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T. E. ADAMSON

3,466,718

METHODS FOR PRODUCING TEXTURED FABRIC MATERIAL

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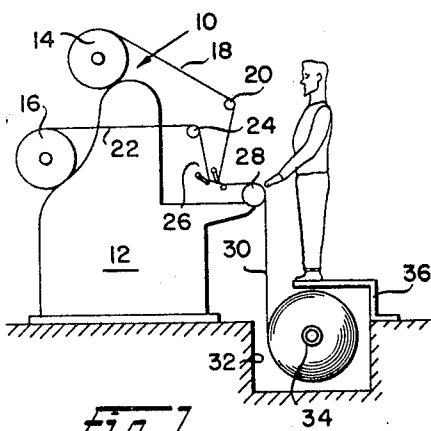


Fig. 1

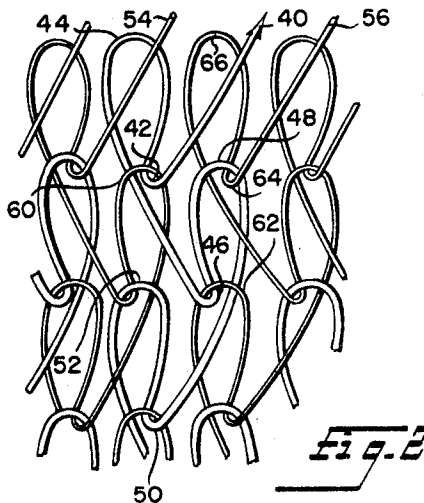


Fig. 2

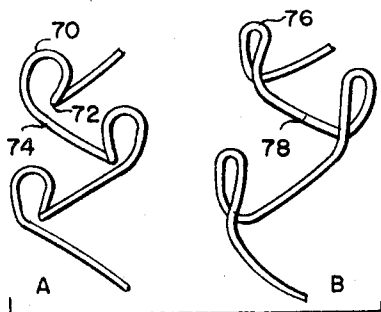


Fig. 3

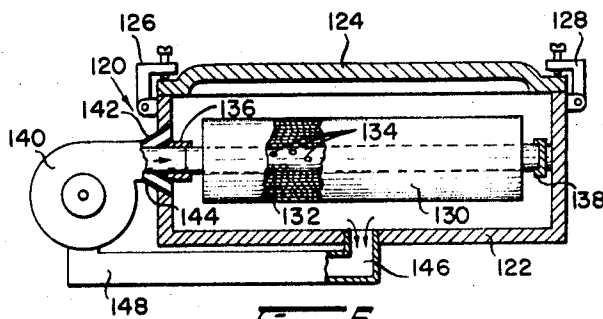


Fig. 6

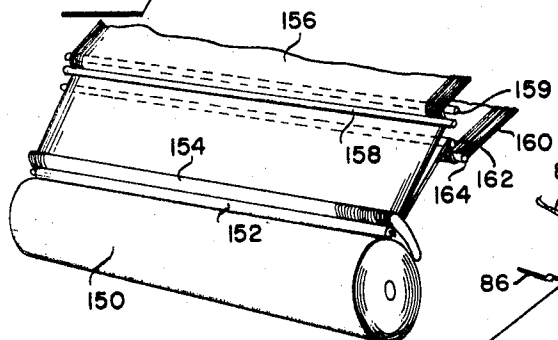


Fig. 4

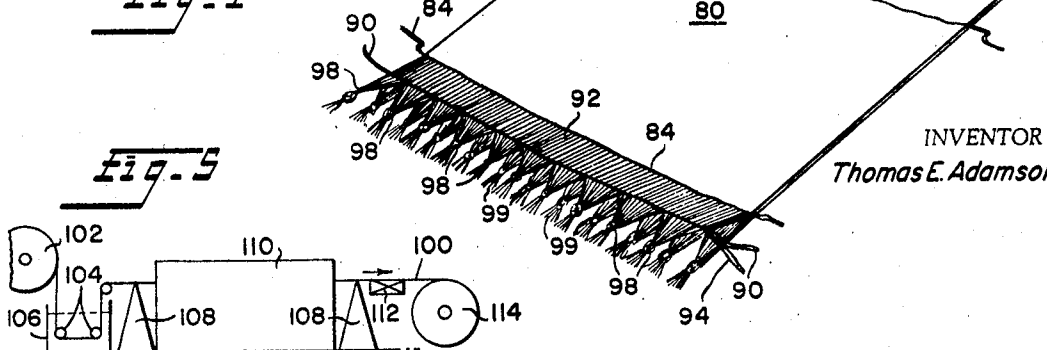


Fig. 5

INVENTOR
Thomas E. Adamson

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3,466,718 METHODS FOR PRODUCING TEXTURED FABRIC MATERIAL

Thomas E. Adamson, 1359 E. 17th St.,
Brooklyn, N.Y. 11230

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11 Claims

ABSTRACT OF THE DISCLOSURE

Multiple textured strands of fragile yarn material, such as acetate, are produced by knitting the plural strands into an open loop fabric web, heat setting the fabric and raveling the plural strands of the web, and then feeding them directly to a textile machine using textured warp strands.

SUMMARY OF INVENTION

This invention relates to a process of texturing yarns, particularly those that are more fragile than yarns currently being used.

A plurality of fragile warp strands are knitted into a web of ravelable warp fabric, preferably an open loop tricot using light yarns such as acetate which are relatively fragile. The knitted warp fabric is wound on a roll, when the process is not to be continuous. When the web of fabric is wound on a roll, weft stitches are placed adjacent the end thereof to permit handling, also a lease thread is placed between the loose front warp threads, and a lease thread between the back warp threads, to keep the threads separated. After knitting the fabric is heated to its thermosetting temperature in an oven or autoclave unit, subsequently cooled and lubricated, and wound on a roll, so that it can be stored if desired. To supply thread to a knitting machine or a textile machine which uses textured warped strands, the roll is mounted adjacent such machine and the web passed through a comb which raveling it to produce front and back warps which are then directly fed to the knitting or textile machine.

BACKGROUND OF THE INVENTION

At the present time there is no acceptable method currently in use for producing textured warps from lightweight yarns. This invention contemplates the use of a knitting, heat treating and raveling technique which can be used on such lightweight yarns and will enable use of these materials in high speed knitting and textile machines where a large quantity of threads must simultaneously be fed to the machines at a controlled and accurate rate.

