BULKY YARN

Filed Dec. 19, 1962 3 Sheets-Sheet 1

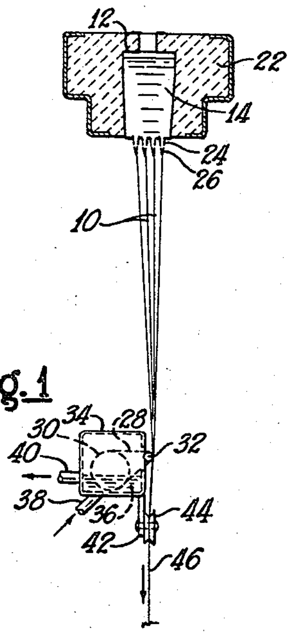

Fig. 1

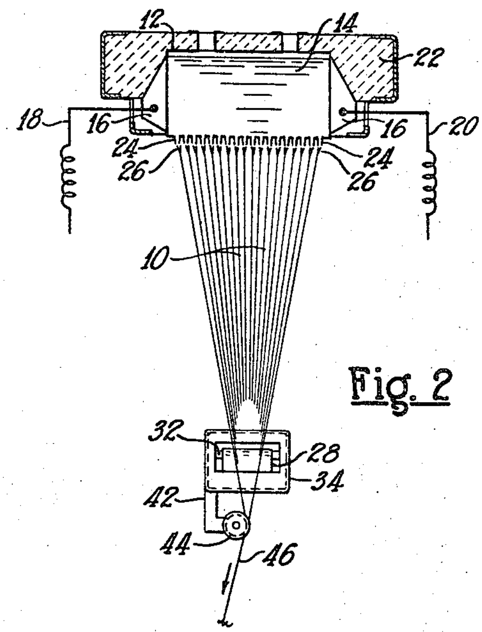

Fig. 2

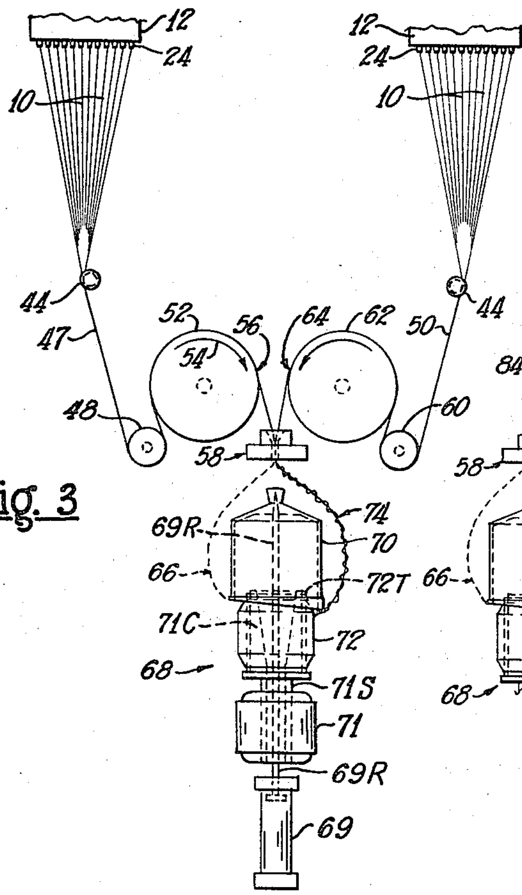

Fig. 3

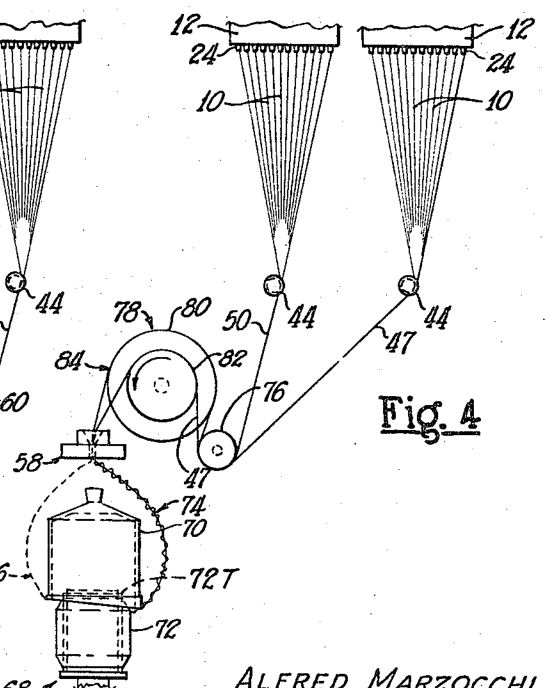

Fig. 4

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BULKY YARN

