United States Patent Office 3,021,588
Patented Feb. 20, 1962

3,021,588

KNITTED TEXTILE PRODUCTS AND METHODS FOR THEIR PREPARATION

Edgar Dare Bolinger, Clemson, S.C., assignor to Deering Milliken Research Corporation, Pendleton, S.C., a corporation of Delaware

No Drawing. Filed Apr. 3, 1958, Ser. No. 726,294
17 Claims. (Cl. 28—76)

This invention relates to methods for the manufacture of knitted textile products and to the textile products produced by such methods. More particularly the invention relates to methods for processing fabrics and articles knitted from elasticized yarns to improve their elasticity and/or bulk, and is a continuation-in-part of application S. N. 512,871, filed June 2, 1955, now abandoned.

There are commercially available any number of so called "elasticized" or "stretch" yarns which are employed in the knitting of stockings, sweaters, blouses, sheets, and other articles of this types and for the knitting of fabrics employed in the manufacture of such articles. In most instances the primary reason for employing an elasticized yarn in the manufacture of such fabrics and articles is to obtain a fabric having a resilient or elastic nature, but in some instances the primary reason for employing an elasticized yarn is to obtain a fabric of increased bulk, and in still other instances both of these characteristics are equally desired. Products having one or both of these characteristics as a result of being fabricated from elasticized yarns have been widely accepted and are presently sold in large volumes.

Ladies stockings are an illustration of the type of article in which a high degree of elasticity is ordinarily quite desirable, and prior to this inventiton it has been customary to employ procedures in the manufacture of hosiery from stretch yarns which are substantially identical to the procedures employed in the manufacture of stockings from ordinary yarns except that in some instances it has been found necessary, due to the liveliness of the particular elasticized yarn being used, to employ special guides or the like during the knitting operation to facilitate yarn handling. In order to obtain stockings having a satisfactory degree of stretch by such procedures it has frequently been found necessary to employ a yarn wherein the fibers are highly convoluted when in a relaxed state since knitting and finishing impart only slight additional elasticity to the yarn and the finished stocking must depend primarily on the elasticity present in the yarn before knitting for its stretch characteristics. The use of yarns the fibers of which are highly convoluted when in a relaxed state is, however, disadvantageous in certain respects since the more highly convoluted the individual fibers of the yarn, the more difficult it becomes to employ the yarn with standard knitting machines.

Sweaters are an example of a type of article in which the bulk of the fabric is generally of more importance than the ability of the fabric to stretch, and in knitting sweaters or fabrics for making the same from elasticized yarns, it is frequently advantageous to subject the yarn to a heat treatment prior to knitting to improve its bulking characteristics even though this might in some instances reduce the elasticity of the yarn. Even with this expedient, however, it has not, prior to this invention, been possible to produce knit fabrics having bulk to weight ratios of magnitudes most desirable for many applications.

It is an object of this invention to provide finishing procedures which permit the use, in the knitting of fabrics having an elastic nature of less lively yarns without loss of elasticity in the knitted product.

It is another object of this invention to provide finishing procedures which make possible knitted fabrics having, in each instance, a greater degree of elasticity and/or a higher bulk to weight ratio than it has heretofore been possible to obtain in a comparable fabric.

According to this invention a fabric or article knitted from a stretch yarn, before heat-setting, is wetted in a cold water bath, and the wetted textile product is thereafter heated to a temperature of at least about 140° F. with continual agitation. The fabric or the knitted article can thereafter be dyed, boarded, or subjected to other conventional processing operations if desired.

While the reason or reasons for the success of the invention are not fully understood, it is believed that the new process gives improved elasticity, as compared to prior art processes, because it more completely favors the positional relaxation, rather than the internal relaxation, of the latent stresses inherently present in the fibers of elasticized yarns. In most instances, latent stresses are created in the fibers of elasticized yarns by the various processes of manufacture, but even if such stresses are not so created or even if they are relaxed before the yarn is pirned, latent stresses are developed by the yarn being wound on a pirn under tension and retained there for a period of time, and an elasticized yarn is conventionally fed to a knitting machine from a pirn or the like on which it has been wound with sufficient tension to at least partially remove the convolutions normally present in the fibers. It will be seen that for the highest degree of elasticity, these latent stresses must be positionally relaxed rather than internally relaxed or "heat set," and the conditions employed according to this invention are believed to be such that the potential ability of these stresses to increase the degree of crimp in the yarn fibers is realized to a near maximum extent.

The increased bulk to weight ratios obtainable by the new process of this invention might most logically be attributed to two causes. In the first place, high bulk and elasticity in a fabric are related to the extent that both are a result, at least in part, of the fibers in the fabric having a crimped configuration so that it might be expected that imparting a higher degree of elasticity might also impart greater bulking ability. A second cause is believed to be that the process of this invention is more favorable, than are prior art processes, to the convolutions in adjacent fibers being formed out of phase. It will be readily apparent to those skilled in the art that it would be possible to have a highly elastic yarn with low bulk if the crimps in adjacent fibers of the yarn were wholly in phase, but when the crimps or convolutions are out of phase, the fibers of the yarn are held apart so that the bulk of the yarn is increased and its apparent density is decreased.