This method is distinct from the well known knit-deknit process or circular knitting process which is slow and supplied only a few threads, requires additional handling steps which have a tendency to cause streaking in the material being manufactured and is expensive. The new process makes it possible to simultaneously feed many fibers at a much more accurate feed rate than other textured yarn supply arrangements thereby reducing the streaking problem.

OBJECTS OF THE INVENTION

It is a principal object of this invention to make possible a texturing of lightweight, fragile yarns for use in textured fabric, which otherwise could not readily be textured by existing processes.

Another object of this invention is to make possible the supplying of multiple, textured, warp threads for use in fabric making machines.

A further object of this invention is to make possible the manufacture of streak-free fabrics from textured yarn warps.

A still further object of this invention is to manufacture a special type of ravelable warp material for texturing purposes which will easily run to supply multiple textured threads for textile machinery.

A still further object of this invention is to make a ravelable warp material wherein the amount of texture is positively controlled to give a uniformity of texture to the yarn.

Another object of this invention is to use the potential of modern machines, such as tricot knitting machines to make a uniform fabric at high speed for producing uniformly textured warps.

A still further object of this invention is to open new areas for fabric development with novelty textured yarns which could be produced from raveled, novelty warp knit fabrics.

A still further object of the invention is to knit a special ravelable warp knit fabric having a knit pattern wherein all of the warps can be raveled at a constant rate.

A still further object of the invention is to reduce the number of steps between texturing and fabrication of the finished textured material.

A still further object of the invention is to increase the quality of the finished textured fabric by feeding yarns to the textile machine at a more uniform rate, and with less handling than heretofore.

Another object of this invention is to provide a means for storing textured raw material to preclude loss of texture during storage thus assuring better quality textured yarns.

A still further object of this invention is to provide means for facilitating handling and storage of textured warp yarn it is protected to prevent damage.

It is still a further object to provide means for accurate alignment and feed to the textile fabric machine.

Another object of this invention is to provide a means for the raveling of such cloth at a uniform rate, with the individual yarns being subject to only a small raveling tension.

These and other objects of this invention will become apparent from the following description and claims.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a side elevation showing a warp knitting machine wherein the fabric is wound on a collecting roller.