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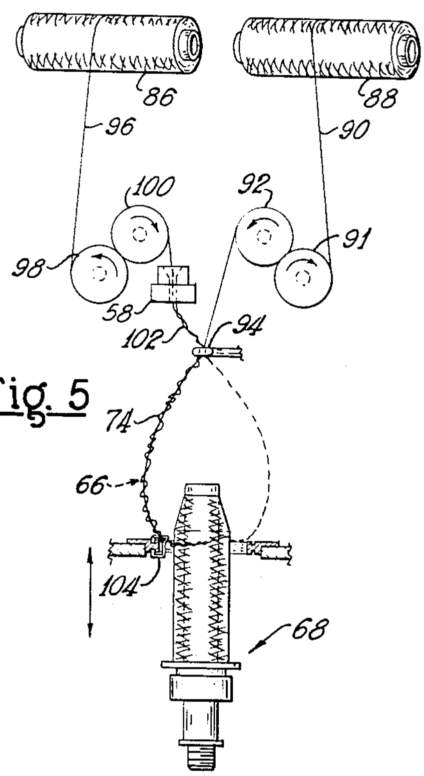

Fig. 5

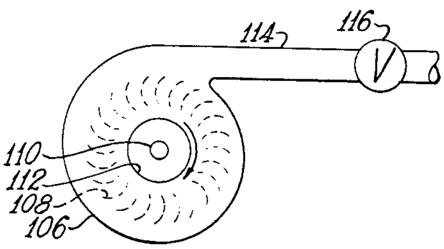

Fig. 6

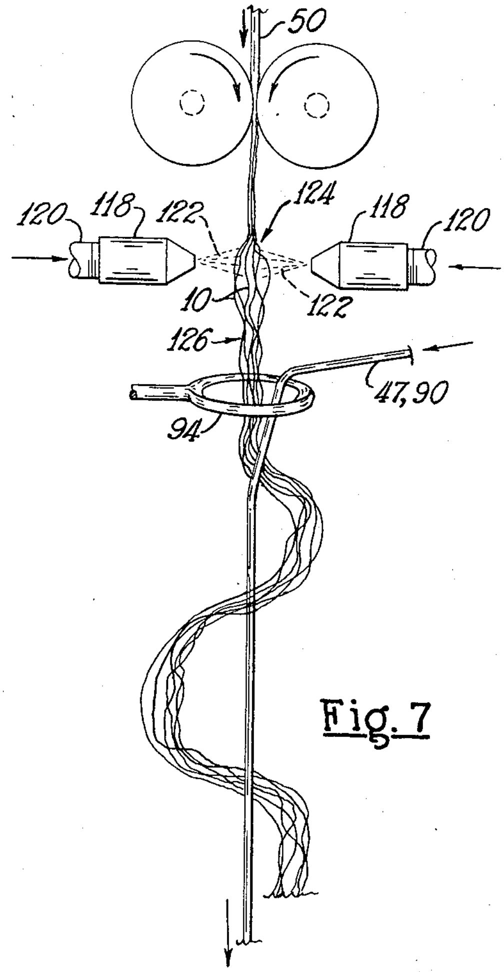

Fig. 7

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Nov. 12, 1968 A. MARZOCCHI ETAL 3,410,077

