# United States Patent

**Burklund**

[15] **3,672,012**

[45] **June 27, 1972**

[54] **APPARATUS FOR TEXTURIZING YARNS AND THE LIKE**

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[51] **Int. Cl.** ....... **D02g 1/00**
[58] **Field of Search** ....... 28/1.2, 72.1; 26/18.5

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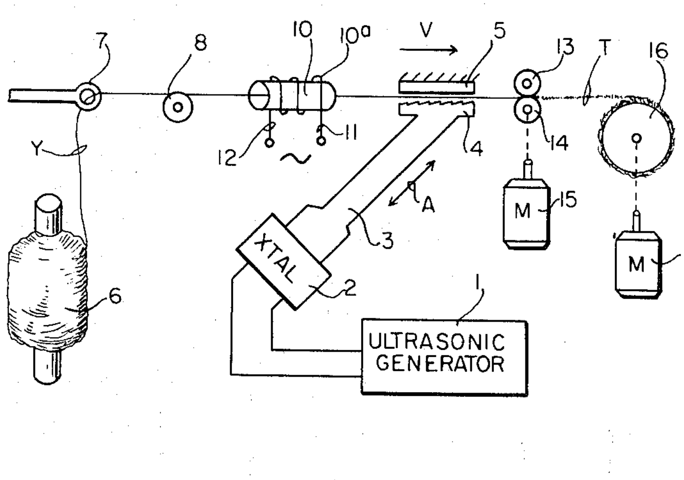
[57] **ABSTRACT**

Improved technique for texturizing synthetic filaments, fibers and yarns by the application of high frequency impact thereto to impart bulk and/or stretch characteristics, each impact being applied to the yarn at an acute angle with respect to its axis and in such a way that each fiber or filament is peened asymmetrically on one side to cause curling or bending while at the same time being advanced through the texturing zone by the impact, and between impacts the yarn is fully released by the impact applying members in the zone so that the yarn can assume a relaxed position whereby any build up of twisting of the yarn is avoided.

**11 Claims, 9 Drawing Figures**



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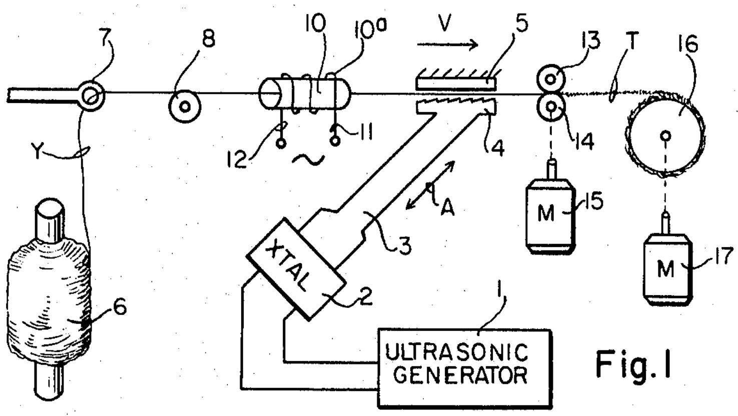