FIGURE 2 is an enlarged view of one type of knit fabric showing the path followed by the warp yarn with the center warp yarn shown enlarged.

FIGURE 3A shows the preferred open loop stitch configuration used for the ravelable warp yarns.

FIGURE 3B shows the usual type of closed loop configuration normally used in warp knit fabrics.

FIGURE 4 shows the end of a roll of ravelable warp material, illustrating the positioning of lease threads.

FIGURE 5 illustrates the processing steps performed upon the ravelable warp material after knitting.

FIGURE 6 shows an autoclave unit which could be used for heat treating of the warp knit ravelable fabric.

FIGURE 7 illustrates the raveling of the ravelable warp knit material after heat treatment to produce textured warp yarns.

DESCRIPTION OF THE INVENTION

Referring to the drawings, FIGURE 1 shows a knitting machine generally indicated at 10 having a base 12 on which reels 14 and 16 each containing a plurality of threads are mounted.

The threads 18 from the upper reel 14 are passed over the thread support member 20, and the threads 22 from lower reel 16 are passed over the support member 24 to the knitting assembly generally indicated at 26.

The ravelable knit material 30 is passed over the support member 28 and downward into the recess 32 below the knitting machine and wound on a roller 34 situated immediately beneath a support member 36 on which the operator may stand.

FIGURE 1 shows the first part of the process, wherein a plurality of yarns are knitted into a ravelable warp fabric. The knitted fabric as shown at 30 may be wound on a roll such as 34, or it may be moved over several rollers and into a heat treating unit. The recess 32 which accommodates the roller 34 can be used as a heat treating compartment for the second step of the process wherein the knitted fabric is heated to give a permanent set to the warp yarns.

The plurality of yarns 18 and 22 which are supplied to the warp knit machine are primarily multifilament thermoplastic textile yarns, such as acetate, nylon, or polypropylene.

Reels 14 and 16 are shown as supplying the yarn, although the raw yarn could also be supplied from a creel stand.

It is essential that an easily ravelable warp fabric be produced. The plurality of warp or longitudinally extending strands are knitted into a fabric which has no cross or weft stitches, so that pulling on the ends of the warp stitches making up the fabric will readily pull it apart.

An example of such a fabric is shown in FIGURE 2, which illustrates a simple tricot warp knit fabric. The central yarn 40 of FIGURE 2 is enlarged for illustration purposes. The yarn is looped back on itself at 42 to form a loop 44, immediately above and to the left of the previous looped back portion 46 which forms the loop 48 on the right side of the path. Prior to the forming of loop 48, the thread had been pinched back at 50 to form loop 52. It will be noted that the loops are first formed to the left and then to the right.

Simultaneously the adjacent yarns 54 and 56 are following identical paths to the left and to the right, respectively, of the yarn 40.

It will be noted that the loops of adjacent yarns extend around and hold the pinched sections of each other. For example, loop 60 of yarn 54 engages the pinched back section 42 of yarn 40 which forms loop 44, while loop 62 of yarn 56 engages the pinched back section 46 of yarn 40 which forms loop 48. Similarly, loop 48 of the yarn 40 holds the pinched back portion 64 of thread 56 which forms the loop 66 of this yarn.

If the adjacent yarns 40 and 56 are pulled simultaneously it can be seen that the loops 44 and 66 would disappear freeing loops 60 and 48 for similar raveling, since the yarn previously extending through these loops at 42 and 64 have been removed.

This type of raveling action is essential to success of the invention. The pattern shown is a simple single bar construction from a tricot knitting machine and is one type of fabric that may be used.

A two guide bar machine in which the machine places two different strands in the same loop, may also be used where a higher density of material is necessary.

The essential element in the fabric is the use of an open loop construction, which is illustrated in A of FIGURE 3. In this instance loop 70 of the yarn is made by bending the section 72 back along the central portion 74 of the yarn. This loop construction is easily raveled.

FIGURE 3B shows the usual tricot loop construction wherein a closed loop 76 is formed by twisting the fabric back over the central portion 78 of the yarn. The drawback to this construction is that it will not ravel without snagging.

The process requires that a warp knit fabric be formed which is easily raveled by pulling uniformly on all of the

adjacent warp strands so that the loops are slipped simultaneously for each lateral row of loops.