BULKY YARN

Filed Dec. 19, 1962

3 Sheets-Sheet 3

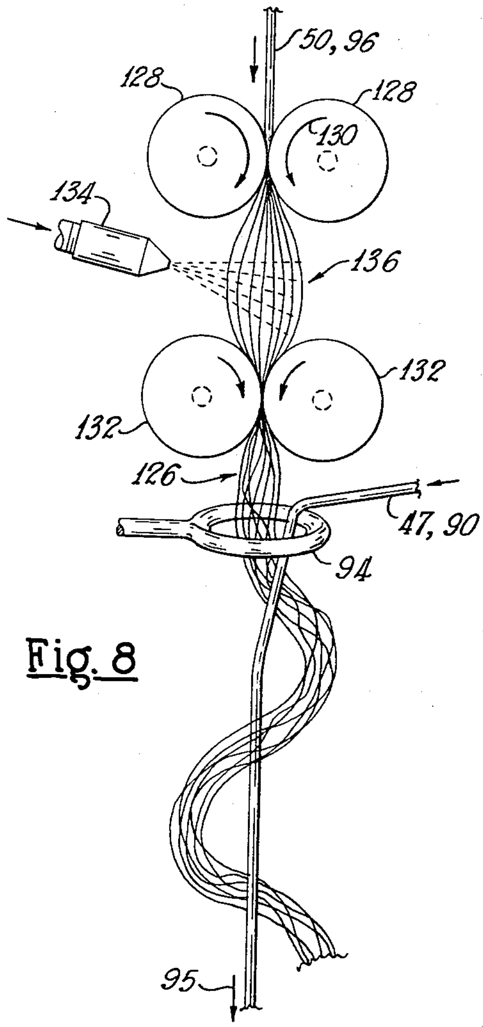

Fig. 8

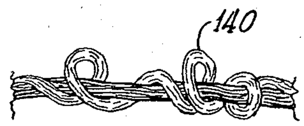

Fig. 10

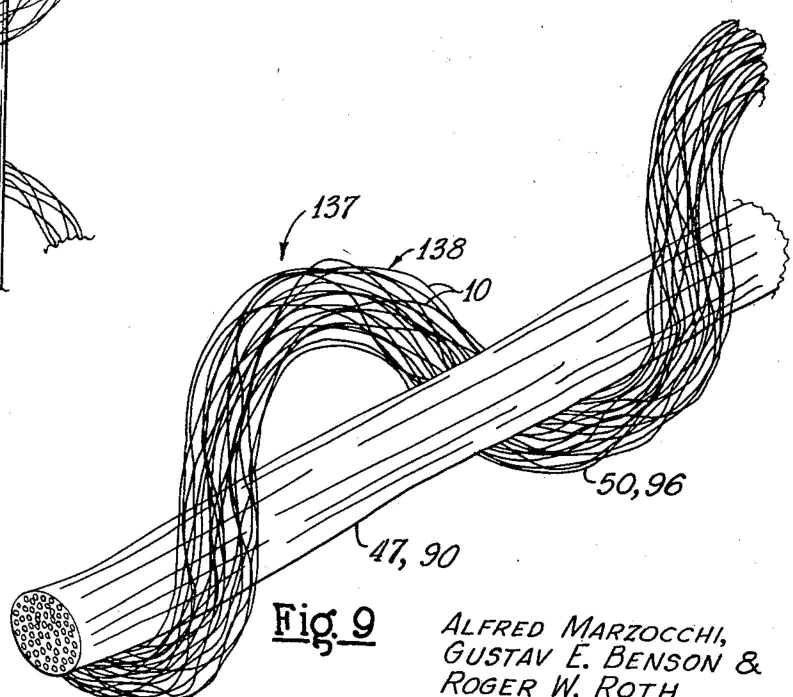

Fig. 9

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United States Patent Office 3,410,077
Patented Nov. 12, 1968

3,410,077

BULKY YARN

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Filed Dec. 19, 1962, Ser. No. 245,880
9 Claims. (Cl. 57—144)

This invention relates to bulky yarns and to apparatus and methods for their production. More particularly, this invention relates to bulky yarns made from a plurality of strands of continuous glass fibers wherein loop yarns are produced with the loops thereof expanded to filamentized form. Thus, novel products are made in accordance with the present invention and novel methods and apparatus are inherent in their production.

THE ESSENCE OF THE PRIOR ART

It is well recognized in the prior art that unusual textured fabrics can be produced from novelty yarns such as loop and boucle yarns wherein the yarns are characterized by loops of a second yarn carried upon a first or tensioned carrier yarn. A loop yarn is self-descriptive, and a bocle has a third spiral wrapped strand to hold the loop strand to the carrier strand.

Other novelty yarns include slub yarns having inserted tufts or balls of loose yarn incorporated into a base yarn; and knop yarns having enlarged knobs formed by twisting one yarn end about another end many times within a very short space, causing enlargements on the surface of the yarn.

THE PROBLEM

From the foregoing it will be noted that these prior art novelty yarns have used either tight loops, as in a loop yarn; tight loops held by a binder yarn, as in a boucle; tufted balls of loose yarn that are partly concealed by insertion in a base yarn, to wit, a slub; or the tight exposed knobs of the knop yarn.

To provide greater esthetic appeal, the novel yarns should display wool-like resilient knubs along the length of the base yarn. Thus, the prior products do not display a truly wool-like characteristic of many exposed or fluffed fibers at the loops. Thus, none of the prior yarns are fully filamentized at the loops to form a truly wool-like product.

Accordingly, novelty yarns displaying a truly wool-like resilient loop characteristic along the length that is adapted to processing by conventional looms would provide a substantial advancement in the art. Apparatus and method for the production of such products would also provide a substantial contribution to the art.

Accordingly, it is an important object of the present invention to provide novel bulky yarns.

Another object is to provide a method for producing the novel bulky yarns.

A further object is to provide apparatus for producing the novel bulky yarns.

A further object is to provide a novelty loop yarn wherein the loops are filamentized.

A further object is to provide a novelty loop yarn of continuous fibers wherein the loops are filamentized.

A further object is to provide a novelty loop yarn comprising at least two strands of continuous fibers, one a so-called tensioned or carrier strand and the other a looped strand on the carrier strand with the looped strand filamentized at least at the bight of the loops.

Anther object is to provide a method for producing novelty loop yarns from strands wherein the looped yarn is filamentized at the point of incorporation into the finished product.

A further object is to provide a method of forming novelty loop yarns from continuous glass strands wherein all fibers going into the product are placed under a constant tension during production and thus are of uniform size as distinguished from forming processes for analogous products in the prior art.