Fig. 1

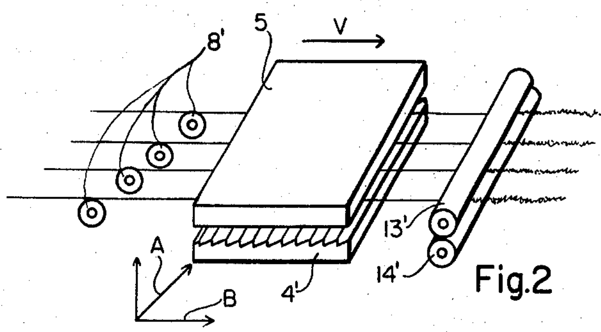
Fig. 2

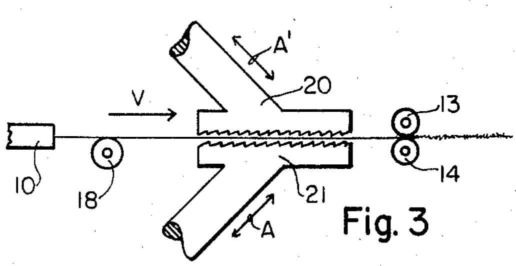
Fig. 3

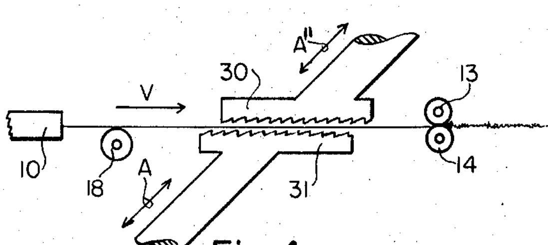
Fig. 4

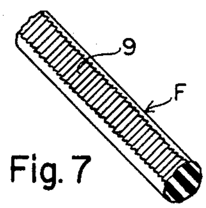
Fig. 7

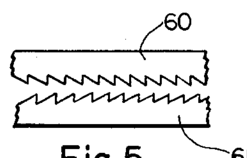
Fig. 5

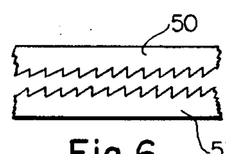
Fig. 6

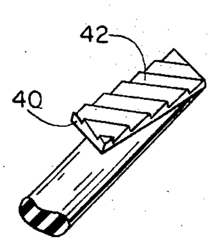
Fig. 8

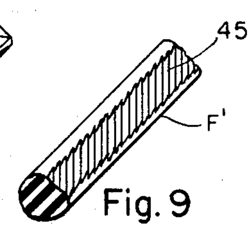
Fig. 9


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## APPARATUS FOR TEXTURIZING YARNS AND THE LIKE

This invention relates to methods and apparatus for imparting texture to synthetic fibers, filaments and yarns utilizing vibratory peening thereof in a texturizing zone. As used in this specification "texturizing" includes bulking to obtain non-linear filaments having crimped or zig-zag contours and/or the imparting of stretch characteristics wherein the filaments experience curling effects where the amplitude is great as compared with the smaller amplitude displacements characterizing crimping.

This invention teaches methods and apparatus for utilization of one or more vibrator energy sources to impart texture and bulk to synthetic yarns including a wide range of plastic materials which have been enumerated to a considerable extent in the prior-art patents discussed below.

It is known in the prior art that numerous different methods have been used to impart texture to synthetic yarns. These methods include, for instance, the passing of yarn over a heated knife blade, heat setting the yarn while in a twisted condition, entangling the filaments of a yarn by means of an air jet, stuffing the yarn into a heated box, and crimping the yarn between meshed gear teeth. Some of these methods alter the cross-sectional shape to achieve areas of residual stress, while others rely upon an elevated temperature to cause a set while the yarn filament is mechanically distorted.

Still another process, as described in my U.S. Pat. No. 3,304,593, teaches the violent shocks through application of sonic or ultrasonic energy transverse to the axis of the synthetic yarn to cause cusps to be indented into the surface of the filaments which result in curling or kinking of the individual filaments. Further, the patent teaches that yarn while being drawn over the shock imparting head should change its direction at right angles or at an obtuse angle so that the fibers are transversely shocked, at spaced points along their lengths. Thus the filaments are made to lie against and conform to a right angle bend by virtue of the angle at which the yarn is drawn over the crimping head. Thus the initial twist which is inherent in most untextured yarns is caused to be isolated and built up between the supply bobbin and the leading edge of the texturizing head, and after sustained operation the yarn in this region will accumulate a continuous twist as great as twenty turns per inch of yarn length. The resultant ropelike yarn being continuously in contact with the head, and subjected to the vibratory motion thereof, permits only those filaments lying on the outside of the ropelike yarn to experience the texturizing action of the head. U.S. Pat. No. 3,438,104 attempts to overcome the deterioration of texture due to the build up of twist upstream from the texturizing head by utilizing a supply yarn with zero twist as withdrawn from the supply bobbin, or by providing special apparatus for withdrawing yarns or filaments from the supply bobbin and delivering them to the texturizing head without introducing twist. The technique revealed in U.S. Pat. No. 3,439,392 utilizes ultrasonic energy to apply a vibrating pressure between two opposed plates to substantially alter the physical state of a pre-twisted yarn to set a substantially-permanent crimped configuration into the yarn. During experimentation with various crimping schemes in connection with my U.S. Pat. No. 3,304,593, tests were made utilizing the opposed vibratory element configuration, and it was subsequently determined through analysis of stress patterns under polarized light that areas of stress caused by transverse vibrating pressure against untwisted filaments passed between opposing vibrating surfaces were in balance because of symetrical deformations on both sides of the filaments, that is stress forces imposed by one vibrating surface that cause physical deformation on one side of the filaments balance out diametrically opposed similar stress forces imposed by the opposing vibrating surface with a resultant absence of curl in the filaments.