This process is primarily intended to provide a means of texturing multi-filament textile yarns of low tensile strength which would be damaged by the normal stresses imposed on yarns in making a textured warp fabric with existing processes. The ravelable warp fabric is preferably done on a fine gauge tricot machine with two guide bars. This machine gives a fine, uniform stitch. The yarn used may be a nylon 15 to 40 denier, or a 55 to 75 or more denier acetate yarn.

Preferably a two guide bar fabric is made to produce the ravelable warp fabric material. But the fabric made is preferably a single guide bar type. This can be made on a two guide bar machine using a double strand and a modified two guide bar mechanism where the guide bars both go in the same direction after interleaving of the needles and the guide bar. The fabric is made by knitting in conjunction rather than in opposition to make a double strand single loop fabric.

It is possible to make a two-bar fabric for this process in which the yarns are knitted in opposition, but in order to make such a fabric which is ravelable it is necessary that the loops each engage the loops of an adjacent yarn only, to permit easy raveling. However, the fabric may also be made wherein the yarn crosses over several adjacent warp yarns. For this type of material to be raveled successfully is necessary that very even simultaneous control of the pull on the warp threads be exercised to prevent snagging.

Preferably, the knitting should be in conjunction rather than opposition with an open loop. The raw yarns should be knit in relation to each other as they will appear in the final fabric, and the total ends in the warp knit fabric should match those required in the final textured fabric to be produced. The runner ratio in knitting the raw yarn in the ravelable warp fabric must be the same as the runner ratio required in forming the textured fabric.

As mentioned previously, the preferred second step is to wind the ravelable warp fabric on a take-up roll directly from the knitting machine. The knit fabric take-up should not load the needles, but should be rolled tight enough to prevent wrinkling of the fabric. It is important that the density be sufficient to preclude curled selvages, since they would interfere with even raveling of the material. The longest possible length of fabric should be placed on the take-up roll to give maximum length textured yarns.

When the maximum amount of material is wound on a roll, and the warps must be cut, special precautions should be taken to separate threads to make provision for raveling of the material after heat treatment. FIGURE 4 shows the end 80 of a roll of ravelable material 82 having three weft stitches 84, 86, and 88. Weft stitch 84 prevents raveling of the fabric during the handling prior to rethreading on a textile machine. When it is removed from the fabric the length of yarn between stitches 84 and 86 will allow enough yarn to be raveled for threading.

Weft stitch 86 is drawn immediately prior to actual operation of the machine. The length of fabric between weft stitches 86 and 88 will allow adjustment and balance of tension on the individual ends of each of the warp yarns, and with normal care the tensions will be balanced before weft stitch 88 is reached. As the weft stitch 88 is approached raveling must be slowed down and stopped to permit removal of weft stitch 88.

Lease thread 90 separates the warp threads 92 of the front warp from each other, while lease thread 94 separates the warp threads of the back warp. These threads are removed after the thread ends are prepared for rethreading in a textile fabricating machine.

The ends of both the front and the back warp thread are tied and knotted as shown at 98 and 99 so that the roll of ravelable warp material may be stored.

FIGURE 5 shows the treatment steps on the warp knit fabric 100 as it is unwound from roll 102 to pass over the tenter frame.

The ravelable warp fabric material 100 is carried by tenter frame 108 and through the oven 110 for drying and heat setting. The fabric should not be stretched on the frame, which is the normal procedure, for this will lock the stitches and make raveling difficult. Care also should be taken to prevent wrinkling of the material, and frame settings should be the minimum necessary to accomplish this.

The fabric travels into the oven where it is heated to the plasticizing temperature of the material. This is sufficient to permit the yarn to take and hold the shape and form of the loops or kinks in the material. The temperature is usually about 350° F., but will depend upon the type of material being used.

After the warp knit material passes out of the oven it will cool, and will then be passed over a yarn lubricant supplying pad 112. This yarn lubricant will make raveling easier in the succeeding steps.

The heat set and lubricated yarn is then wound on take-up roller 100, ready for raveling to supply multiple strands of textured filament yarn to a textile machine. The fabric roll 114 is either used immediately or if desired can be stored to provide textured fabric yarn at some future time.

FIGURE 6 shows a cross-sectional view of an autoclave unit which could be substituted for the oven 110.

The autoclave has a casing 122 which has a top 124 held on by clamps 126 and 128.