Another object is to provide apparatus for the production of novelty loop yarns from continuous fibers wherein the fibers of the loop yarn can be made of differing diameters as compared to the fibers of the carrier yarn, and wherein the loops are filamentized to provide a novel product.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

FIGURE 1 is a front elevation, partly sectioned, of apparatus for producing continuous fibers from heat-softenable materials, such as glass;

FIGURE 2 is a side elevation of FIGURE 1, also partly sectioned;

FIGURE 3 is an elevation view of apparatus used for producing novel loop yarns directly from a forming operation for continuous fibers in accordance with the invention and packaging the so-produced, novel yarn;

FIGURE 4 is an elevation of a second embodiment of the invention for producing novel loop yarns directly from a continuous fiber forming operation and packaging the so-produced, novel yarn;

FIGURE 5 is an illustrative view of apparatus for producing novelty loop yarns from at least two previously produced separate fibrous strands;

FIGURE 6 is a side view of apparatus for application with apparatus of FIGURES 3 and 4 to apply constant tension to the strand fed to the pull wheels and thereby prevent overrun and looping at the guide wheels;

FIGURE 7 is an elevational view of apparatus and illustrating another method of filamentizing a loop yarn;

FIGURE 8 is still another view of apparatus used for filamentizing the loop yarns for use in the invention;

FIGURE 9 is a greatly enlarged perspective view of a loop yarn of the invention; and

FIGURE 10 is a view illustrating prior analogous, tight-loop products.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Briefly, the present invention relates to the production of novelty loop yarns wherein both a carrier yarn and the loop yarn are formed under conditions of constant tension in initial fiber production and yarn formation, thus assuring the production of fibers of uniform diameter in the finshed product; and the so-called overrun or loop strand is filamentized prior to combination in the final product yarn. This basic concept of the invention is applicable both to the production of a novel loop yarn directly from the forming operation, and also from previously formed strands, in a twisting operation, with various methods for filamentizing the loop yarn becoming a part of the invention.

The extended scope of invention also logically includes the product wherein the carrier strand is tensioned and the loop strand is filamentized, thus exhibiting a realistic wool-like product as regards feel and weaving characteristics, and to the method of production.

Although the invention will be illustrated relative to the production of glass fibers, it is to be understood that the invention is applicable to substantially any continuously producible filamentizable material.

By reference to FIGURES 1 and 2, a typical environmental background relating to the formation of continuous glass fibers from a body of molten glass will be briefly described.

Thus, as shown in these figures of the drawings, continuous glass fibers **10** are formed utilizing a melter-feeder or bushing **12**, heated as hereinafter described to provide a body of molten glass **14**. Thus, the bushing **12** is provided with electrical terminals **16** at each end, FIGURE 2, to which electrical lines **18** and **20** are connected whereby electric current is passed through the bushing to heat the same by its own internal resistance. An insulating refractory **22** is provided around the bushing **12** to retain heat and thereby improve efficiencies.

Although not shown, a means for feeding glass marbles or powdered glass-forming materials, typified by a suitable chute or hopper is provided above the bushing **12**.

Glass-forming materials are fed by gravity into the bushing **12** at a controlled rate. In the bushing **12**, the glass-forming materials are converted into molten glass to provide the body **14** which is exuded downwardly from a plurality of apertures **24**, formed in aligned array over the bottom of the bushing, as small molten streams **26**. The streams **26** are attenuated into the fibers **10** by being pulled as will be hereinafter described, and the fibers **10** are passed into tangential contact with a sizing belt **28** operating over a roll **30** and a guide **32**. The roll **30** is positioned within a container **34** that retains a body of liquid size **36**, with the bottom portion of roll **30** being immersed in the liquid size; thus, as the belt **28** passes over the roll **30** it is wetted to transfer the size to the fibers **10** during their tangential passage over the belt at the guide point **32**. A conduit **38** supplies fresh size to the container **34** and an exhaust conduit **40** recirculates the size to a central source for purification and enrichment to assure a fresh, clean supply.

A depending arm **42**, attached to the container **34**, supports a gathering guide **44** which takes the form of a small wheel having a V-shaped groove in the periphery and that is made of wear-resistant material such as graphite. The wheel form is desirably used in the guide **44**, so that as wear develops, the wheel can be indexed to bring a new gathering surface into position for accurate fiber gatherings. This belt, wheel-guide arrangement is considered an advance in the art over the earlier used saturated wool gathering pads which, of course, needed replacement because of the cutting action of the fibers on the wood pad.

After the fibers **10** pick up a coating of size by contact with the wetted belt **28** at the point **32**, they are converged into a strand **46** by the V-periphery of the gathering guide **44**. The strand **46** is then passed downwardly to apparatus forming part of the present invention and wherein an attenuating force is provided, and a complete description of the apparatus of invention and method and product produced will now follow:

THE EMBODIMENT OF FIGURE 3

By reference to FIGURE 3, which represents a first embodiment of the invention, it should be noted that the strand **47** is designated a slow strand and that the strand **50** is designated a fast strand.

Now discussing strand **47** first, it will be noted that this strand proceeds downwardly to an idler roll **48**, which has a braking mechanism attached thereto to be subsequently described with reference to FIGURE 6. The strand **47** half laps the idler roll **48** and thence proceeds vertically upwardly to a wheel puller **52**, rotatably driven in the arrow **54** direction by mechanism such as a suitable electric motor, not shown. As the strand **47** laps the puller **52** to the point **56** it is tangentially thrown from the puller to a filamentizer **58**, here exemplified as a tangential air blower.