To achieve curling or kinking in a fiber, it is necessary to generate non-symmetrical stresses in the fiber. Peening one side of the fiber, while leaving the opposite side virtually undisturbed causes the fiber to curl until the stresses in the fiber reach a state of equilibrium in which the fiber assumes a kinked appearance, for which it has a memory. These balanced stresses will remain in a state of equilibrium so that when the fiber is later disturbed as by physical stretching it will return to its crimped position when released to again permit the forces to return to a state of equilibrium.



The instant invention utilizes the confinement of fibers or filaments between mechanical members, one or both of which have multiple peening edges such that successive impacts by the peening edges as the yarn passes through the texturizing zone will cause deformations. The members are so arranged that the diametrically opposite side of the fiber in contact with the other member will either be undeformed or non-symetrically deformed, resulting in non-balancing stresses, a condition necessary to curling and zig-zag bulking or kinking. Additionally, impacting with the peening edges set at an angle produces non-normal vector stresses about the longitudinal axis of the yarn.

The present invention teaches a novel approach employing peening action producing a pattern of spaced impacts designed to alter the cross-sectional shape of a filament or a yarn including many filaments and thereby cause non-symetrical stresses to be introduced therein which become permanent in the filament and which cause the filaments to acquire a stretch characteristic in the form of a series of coils and loops, or else a zig-zag texturized appearance, or both. In one case peening action is accomplished by drawing the yarn between a static member and a vibratory member mounted to vibrate theretoward at an acute angle with very close spacing with respect thereto, but without physical contact. In another form the peening action is accomplished by advancing the yarn between a combination of two vibratory members spaced apart in close mechanical proximity and both mounted to vibrate at an acute angle with respect to the other but without physical contact. In every one of the cases the vibratory member or members are vibrated at a relatively high cyclical rate, said rate being at least sonic and derived from a crystal or magnetostrictive transducer mechanically connected to a vibrating texturizing member. In the working embodiments of the invention illustrated in the present application the yarn ends are passed between the members in a straight path of travel, and the members are so positioned that when in their most retracted vibratory position they are out of contact with the filaments so that the latter are free to untwist, and when they are advancing they not only contact the yarn to cause peening but they also advance the yarn toward the take up mechanism.

It is a principal object of this invention to mechanically peen the synthetic fibers by repeatedly striking them with axially inclined mechanical blows while they are confined against opposed members, the blows having sufficient force to non-symetrically deform the cross-section of the fiber.

Another object of the invention is to provide a bulking method and apparatus in which the yarn, from a supply bobbin, is directed in a straight line between a fixed and a diagonally inclined vibratory texturizing member, and collected on a take up bobbin.

A further object of the invention is to mechanically peen a fiber while same is directed in a straight line between two vibrating mechanical members, disposed diametrically opposite the circular cross-section of the fiber, and whose texturizing surfaces are planar, each to the other, and wherein the axis of vibration of the peening members forms an acute angle with the longitudinal axis of the yarn from the supply bobbin.

A further object of the invention is to mechanically peen a fiber while the fiber is directed in a straight line between two vibrating mechanical members disposed diametrically opposite each other across the circular cross-section of the fiber, and whose texturizing surfaces are planar, each to the other, and wherein the longitudinal axis of vibration of one of the vibrating members forms an acute angle with the longitudinal axis of the yarn from the supply bobbin, the longitudinal axis of vibration of the second vibrating member forms a complementary angle with the longitudinal axis of the yarn, and their positioning being such that these longitudinal axes are colinear with each other.

Another object of the invention is to provide texturizing surface elements having advantageous shape and surface serrations. For example, when a vibratory member set at an acute angle as described above is used in conjunction with a smooth surface fixed member, and serrations perpendicular to the longitudinal axis of the yarn are employed on the surface of the vibrating texturizing member, an automatic stepping of the yarn ensues with each impact in conjunction with the peening of the yarn. The rate of incremental advancement of the yarn is mainly determined by the frequency and amplitude of vibration and the angular acuteness of the vibratory mechanism to the yarn.