The roll of fabric material 130 is wrapped around hollow perforated stainless steel shaft 132 having openings along its length at 134 as shown in the cut away section of the roll of fabric 130. The hollow perforated shaft 132 is supported at each end by support bearings 136 and 138.

Hot fluid from pump 140 is supplied through bearing 136 to the interior of the perforated axle 132, while other fluid is supplied through openings 142 and 144 to the interior of the autoclave unit. The fluid is circulated through the interior of the unit and out through opening 146 and back to pump 140 through duct 148.

FIGURE 7 shows a roll of ravelable warp material which is being raveled to supply textured yarn for a knitting or other textile machine. The fabric is fed under a metal presser roller 152 and through a comb-like reed 154 which separate each of the warp yarn threads of each stitch loop from each other.

Alternate threads are separated into top and bottom warps by means of separating rods. The top warp threads 156 are passed under rod 158 and over rod 159, while the bottom threads 160 are passed over rod 162 and under rod 164.

The top and bottom warps both supply textured fabric yarns for use in a knitting or other textile machine directly from the roll at an easily controlled even rate, thus permitting delicate textured fabric yarns such as those used in lightweight fabrics.

The fabric should be raveled as soon as it leaves the roll to minimize run-backs. The roll is started after placing the end of the fabric through the comb 154 and subsequent to removing the lease strings 90 and 94.

In the manufacturing process, two reels of synthetic multifilament thermoplastic textile yarns are mounted on a knitting machine and the yarns are knitted into an open loop ravelable fabric. The fabric is then wound on a roller for ease of handling, or for storage for future use.

If the material is to be stored several lease threads are stitched between adjacent threads of the material to keep the threads in place, and to assist in subsequent threading of the threads on a knitting machine.

The material on the roll is then heated to the thermo-

plastic temperature so that the individual threads will then have a tendency to assume the shape in which they are held in the yarn. On subsequent cooling a permanent set will be imparted to the threads so that they will have a tendency to retain the shape in which they are held within the fabric.

Two methods may be used in heating the fabric. When the fabric is mounted on the roll, it may be heated in an autoclave unit to the thermoplastic temperature as shown in FIGURE 6.

It is also possible to unwind the fabric from the roll, as shown in FIGURE 5, and pass it over a tenter frame and through a heating oven. It is subsequently cooled and wound on a second roller.

If a continuous process is desired, the knitted ravelable material is fed directly from the knitting machine and over a tenter frame and passed directly to a raveling comb and a textile machine using textured warp yarns.

Prior to heat treatment, as shown in FIGURE 5, the knitted ravelable warp material is passed under rollers 104 to immerse the fabric in a light scouring bath 106 to remove lubricant prior to heat treatment. On emerging from the oven 110, as shown in FIGURE 5 the material is preferably passed over a lubricant supply pad 112. The lubricant is applied to the material to facilitate raveling of the warp yarns.

The cooled fabric with a set or crimp therein, is subsequently raveled to supply a plurality of textured warp yarns for a textile machine.

As shown in FIGURE 7, the warp ravelable fabric 150 is fed through a comb which ravel the fabric into upper and lower sets of warp threads. These threads are fed directly to a textile machine using textured warp yarns.

While the invention has been described in connection with different embodiments thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following in general the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as may be applied to the essential features hereinbefore set forth.

Having thus described my invention, what I claim is:
1. The method of producing textured warp fabric material which comprises:

- (a) feeding a plurality of parallel spaced yarns of fragile thermosetting material at a given uniform rate to a knitting machine;
- (b) knitting said plurality of yarns into a warp knit fabric having a width substantially equal to that of a desired material to be made on the knitting machine;
- (c) heating said warp knit fabric to its thermosetting temperature to induce the separate yarns to assume the knitted loop configuration they hold in the fabric;
- (d) cooling said fabric to impart a permanent set to the yarns in said warp knit fabric;
- (e) raveling said warp knit fabric by exerting an even linear pull on each of said yarns to produce a plurality of spaced substantially parallel textured warp strands having a tendency to retain the knitted configuration in which they had been held in the fabric;
- (f) feeding said plurality of said spaced substantially parallel textured warp strands directly to a textile machine for making a textured fabric, the feed rate of said strands being at a controlled and uniform rate which matches the raveling rate of the warp knit fabric; and
- (g) making textured fabric on said textile machine with said textured warp strands.