Now referring to the fast strand **50**, it will be noted that an adjustable speed idler wheel **60** is half lapped and that the strand then proceeds vertically upwardly to a second wheel puller **62** which it half laps and is tangentially thrown to the air blower **58** from the point **64**.

Now it will be understood that the two strands **47** and **50** are combined at the air blower **58**, and it is at this point that the invention truly reflects itself.

Thus, strand **50** will be understood to be moving faster than the slow strand **47** and will thus be in a slack condition as compared to the slow strand within the air blower **58**. Loop formation thus starts at this point and as the loops are formed, e.g., as the strand is slackened it will be understood that the action of the air of blower **58** tends to separate or filamentize the individual fibers **10** of the faster strand **50**.

Incorporation of the fast and slow strands, the fast strand having been filamentized, is effected by substantially instantaneously at the point of filamentization imparting a twist to the two strands to interlock them and preserve the loop form produced by the fast strand.

For this purpose, the two strands are ballooned downwardly as at **66** to a winding mechanism designated **68**, typically comprising a cap winder **70** operating over a rotating package **72**. Rotating package **72** is suitably carried on a conventional textile yarn twist frame adapted for glass fiber processing, and it is to be understood that as the balloon **66** circumscribes the package **72**, a desired number of twists or turns per inch is imparted to the combination strand **74**. The twist is effective to retain the loop form of the fast strand **50** in the package **72**.

Although the cap winder **70** forms no essential part of the present invention, it will nevertheless be described to provide full clarity of description for the reader. Thus, the cap winder **70** operates in conjunction with a motor **71** having a hollow shaft **71*s*** supporting a collet **71*c*** that carries a winding tube **72*t***. Beneath the motor **71** is located a hydraulic cylinder **69** including a piston rod **69*r***, extending up through the hollow shaft **71*s*** of motor **71**. The piston rod **69*r*** is pointed at the top end to receive cap **70**, having an appropriate internal socket. The cap **70** does not rotate and accordingly the angularity of the bottom edge controls lay of strand on the package **72**. Movement of the piston rod **69*r*** in an up and down manner provides yarn traverse on the package **72**.

This product may be used as is; however, as known in the art, the product will be "wild," and if desired may be plied with another combination strand of like configuration to provide a balanced product.

Regarding the foregoing description, it is to be understood that the fast strand **50** moves at a higher linear speed than the slow strand to provide the loops indicated at **74** for the combined strand. Relative speeds in the range from 1.25 to 2× the speed of the slow strand can be induced into the fast strand to provide variations in loop lengths and bulk of the finished yarn **74**, and these are not to be considered limiting on the invention. However, a ratio in the range of about 2 to 1 has been found to provide a very satisfactory final product.

As mentioned hereinbefore, it is an advantage of the present invention that during forming, all fibers are under constant tension assuring uniform diameters. One might well ask at this point if the strand **47** is pulled at a slower rate than strand **50**, how can all fibers be of the same diameter? This is answered by adjustment of the size of the apertures **24** to produce molten streams commensurate with drawing speeds to have all fiber of uniform diameter if desired. However, a logical extension of the invention would include all apertures **24** of both bushings being of the same size so that all glass streams are of the same size and thus the fibers of the slow strand would be larger in diameter than the fibers of the fast strand. It is evident that some end products would advantageously employ such a combined yarn **74** including such differing diameter fibers in the two strands.

THE EMBODIMENT OF FIGURE 4

Reference to FIGURE 4 will indicate that essentially the same phenomenon or effect as produced in FIGURE 3 can be provided by using two individual bushings **12**; or optionally a single bushing, split as known in the art, to produce slow and fast strands 47 and **50**. It will be noted in this embodiment that the strands **47, 50** are run over two side-by-side idler-tension rolls **76** and thence passed to a stepped single wheel puller designated by the reference numeral **78**, to produce the differential in speed between the strands **47** and **50**. It will be noted that the puller **78** has a section **80** of larger periphery and a section **82** of smaller periphery.

As previously described for the pullers of FIGURE 3, the strands are ejected from the periphery tangentially as at the point **84** and directed to the tangential air blower **58**, so designated because of the same configuration as in FIGURE 3. Subsequent processing is as described in FIGURE 3, comprising ballooning as at **66** with downward movement to winding mechanism **68**, characterized by a textile twisting frame utilizing a cap winder **70** and forming a package **72**. The combined strand **74** with looped and carrier strand in combination is accordingly produced.

THE EMBODIMENT OF FIGURE 5

A logical extension of the concept of the present invention is illustrated in FIGURE 5 wherein packages **86** and **88**, as from a conventional textile forming operation, are utilized as starting materials for processing in accordance with the invention.