It is a further object of the invention to provide novel vibratory texturizing members in which the serrations are skewed at an angle across the path of the filaments so as to provide diagonal impacts tending to roll the yarn against the other member and thereby add a third dimension to the curling effect so that the yarn tends to bulk in a cylindrical configuration.

It is another object of the invention to provide tensioning means in combination with the texturizing members to provide a controllable drag upon the yarn that permits optimization of texture and bulk characteristics. Experience shows that acoustical pressure is created by a rapidly reciprocating vibratory member which when used in conjunction with another vibratory member or static member in close proximity causes agitating pressure waves between the members, of considerable magnitude. Low mass material such as yarns will be dithered thereby so that their filaments will be separated and distributed over greater areas of the vibratory members. Tension will aid in confining the yarn to the active texturizing zone. Acoustic pressure serves a useful purpose, however, by agitating the yarn while in the texturizing zone, by dithering crossed filaments caused by twist, and by generally distributing the fibers so as to permit the serrations on the texturizing surface to peen all filaments contained in a yarn transiting the texturizing zone.

Another object is to precondition or plasticize certain fibers prior to entry into the texturizing zone, to allow the serrations to more readily deform the yarn filaments, and induce therein stresses which cause the filaments to become curled and kinked. In appropriate cases fibers are plasticized by passing the yarn, just prior to entry into the texturizing zone, through a suitable heating medium to induce heat into the fiber. There are many types of heaters suitable for this purpose, and the details thereof form no part of the present invention. Other filament materials, however, may be deteriorated by heat preconditioning, so that heating is not necessarily applicable to all present and future synthetic fibers.

The benefits derived from the present apparatus include the ability to texture and bulk synthetic yarns having twist by freely passing each turn as it is encountered in transiting the texturizing zone without accumulating the twist, thereby causing a uniform product to be manufactured. Although many schemes might be devised to vibrate the texturizing surfaces or surfaces, a crystal or magnetostrictive type transducer driving each vibrating member through a mechanically resonant matching link appears to be the most efficient method. The electronic ultrasonic generator requires little maintenance, and the transducer assembly is likewise rugged and reliable and not subject to wear to the degree encountered in mechanical apparatus used in other processes. Further, because the yarn is introduced in a straight line through the texturizing zone with the vibratory apparatus set at an acute angle, the yarn can receive a greater number of impacts per unit length despite the high speed of travel through the zone, which is greater by several fold than existing mechanical and ultrasonic texturizing processes.

If desired, external pinch rolls can be driven to pull the yarn through the texturizing zone even faster than the vibratory members increment it. Moreover, many yarn ends can be simultaneously treated by the present vibratory mechanism by guiding them into side-by-side relationship when transiting the texturizing zone.

Additional objects and advantages will become apparent during the subsequent description of the drawings wherein:

FIG. 1 is a diagrammatic view showing yarn passing from a supply bobbin and being introduced in a straight line through a heater and then through a texturizing zone including a flat platen and an inclined vibrating texturizing member, the zone being followed by a take-up bobbin;

FIG. 2 is a perspective view showing a multiplicity of yarn ends being simultaneously texturized by texturizing members similar to FIG. 1;

FIG. 3 is a view of a modified form of the invention using two vibratory texturizing members both set at an acute angle to the axis of yarn motion, and having vibratory axes which converge to intercept the yarn near the apex of convergence;

FIG. 4 is an elevation view of a further modification using two vibratory texturizing members set at complementary angles to the axis of yarn motion, their vibratory axies being colinear;

FIG. 5 and FIG. 6 show enlargements of portions of the texturizing members for two different forms wherein both opposed members are vibrated;

FIG. 7 shows an enlarged view of a length of filament which has been peened on one side by texturizing members such as are shown in FIGS. 1 and 2;

FIG. 8 shows an enlarged view of a texturizing head modified to skew the peening edges out of right-angular relationship with the axis of vibration of the texturizing member and the yarn motion; and

FIG. 9 shows an enlarged view of a length of filament which has been peened on one side by a texturizing member such as is shown in FIG. 8.

Referring to the drawings, FIG. 1 shows an embodiment of the invention using an ultrasonic generator **1** capable of delivering an undulating electrical signal at a relatively high power level, the generator being connected to drive a crystal transducer **2** which is mechanically connected to deliver motion through a rigid resonant column **3**, to which in turn is affixed a texturizing member **4** in the form of a block of metal into which transverse serrations have been introduced, for instance, engraved as also shown at **4'** in FIG. 2. The generator **1** and the crystal transducer element **2** are purchased items, such as manufactured by Branson Sonic Power Model LS-75.