2. The method of producing textured warp fabric as set forth in claim 1 wherein:

- (a) said yarn is knit into an open loop tricot fabric.

3. The method of producing textured warp fabric as set forth in claim 1 wherein:
- (a) said yarn is knitted in a double strand open loop warp knit fabric.
4. The method of producing textured warp fabric as set forth in claim 1, wherein:
- (a) the heat treated warp fabric is raveled by passing it directly through a comb-like reed to separate the warp threads into groups of upper and lower warp threads for subsequent feeding to the textile machine.
5. The method of producing textured warp fabric material as set forth in claim 1, wherein:
- (a) said ravelable warp fabric is passed through an autoclave unit which heats said ravelable warp fabric to the thermosetting temperature.
6. The method of producing textured warp fabric material which comprises:
- (a) knitting a plurality of parallel spaced threads of thermosetting material into a ravelable warp knit fabric;
- (b) winding said warp fabric onto a roll under slight tension;
- (c) subsequently unwinding said ravelable warp material from said roll and passing it through a heat treating unit to set the plurality of threads into the pattern in which they are knit in the ravelable warp knit fabric;
- (d) raveling said heat treated warp knit material to produce a plurality of textured warp strands by linearly pulling and directly feeding of the strands into a textile fabricating machine at a controlled uniform rate to produce textured warp fabric material.
7. The method of producing textured material as set forth in claim 6, wherein:
- (a) said plurality of yarns are knitted into an open loop tricot fabric.
8. Method of producing textured warp material as set forth in claim 6, wherein:
- (a) said plurality of yarns are knitted in a double strand, single guide bar tricot pattern.
9. The method of producing a textured warp material in a continuous process which comprises:
- (a) knitting a plurality of parallel spaced textile yarns into a ravelable warp fabric;
- (b) heat treating said fabric after knitting to impart a textured set to the yarns therein;

- (c) raveling said warp fabric after heat treatment by linearly pulling and directly feeding of the strands into a textile fabricating machine at a controlled uniform rate to produce textured warp fabric material.
10. The method of producing a textured warp material in a continuous process as set forth in claim 9, wherein:
- (a) said plurality of warp strands are knitted in an open loop ravelable warp tricot pattern.
11. The method of producing a textured warp material which comprises:
- (a) knitting a plurality of parallel spaced synthetic yarns into a ravelable warp fabric material having a double strand open loop tricot pattern;
- (b) scouring said tricot fabric to remove yarn lubricants;
- (c) heating said ravelable warp fabric to the thermosetting temperature of the material to set said yarns in the configurations they are held in the ravelable warp knit fabric;
- (d) applying yarn lubricant to said heat treated ravelable warp knit fabric to facilitate raveling and re-knitting;
- (e) raveling said warp knit fabric by linearly pulling and directly feeding of the strands into a textile fabricating machine at a controlled uniform rate to produce textured warp fabric material.

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ROBERT R. MACKEY, Primary Examiner

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,466,718

September 16, 1

Thomas E. Adamson

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 14, "fabric and" should read -- fabric, subsequently --; line 26, after "light" insert -- thermoplastic --; same line 26, after "acetate" insert -- or nylon --; line 34, "its thermosetting" should read -- slightly above its setting --; line 57, "supplied" should read -- supplies --. Column 2, lines 6 and 7, "texturing purposes which will easily run to supply multiple" should read -- supplying multiple --; line 37, after "yarn" insert -- whereby --. Column 7, line 16, "thermosetting" should read -- thermoplastic --; line 20, "thermosetting" should read -- thermoplastic --; line 24, beginning with "subsequently" cancel all to and including "pattern" in line 27, and insert -- heating said warp fabric to the thermoplastic temperature of the yarn material to impart a textured set to the threads as a result of the configuration --; line 44, after "spaced" insert -- thermoplastic --; line 46, "heat treating said fabric after" should read -- heating said warp fabric to the thermoplastic temperature of the yarn material after --. Column 8, line 8, cancel "warp"; lines 16 and 17, "the thermosetting" should read -- above the thermoplastic --. Column 6, lines 48 and 54, "thermosetting", each occurrence, should read -- thermoplastic --; line 52, "the knitting" should read -- a textile --.

Signed and sealed this 21st day of July 1970.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patent