Thus, for purposes of description, the strand **90** moving from the package 88 will be designated the slower or carrier strand that is moved downwardly to pull rolls **91, 92** and thence to a guide eye **94**. It will be noted that this is a slight departure from feeding both strands into the tangential air blower as shown in FIGURES 3 and 4; however, the same effect is provided. The slower strand in this embodiment and the foregoing embodiment would be prevented from filamentizing in the air blower **58** because of constant tension. It is the faster strand which is filamentized because of the slack developed therein in its faster running or overrunning compared to the slower strand. ,

Accordingly, the faster strand **96** is moved downwardly to pull rolls **98, 100**, thence to the tangential air blower **58**, previously mentioned. From the air blower **58**, where the faster strand **96** is filamentized, the filamentized strand designated **102** moves to the guide eye **94** for incorporation with the slow strand **90**. Briefly this includes a balloon as at **66** to the twister spindle **68** carrying a ring and traveler **104** as distinguished from the cap winder **70** of FIGURES 3 and 4 to form the combined strand **74** containing filamentized loops.

SUPPORTING ELEMENTAL DETAILS OF THE INVENTION

The idler wheel brake

In the description above regarding FIGURES 3 and 4 it was indicated that the idler wheels **48, 60** and **76** were provided with suitable braking mechanism to prevent overrunning of the strands and malfunction due to looping wheel puller slippage and the like.

Accordingly, one suitable mechanism for providing an adjustable braking effect and thus a constant tension through the medium of idler wheels **48, 60** and **76** is shown in FIGURE 6. This comprises a small centrifugal air blower including a housing **106** within which a vane wheel **108** is rotated on a shaft **110**, common to the shaft of the idler wheel **48, 60** or **76** of FIGURES 3 and 4. It will be noted that the housing **106** is provided with an inlet **112** and an outlet **114** and that in the outlet duct **114** therein is imposed an adjustable valve **116** to control air flow from the unit and thereby impose a variable load on the vane wheel **108**. It will be understood that the larger amount of air pumped or the larger opening of the valve **116** gives a greater load and thus reduces speed, tending to impose a proper restraint upon one of the guide wheels **48, 60, 76** and thereby effectively controls tension with a minimum expenditure for apparatus.

Due to the fluid nature of the air being pumped, it will be found that a certain degree of flexibility or tolerance is actually provided for each setting of the valve **116**.

This element may be characterized broadly as a fluid brake.

THE AIR JET FILAMENTIZER

As shown in FIGURE 7, one suitable filamentizer includes a plurality of gas directing nozzles **118**, attached to the forward end of conduits **120**. It will be noted that jets **122** are directed into colliding relation with one another as indicated by the blast zone **124** where the slack in the fast strand, typically designated **50**, begins to develop and thus, the filaments or fibers **10** are blasted apart as indicated by the reference numeral **124**. The filamentized strand **126** is thereafter directed to a guide eye **94** for combination with a slower, tensioned strand, characterized by the reference numerals **47, 90**. As indicated, from the guide eye **94**, the filamentized strand **126** and the taut strand **47, 90**, proceed to a twister, thereby forming an integrated, coherent product.

THE SLACK ROLL FILAMENTIZER

Referring to FIGURE 8, there is shown an alternate method and apparatus for filamentizing within the scope of invention. Thus, a high speed or fast strand **50** is run between a first pair of slack inducing rolls **128**, in peripheral contact and driven in the arrow **130** direction. These are spaced from from a second pair of slack inducing rolls **132** with the yarn length between the rolls being adjusted to be greater than the length between the axes of the rolls **128** and **132**.

It may be found because of the previous set to the binder applied to the fibers in forming, that an optional gas jet **134** will be necessary to provide optimum filamentizing in the zone designated **136**. In any event, the strand produced is filamentized as indicated at **126**, in a manner analogous to the showing of FIGURE 7. The filamentized strand then moves to a guide eye **94** for combination with a slow strand **47, 90** and thence to a subjacent twister, as exemplified by the arrow **95**.

THE PRODUCT OF INVENTION

The product of the present invention is illustrated more clearly in the enlarged view of FIGURE 9 wherein the tensioned multi-fiber or monofilament carrier strand is designated **47, 90** and the loop strand **50, 96**. Note the exposed end of the carrier strand and the integrity illustrated in the fibers. Note in contrast the filamentized configuration of the individual fibers at the free or exposed bight **138** of the loop **137**, wherein the individual fibers **10** are clearly exposed and separated from one another.

The distinguishable and contrasting prior art product is illustrated in FIGURE 10. Note the tight configuration of the loops indicated by the reference numeral **140**.

PROCESS SUMMATION

The process of invention essentially resides in the following aspects:

(1) Providing a first linearly moving carrier strand;

(2) Providing a second linearly moving multi-fiber loop strand at a rate greater than the rate of 1, to provide loop formation;

(3) Fiberizing the second strand, at some point in its hi tory;

(4) Combining the two strands at the lineal rate of travel of the first or slower strand to provide loops along the length of the carrier; and

(5) At least relatively fixing the configuration of the

loops and their disposition along the length of the carrier strand.