The unprocessed fibers in the form of a yarn Y are withdrawn from one or more supply bobbins **6** and led through guide means **7** whereupon they are tensioned by an adjustable disc tensioner **8** whose supporting shaft is mounted on the machine frame (not shown). The yarn is then drawn through the core of a heater **10** upon which an electrical heating element **10a** is would whose leads **11** and **12** are connected to an appropriate voltage source. The yarn then is drawn in a straight path through the texturizing zone between the vibratory texturizing member **4** and a rigidly mounted plate member **5** by the chill rolls **13** and **14**, the latter being continuously driven by a motor **15**. The textured yarn T is then wound on a storage bobbin **16** which is powered by suitable motor means **17**. The path of the yarn is such that when the vibratory member **4** is in its most retracted position the yarn just misses touching it and just misses touching the plate **5**.

Experience with the present embodiment indicates that the vibratory member **4** can be made to work in concert with the fixed plate **5** to perform two essential tasks, first to peen a multiplicity of stress producing impact marks **9** into one side of each filament F as shown in FIG. 7, and second, because the texturizing assembly is set at an acute angle to the axis of the yarn, it can cause a longitudinal vector force to be created that acts along the axis of the yarn to cause an incremental stepping of the yarn synchronous with the frequency of the vibratory source.

The acute angle of the axis A of vibration of the member **4** with respect to the axis of the yarn is illustrated in the drawing as rather greater than would be the case in a practical apparatus. This angle is affected by filament diameter, and decreases with decrease in filament diameter. Practical ranges of diameters can be set forth for various filament sizes. For instance for a filament diameter of 0.001 inch, the acute angle can vary between 2° and 20°; for 0.003 inch filament diameter the acute angle should be between 5° and 40°; and for 0.01 inch filament diameter, the angle can go up to 10° and 45°. The angle should be selected to limit the depth of impact to prevent filament breakage and to advance the yarn through satisfactory increments. The texturizing serrations or teeth are of course much finer than is shown in the drawing, the separation between tooth edges being, for example, in the neighborhood of ten thousandths of an inch, so that repeated impacts on the filament F shown in FIG. 7 will provide marks 9 on the filament which are much closer together than the spacing of the teeth so as to produce in the filament a strong tendency to curl.

FIG. 2 shows a modification of FIG. 1 in which a plurality of yarns ends are simultaneously subjected to texturizing action utilizing the same type of vibratory member 4', thereby achieving greater efficiency in a production embodiment of the apparatus, and only requiring that an additional disc tensioner 8' be added for each additional yarn end and that the length of the chill rolls 13' and 14' be increased to accommodate the lateral deployment of plural yarn ends. Tests demonstrate that a 75 watt generator will drive the texturizing assembly adequately to simultaneously process 30 to 50 yarns ends, since the amount of energy absorbed when peening the yarn is small. Most of the energy produced by the generator is utilized in maintaining the column 3 at its maximum vibratory displacement. In any event, the vibratory column drives the texturizing member in the direction of the arrow A, so that it reciprocates into and out of contact with the yarn, and by virtue of being set at an acute angle to the axis of the yarn, it also incrementally steps the yarn at a velocity V between the texturizing members as shown by arrow B in the vector diagram of FIG. 2.

The velocity V in certain cases may be determined by the rate of incremental feed imposed by the vibratory reciprocation, the angle of the vibratory member to the yarn, and the tension imposed on the yarn. In other cases, the yarn may be drawn through the texturizing zone at a predetermined speed as set by the rotational rate of the chill rolls which can act to pull the yarn through and override the tendency toward self-feeding. In either event, the velocity V will determine the number of impacts per unit length of yarn, other things being equal, and the number of impacts will determine the type of texture. The self-feeding case will cause a very tight curling of the filaments and result in a yarn with high stretch qualities, whereas the roller feed will produce a yarn that has less stretch, but greater amplitude of bulk. Analysis indicates that self-feed at a vibratory rate of 20 KHz, (Kilo-cycles per second) for instance, can result in a yarn velocity V of 450 yards per minute, while motor feed can be accomplished to provide a yarn velocity V of 4,000 yards per minute.

