths and baled as staple fiber.

This invention can advantageously use as a starting material thick and thin yarn prepared from a variety of polymers, including polyamides, polyesters, polyurethanes, polyureas, polyacrylonitriles, polyhydrocarbons (polyethylene, polypropylene, etc.), polyvinyl chlorides, cellulose esters, and cellulose ethers, as well as many other materials. The yarn can have a round cross section, as well as a non-round cross section such as X and Y configurations. In addition, the yarn can be tubular or have discontinuous voids. It is prefered that the yarn be made of polymeric ethylene terephthalate or of nylon which is a class of polyamides. In particular nylon-6 and nylon-66 can be advantageously processed. When these specific nylons are employed, it has been found that best results are obtained by heating the yarn in the range of about 150–250° C.

The following examples are illustrative of the invention; but, the same obviously is not limited thereto.

Example I

Nylon-66 was melt spun into undrawn yarn having a total denier of 280 and being composed of 14 continuous filaments. The natural draw ratio of the yarn at conditions employed was determined to be 4.5. However, the yarn was drawn using conventional feed rolls and draw rolls at a draw ratio of 3.4. The yarn was nubby having thick areas and thin areas. This thick and thin yarn was dyed with 'Superlitefast" Blue 8 GLN, a sensitive dye for nylon, in a conventional yarn dyeing procedure. Then, the yarn was passed through gears of the type shown in the accompanying drawing. Before being so crimped, the yarn was heated. The yarn was packaged as shown in FIGURE 3. Thereafter, the yarn was withdrawn therefrom and stretched to complete the draw to the natural draw ratio. It was observed that after being heated while under no tension, the yarn exhibited crimped areas and uncrimped areas along the length thereof. The crimped areas had a noticeably lighter color of blue than the uncrimped areas. Fabric made therefrom had a novel two-toned color effect.

Example II

The underdrawn nylon yarn having thick and thin areas in the above example was knitted in a circular knit fabric. The fabric was dyed with a conventional nylon dye, heat-set, and unraveled. The draw of the yarn was completed. The resulting yarn was uniformly fully drawn and exhibited crimped areas and uncrimped areas along the length thereof. The crimped areas had a noticeably lighter color than the uncrimped areas. Fabric made therefrom had a novel two-toned color effect.

Example III

Nylon-66 is melt spun into undrawn yarn having a total denier of 280 and composed of 14 continuous filaments. The natural draw ratio of the yarn at conditions employed is 4.5. However, the yarn is drawn using conventional feed rolls and draw rolls at a draw ratio of 3.4. The yarn is rendered nubby having thick areas and thin areas. This thick and thin yarn is passed through a twist-curling device as illustrated in the drawing. A false twist of 50 turns per inch is imparted thereto. The heater is operated at about 190° C. The yarn leaving the false-twister is then stretched to finish the draw thereof. The yarn is uniformly fully drawn and exhibits curled areas and uncurled areas along the length thereof. When the yarn is dyed before having the stretch removed therefrom, the resulting curled areas have a noticeably lighter color than the uncrimped areas. Fabric made therefrom has a novel two-toned color effect.

Example IV

Nylon-66 is melt spun into undrawn yarn having a total denier of 280 and composed of 14 continuous filaments. The natural draw ratio of the yarn at conditions employed is 4.5. However, the yarn is drawn using conventional feed rolls and draw rolls at a draw ratio of 3.4. The yarn is rendered nubby having thick areas and thin areas. This thick and thin yarn is passed through a stuffing box crimper operating to impart thereto about 8 crimps per inch of an amplitude of about 1–5 mm. The first part of the box is heated by an electric heater at about 190° C. The yarn leaving the box is then stretched to finish the draw thereof. The yarn exhibits crimped areas and uncrimped areas along the length thereof. When the yarn is dyed before having the stretch removed therefrom, the resulting crimped areas have a noticeably lighter color than the uncrimped areas. Fabric made therefrom has a novel two-toned color effect.

Thus, it is seen that the present invention provides a convenient and economical process for producing an intermittently textured continuous filament yarn. The texture can be in the form of twist-curls, crimps, etc. The yarn can be dyed during the processing thereof such that the textured parts will have a different shade of color from the untextured parts.

It is apparent that many different embodiments of the above can be made without departing from the spirit and scope of the present invention. Therefore, it is not intended that the invention be limited except as indicated in the following claims.

What is claimed is:

1. A method of producing intermittently textured yarn comprising:
   (a) providing a source of thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;
   (b) subjecting the yarn to a texturing operation; and
   (c) stretching the yarn to complete the natural draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn.