GENERAL COMMENTS AND EXTENDED SCOPE

As regards production of the product of invention in accordance with the forming methods of FIGURES 3 and 4, it will be understood that the size applied at the point **44** will still be wet upon entrance of the slow strand into the tangential air blower or filamentizer **58**. At this point it will of course be understood that at least part of the moisture will be ejected from the fibers and thus impart a set to the solids of the size and binder which remains, and thus tend to give the filamentized fibers a set in the filamentized condition.

This is a definitely unexpected result over the prior art which, as far as the present inventors are knowledgeable, does not even contemplate the filamentizing aspect of the present invention.

Thus, as the size is partially dried, the filamentized fibers stay blasted open. The enhances the woolly characteristic or wool-like feel of the product as distinguished from the prior art analogous materials, which as pointed out above, are of tight-looped configurations.

Processing speeds according to the present invention are substantially flexible, being variable in the range from about 300 feet per minute to as high as 10,000 to 12,000 feet per minute. At these higher speeds, of course, the braking or tensioning effect provided by the blower brake of FIGURE 6 becomes especially valuable in contributing to the efficiency of the processing of the invention.

It should be pointed out that the present invention is distinguishable from the known prior art by the use of a constant tension applied to the individual fibers or filaments during their formation, as contrasted to the prior art where slack is developed to give a crinkled type fiber in the carried yarn, which of course means that such crinkled fibers are of erratic varying diameters and are of generally enlarged diameter. The invention is also distinguishable from a plain looped fiber or boucle yarn on a tensioned carrier in that in the prior art there was no filamentization of the individual fibers of the loop yarn as has been discovered in accordance with the present invention.

It is also to be understood in view of the foregoing that the present invention contemplates processing speeds tremendously in excess of those contemplated in the prior art, typical prior figures as regards production of fibers from regenerated cellulose solutions on the order of 1,000 meters per minute maximum for orifices of diameter 0.075 mm. and 0.10 mm. Actually, the prior art states that it is usually preferable that the linear extrusion rate employed for a given spinning solution using orifices of a given diameter should not greatly exceed the minimum rate at which crinkled filaments are formed under under these conditions, since considerably higher rates not only involve the use of spinning pressures that may be inconveniently high, but may also give a less satisfactory product.

The present invention is also clearly distinguishable from regenerated cellulose made into nubby yarns wherein a pulsating motion is imparted to the viscose filament-forming solution prior to its passage through the spinning cell, or the filaments, after formation, may be drawn at abruptly changing linear speeds. As pointed out before, filament formation is characterized in accordance with the present invention by constant tension being applied to the filaments for attenuation purposes. Thus, no pulsating motion to the forming mass or to the strands or fibers is utilized; contributing substantially to improved processing and higher rates of manufacture.

While the foregoing discussion has related to both strands being of the same material, to-wit, made up of a plurality of continuous glass fibers in side-by-side associated or adhered relationship and oriented in a common axial direction, the broad scope of invention would

include two different types of strands. That is, the carrier strand in the ultimate yarn can be of soluble material that would dissolve or integrate with a matrix material in which the end product is incorporated, as in a plastic laminate or the like. In another sense, the carrier strand can be stated as a thermoplastic material of a lower melting point than the loop strand, and made of the same material forming the body of the matrix impregnated in the woven material. Thus, the carrier strand, for example, could be made up of acrylic fibers and these would dissolve in an impregnating acrylic resin, forming a panel in which the loop yarn is incorporated as a reinforcement.

Also, the carrier strand could be made of a readily fracturable material, such perhaps as silica fibers that would be sufficiently strong to permit weaving, but would break into smaller lengths during a drafting or drawing of the woven product to conform to shapes as in resin molding operations, such as matched metal molding processes. The broken lengths could be of quartz or glass fibers of sufficiently small yarn diameter that the breakage would occur only during the drawing but not during the weaving operation.

Also, while the foregoing invention has related to glass fibers, it is to be understood that heat-softenable materials broadly capable of attenuation or formation into fine fibers are contemplated within the broad scope of invention. The tension aspect is also to be understood to encompass regeneratable materials such as viscose, at constant velocity and subsequent blasting.

The invention would also encompass the processing of staple fiber strands.

The combination of the fast strand with the slow strand at the filamentizing blower or guide ring by the present invention can be described by reference to a single point on the fast strand. Thus, when this point is approaching the slow strand, it is moving at a constant forward lineal velocity. However, when it actually wraps onto the carrier or slow strand, the point of contact as distinguished from a part of the loop, moves forward and stops and the loop points continue to move forming the loop and then another point contact abruptly stops. It might be said in describing this phenomenon that a pulsating motion is imparted to some points on the strand as distinguished from others as the overfed strand is moved into the final bulky yarn; thus at least some points are characterized by abruptly changing linear speeds.