FIG. 3 shows a modification of the texturizing apparatus wherein the yarn is delivered from an adjustable disc tensioner 18 in a straight line between two serrated opposed vibratory texturizing members 20 and 21 from which the texturized yarn is taken up between the chill rolls 13 and 14, the serrated texturizing members being driven by individual vibratory sources (not shown) whose axes of vibration are driven in the directions of the arrows A and A'. It is noted that the axes of vibration converge to intercept the yarn in the vicinity of the apex of convergence.

Actually two modes of vibration can be accomplished with this modification, depending upon the polarity of the electrical connections between a common ultrasonic generator (not shown) and both crystal transducers respectively driving the members 20 and 21. The first mode occurs when the electrical connection causes the vibratory transducers to operate in phase such that both vibratory texturizing elements 20 and 21 advance along their respective axes to converge on the yarn simultaneously, and the second mode occurs when the electrical connections to one of the crystal transducers are reversed, for instance, such that element 20 advances along its axis A' toward the yarn to it's maximum amplitude while simultaneously element 21 has retreated to it's maximum excursion along axis A away from the yarn, and vice versa.

The net effect of the first mode, operating in phase, is that the serrations on the respective texturizing surfaces should be disposed as shown in FIG. 6 at 50 and 51 and should tend to mesh with each other thus forcing the yarn, under pressure, to become crimped and conform to the meshed serration contour. Thus the plastic yarn is crimped with the sharp cusps of the serrations which causes a deformation of the cross section of the yarn filaments. Moreover, where a yarn is softened by heating, is crimped, and then encounters a cold mass in the form of the texturing members 20 and 21, the yarn is suddenly chilled, thereby setting memory of the shape into the plastic deformations crimped into the yarn and causing it to become permanently texturized. The rightward motion of both members causes the yarn to be incrementally stepped out of the texturizing zone in the direction of the arrow V.

The second, out of phase mode, results when texturizing members 20 and 21 take the shape of the serrations shown at 60 and 61 in FIG. 5. Consider the case where the texturizing member 20 is at the maximum point of excursion toward the yarn along arrow A', and simultaneously the member 21 is at its maximum excursion away from the yarn along arrow A. This mode of operation provides an alternating kind of push-pull action on the part of the members 20 and 21 in which each scuffs the yarn when retreating but bites into it when advancing, the biting on one side being staggered with respect to the biting on the other side to produce n0n-symmetrical stresses in the filaments which cause them to become bulked and kinked, the degree of which is determined by the tension imposed upon the yarn, and in some cases the amplitude of vibration of the texturizing members. Moreover, the incremental feed rate of the yarn is approximately doubled by the push-pull action.

FIG. 4 shows still another modification of the apparatus wherein the yarn is delivered from an adjustable disc tensioner 18 in a straight line between two serrated vibratory texturizing members 30 and 31, having serrations arranged as shown at 50 and 51 in FIG. 6. The emerging textured yarn is withdrawn between the chill rolls 13 and 14, and the vibratory texturizing members are driven by individual vibratory transducers whose co-linear axes of longitudinal vibration are driven in the direction of arrows A and A''. Though out of phase operation cannot be excluded for certain specialized applications, especially in texturizing large diameter materials, the most practical results are attained when both vibratory members advance toward the yarn along the respective axes, and simultaneously intermesh their serrations just short of mutual bottoming at their peak of excursion. Conversely, the maximum separation between the serrated texturizing members must be adjusted to permit the crimped yarn to pass freely out of the texturizing zone therebetween, for instance, towed therefrom by the rollers 13 and 14. In this embodiment the fibers are advanced from the tensioner 18 through the texturizing zone and the chill rolls 13 and 14 by the crimping action of the members 30 and 31 because each time the latter come together the zig-zag pattern that yarn assumes pulls more yarn through the adjustable tensioner 18, and each time the members 30 and 31 separate the chill rolls take up the slack in preparation for the next closing of the members 30 and 31.