2. A method of producing intermittently textured yarn comprising:
   (a) providing a source of synthetic thermoplastic multi-continuous filament yarn previously drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;
   (b) forwarding the yarn longitudinally through a zone wherein the yarn is heated;
   (c) thereafter simultaneously cooling and deforming the heated yarn by continuously passing the yarn between intermeshing toothed wheels;
   (d) stretching the yarn to complete the natural draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn, and
   (e) collecting the yarn in an orderly manner.

3. The process of claim 2 wherein the yarn is dyed before the yarn is stretched to complete the natural draw.

4. A method of producing intermittently textured two-toned yarn comprising:
   (a) providing a source of undyed thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof,
   (b) forwarding the yarn longitudinally through a zone wherein the yarn is heated;
   (c) thereafter simultaneously cooling and deforming the heated yarn by continuously passing the yarn between intermeshing toothed wheels;
   (d) collecting the yarn in an orderly manner;
   (e) dyeing the yarn; and
   (f) stretching the yarn to complete the natural draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn.

5. The method of claim 1 wherein the yarn is composed of a nylon polymer.

6. The method of claim 5 wherein the yarn is composed of nylon-66.

7. The method of claim 5 wherein the yarn is composed of nylon-6.

8. The method of claim 5 wherein the heating zone is maintained at about 150–250° C.

9. The method of claim 1 wherein the yarn is composed of polyester.

10. The method of claim 2 wherein the yarn is passed a plurality of times between the toothed wheels.

11. A method of producing intermittently textured yarn comprising:
   (a) providing a source of thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;
   (b) forwarding the yarn longitudinally through a zone wherein the yarn is twist-curled by being twisted, heated and cooled while twisted and then is untwisted;
   (c) thereafter stretching the yarn to complete the draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn; and
   (d) collecting the yarn in an orderly manner.

12. A method of producing intermittently textured yarn comprising:
   (a) providing a source of substantially untwisted thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;
   (b) forwarding the yarn longitudinally through a twist-curling zone;
   (c) in said zone twisting to impart about 20–200 turns per inch therein;
   (d) in said zone consecutively heating and cooling the twisted yarn;
   (e) thereafter, untwisting the yarn;
   (f) stretching the yarn to complete the draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn; and
   (g) collecting the yarn in an orderly manner.

13. A method of producing intermittently textured yarn comprising:
   (a) providing a source of substantially untwisted thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;
   (b) forwarding the yarn longitudinally through a twist-curling zone;
   (c) imparting and releasing a false twist in the yarn in the zone;
   (d) while the yarn is twisted, consecutively heating and cooling the yarn;
   (e) stretching the yarn to complete the draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn; and
   (f) collecting the yarn in an orderly manner.

14. The method of claim 13 wherein the heating step is carried out at about 190–240° C. while the yarn has a twist of about 20–200 turns per inch.

15. The process of claim 11 wherein the yarn is dyed before the yarn is stretched to complete the natural draw.

16. A method of producing intermittently textured yarn comprising:
   (a) providing a source of thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;

(b) cramming the yarn longitudinally through a confined zone in the form of accordion-like folds;

(c) heat-setting the folded yarn as the same moves through the confined zone;

(d) after removing the yarn from the confined zone, stretching the yarn to complete the draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn; and

(e) collecting the yarn in an orderly manner.

17. A method of producing intermittently textured yarn comprising:

(a) providing a source of thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;

(b) cramming the yarn longitudinally through a confined zone in the form of accordion-like folds;

(c) consecutively heating and cooling the folded yarn as the same moves through the confined zone in order to heat-set same;

(d) after removing the yarn from the confined zone, stretching the yarn to complete the draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn; and

(e) collecting the yarn in an orderly manner.

18. The process of claim **16** wherein the yarn is dyed before the yarn is stretched to complete the natural draw.

19. A method of producing intermittently textured yarn comprising:

(a) providing a source of thermoplastic continuous filament yarn drawn below the natural draw ratio so that the yarn exhibits thick and thin portions along the length thereof;

(b) knitting the yarn into fabric;

(c) heat-setting the fabric;

(d) unraveling the fabric; and

(e) thereafter, stretching the yarn to complete the natural draw thereof whereby the thin portions retain the texturing therein and the thick portions are removed from the yarn.

20. The process of claim **19** wherein the yarn is dyed before the yarn is stretched to complete the natural draw.

References Cited by the Examiner

UNITED STATES PATENTS

2,278,888	4/1942	Lewis	57—140
2,370,112	2/1945	Truitt	28—72
2,780,833	2/1957	Braunlich	57—140
2,878,548	3/1959	Lohr et al.	57—140
3,069,726	12/1962	Adams	161—179 X
3,122,816	3/1964	Rhoden	28—72
3,136,111	6/1964	Pittman	57—140
3,143,784	8/1964	Scott	28—72

MERVIN STEIN, *Primary Examiner.*

STANLEY N. GILREATH, *Examiner.*

J. PETRAKES, *Assistant Examiner.*