ADVANTAGES OF THE INVENTION

Firstly, it is to be understood that a novel, filamentized, loop yarn is manufactured in accordance with the present invention, thus providing a substantial contribution to the art of manufacture in the utilization of heat-softenable materials, producible as by attenuation from a molten body of the same.

A further advantage of the invention resides in the novel processing contribution to the prior art in the form of application of uniform tension to the fibers during manufacture and the subsequent overrunning of one of the strands so produced with filamentization before or substantially at the point of combination with a slower running, tensioned carrier strand.

The present invention also provides a distinct advantage to the art by the contribution of novel apparatus for producing the novel product. Thus, the use of a fluid brake is contemplated to prevent looping at the idler wheel and, in accordance with the invention, the apparatus provides for the formation of the novel product directly from virgin fiber production. Thus, intermediate handling, labor and processing are omitted, contributing to greater economy of production as contrasted to the prior art methods where a twister prepares loop yarns by feeding one yarn end excessively so that when the "binder" yarn is applied, loops appear at intervals along the length of the "binder" yarn. This presumes of course prior strand formation, the product being characterized in FIGURE 10 of the drawings.

We claim:

1. In a looped yarn,
a carrier strand of generally smooth axial alignment and direction and orientation,
a looped strand having consecutive loops curled around said carrier strand along the length thereof,
and the fibers of said looped strand being filamentized at least in the bight portions of the loops.

2. In a looped yarn made from a carrier strand and a looped strand,
each strand being comprised of a plurality of continuous glass fibers associated in generally parallel, axially aligned array,
said carrier strand being coherent of generally smooth axial alignment,
said looped strand having consecutive loops curled around said carrier strand along the length thereof,
the fibers of said looped strand being at least partially filamentized at least in the free bight portions of the loops,
and said composite yarn having twists along the length thereof, retaining said looped strand in positive association with said carrier strand.

3. In a looped yarn,
a coherent carrier strand comprised of a plurality of fibers of heat-softenable material and associated in generally parallel, axial alignment,
a looped strand having consecutive loops curled around said carrier strand along the length thereof,
said looped strand comprising a plurality of fibers of heat-softenable material,
and the fibers of said looped strand being filamentized at least in the bight portions of the loops.

4. In a looped yarn,
a coherent carrier strand comprising a plurality of fibers of heat-softenable synthetic resin bonded together in generally parallel axial alignment, and said carrier strand being of generally smooth axial alignment and direction and orientation,
a looped strand having consecutive loops curled around said carrier strand along the length of said carrier strand,
said looped strand being comprised of a plurality of continuous siliceous fibers associated in generally parallel axial alignment,
and the fibers of said looped strand being filamentized at least in the bight portions of the loops.

5. In a looped yarn,
a coherent carrier strand comprised of a plurality of siliceous fibers bonded together in generally parallel axial alignment, and said carrier strand being of generally smooth axial alignment and direction and orientation,
a looped strand having consecutive loops curled around said carrier strand along the length thereof,
said looped strand comprising a plurality of non-siliceous fibers associated in generally parallel axial alignment,
the fibers of the looped strand being filamentized at least in the bight portions of the loops,
and said composite yarn having twists along its length retaining the loops in relatively fixed relation along the length of the carrier strand.

6. In a looped yarn,
a coherent carrier strand comprised of a plurality of fibers bonded together in generally parallel axial alignment, and said carrier strand being of generally smooth axial alignment and direction and orientation,

a looped strand forming loops having consecutive loops curled around said carrier strand and extending along the length of said carrier strand,
said looped strand also comprising a plurality of fibers associated in generally parallel axial alignment,
the fibers of said loops being filamentized at least in the bight portions of the loops,
and a dry binder retaining said loops in relatively fixed relation along the length of said carrier strand.

7. In a looped yarn,
a coherent monofilament carrier strand of generally smooth axial alignment and direction and orientation,
a looped strand having consecutive loops curled around said carrier strand and extending along the length of said carrier strand,
said looped strand comprising a plurality of fibers associated in generally parallel axial alignment,
said fibers of said loops being filamentized at least in the bight portions of said loops,
and said looped strand being curled around said carrier strand along the length thereof.

8. In a looped yarn,
a carrier strand of tensioned, generally smooth axial alignment and direction and orientation,
a looped strand having consecutive loops curled around said carrier strand along the length thereof,
the fibers of said looped strand being filamentized at least in the bight portions of the loops,
and a dry binder on said filamentized fibers, holding said filamentized fibers in such condition.

9. In a looped yarn,
a coherent carrier strand comprising a plurality of fibers held together in generally parallel, axial alignment, and said carrier strand being of generally smooth axial alignment and direction and orientation,
a looped strand having loops curled around said carrier strand along the length of said carrier strand,
said looped strand also comprising a plurality of fibers associated in generally parallel, axial alignment,
the fibers of said loops being filamentized at least in the bight portions of the loops,
said loops being in relatively fixed relation along the length of said carrier strand,
and a dry binder holding said filamentized fibers in separated condition.

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