FIGS. 8 and 9 show a novel type of apparatus and finished product wherein the serrations 45 are skewed from right angle orientation with respect to the length of the filament F'. The filament F when peened as shown in FIG. 7 tends to curl into a plane spiral configuration, but because of the skewing of the peening 45, the filament F' tends to curl into a helix whose lead is determined by the skew angle, thus giving a novel texturizing configuration. FIG. 8 shows a texturizing member 40 having skewed serrations **42** thereon for accomplishing peening of the type shown in FIG. 9. Using the member **40** it is possible to peen the filaments F′ against a plate type member **5** in such a way as to cause some rolling of the filament each time it is impacted so that the peening **45** is arcuate about the filament and can therefore be made longer without requiring the member **40** to penetrate deeply into the fiber interior. Accordingly, a stronger fiber can result since it is not as deeply penetrated, while the peening will be as extensive in girth as if deep penetration had been resorted to. Selective rolling of the filaments may also be useful in fighting the tendency of the yarn to twist in one direction as a result of pretwist of the yarn before texturizing.

Although this invention is illustrated in terms of texturizing synthetic yarn, the process has utility in connection with texturizing or crimping a wide variety of other continuous filaments or rods, and at frequencies which may be in the sonic range where the filaments have a greater mass and are of larger diameter.

The present invention is not to be limited to the exact illustrative forms, for obviously many additional variations and modifications can be made without departing from the spirit and scope of the invention.

I claim:

1. Apparatus for texturizing synthetic fibers in a yarn, comprising:

a. means for passing the yarn in a substantially straight line path through a texturizing zone;

b. opposed texturizing members in said zone on opposite sides of said yarn and including on at least one member multiple striations disposed across the path of the yarn and having edges extending toward the yarn, said edges terminating in a common plane of the associated texturizing member which plane lies parallel to said path;

c. means for vibrating said one member to reciprocate it along a vibratory axis disposed at an acute angle to said straight line path to alternately peen the yarn which is backed by the opposed other member and then retract out of contact with the yarn; and

d. said vibrating means reciprocating the member at a rate which is at least sonic and at an angle and amplitude such that the impacts of said edges on the yarn fibers produce cusps therein which permanently distort their cross-sections and provide non-normal vector stresses about the axis of the yarn, said impacts further tending to advance the fibers through said zone.

2. In apparatus as set forth in claim **1**, said acute angle lying within the range of 2° through 45°.

3. In apparatus as set forth in claim **1**, the opposed other member comprising a smooth-surface fixed plate disposed with respect to the yarn so that it is just out of contact with it when said one texturizing member is retracted out of contact with the yarn.

4. In apparatus as set forth in claim **1**, yarn heater means preceding said texturizing zone, and said opposed members comprising metal plates of opposed area which is large as compared with the longitudinal spacings between said edges, whereby the plates impact each length of yarn many times as it passes through said zone and cool the yarn during contact therewith.

5. In apparatus as set forth in claim **1**, said vibratory rate being ultrasonic and said opposed members comprising plates of opposed area which is large as compared with the maximum separation between plates when reciprocated, whereby a high degree of air turbulance is generated among said striation edges to dither the yarn and spread its fibers across the surfaces of the plates for greater exposure to impact.

6. In apparatus as set forth in claim **1**, adjustable drag means disposed to act on the yarn ahead of said texturizing zone and chill roll means pulling the yarn through the drag means and tensioning it in said zone.

7. In apparatus as set forth in claim **1**, the striations in said member being disposed at an angle other than a right angle to the straight line travel of said yarn such that the impacts of said edges in the fibers are non-perpendicular with respect to their longitudinal axes.

8. In apparatus as set forth in claim **1**, said other texturizing member having multiple striations disposed across the path of the yarn and having edges extending toward the yarn; and means for vibrating said other member to reciprocate it along another vibratory axis disposed at an angle to the path of the yarn travel, said vibratory axes both intersecting said path.

9. In apparatus as set forth in claim **8**, the striations on both members having saw-tooth shapes as viewed in cross-section and all disposed alternately to bite into the yarn fibers to advance them through the zone and to scuff free of the fibers when retracted during reciprocation of said members.

10. In apparatus as set forth in claim **8**, said edges on the responsive opposed members being staggered out of mutual contact whereby the fibers are asymetrically peened thereby as the members are reciprocated.

11. In apparatus as set forth in claim **1**, said other texturizing member having multiple striations shaped to mate with the striations of said one member; and means for supporting and vibrating said other member to reciprocate it along a vibratory axis which is colinear with said first-mentioned vibratory axis and in the opposite direction from the reciprocatory motion of said one member alternately to peen the yarn between said members when advanced toward the yarn and to release it when retracted therefrom.

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