Yarns which can be employed for knitting fabrics or articles suitable for use in this invention include any of the commercially available "elasticized" or "stretch" yarns, and generally comprise synthetic organic fibers, such as nylon, cellulose acetate or other cellulose ester or ether fibers, polyacrylonitrile or other polyacrylic fibers, or polyethyleneterephthalate or other polyester fibers, capable of being heat set or otherwise distorted such that they assume a convoluted linear configuration when in a relaxed state. As a result of the highly curled or convoluted fibers in the yarn, it can be readily elongated to an appreciable degree by applying sufficient tension to result in the curled fibers being partially straightened. Substantially any elasticized yarn can be employed for knitting fabrics suitable for use in the process of this invention, and such yarns can be prepared by any one of several methods such as, for example, the method disclosed in U.S. Patent No. 2,564,245 to Billion, the method disclosed in U.S. Patent No. 2,575,839 to Rainard, or the method disclosed in co-pending U.S. application S.N. 274,358, filed March 1, 1952, and U.S. Patent No. 2,919,-

534, which comprises passing a thermoplastic strand under tension and at an elevated temperature about the sharpened edge of a blade member. If desired, elasticized yarns prepared according to the above methods can be given a preliminary heat treatment before being knit into fabrics and such a treatment has the advantage, in many instances, that it increases the bulking ability of the yarns. When high bulk is desired, such a heat treatment can be readily effected by overfeeding the yarn onto a contact heater or the like and can, in some instances, be combined with a plying operation or other preliminary operation necessary for placing the yarn in a desired condition for knitting.

The yarn used for knitting fabrics or articles for processing according to this invention can be of any desired denier and conventional denier yarns are generally employed. In some instances, it is advantageous to use a yarn of smaller denier than would otherwise be employed since this results in there being more space between yarns in the knitted fabric, and permits the yarn filaments to coil or crimp more freely. In manufacturing articles such as sweaters, where a high degree of bulk is desired, it is generally advantageous to employ yarns composed of a plurality of small denier filaments, as illustrated by 70 denier, 34 filament yarn, but in knitting articles such as ladies hosiery, where the stretch characteristics of the article are of prime importance, one can employ almost any type of continuous filament yarn except that if the yarn is prepared by a torque elasticizing process, a monofilament strand tends to twist upon relaxation, and one should employ a two-ply strand having filaments which tend to twist in opposite directions. If one desires to knit fabrics for use in the process of this invention from unplied monofilaments, non-torque elasticized monofilament yarns should be employed.

The actual knitting of fabrics or articles to be processed according to this invention can be conventional except that if one is employing a yarn with excessive liveliness, special techniques might be necessary for the yarn to be handled by knitting the machine. In the case of articles of wearing apparel or the like, the article should be deliberately knit to a minimum size which is at least as large as the largest size for which it is ultimately intended and it is generally advantageous to knit the article 5% to 10% or more larger than the minimum size. Another advantageous expedient is to knit with a looser stitch than would conventionally be employed since this provides additional space for the yarn to coil or kink and thereby increases the elasticity of the resulting product.

As a first operation involving heat after knitting, the fabrics or knit articles are, according to the preferred procedure of this invention, subjected to an agitated bath treatment and this operation must be properly conducted if the knitted fabrics or articles are to have the most desirable properties. The knitted fabrics or articles should be entered into the bath before heating of the bath is initiated and for best results the bath should be at a temperature of no more than about 100° F. and preferably no more than about 80° F. when the knitted goods are placed therein. The temperature of the bath should thereafter be raised very gradually, but heating of the bath need not be initiated immediately, and in fact, better results are generally obtained when the bath is allowed to remain in an unheated condition for 15 to 30 minutes after the goods are entered therein than are obtained when heating of the bath is commenced immediately. Particularly during the initial stages of heating, the rate of temperature increase should be very slow and as a general rule the rate of increase should be no more than about 2 to 5 degrees per minute and preferably no more than about 1 to 3 degrees per minute until the bath is at a temperature of about 120° F. After the temperature of the bath has reached this point, the rate of heating can be increased and the temperature of the bath can be raised 5 to 10 degrees per minute until the desired ultimate temperature is reached, although best results are obtained if the maximum rate of temperature increase, even in the last stages of the heating operation, is no more than about 4 to 6 degrees per minute. As a general rule, the slower the temperature rise the better are the results that one obtains. The end temperature of the bath should be at least about 140° F., and as a general rule better results are obtained if the bath is heated to a minimum end temperature of 160° to 180° F. If desired, the bath can be heated to the boiling point or even placed under pressure and heated to temperature of 300° F. or higher since once the elasticity and bulk have been developed in a knitted fabric, they are not adversely affected by higher temperatures if the fabric is in a substantially untensioned condition. As a general rule, however, there is no advantage in employing end temperatures above the boiling point of the bath. Heating of the bath can be achieved by any suitable means such as by a steam jacket or the like or by means of steam jets or submerged heated coils.

Agitation of the bath should be initiated at least concurrently with heating and is preferably started at least about 15 to 30 minutes before the temperature of the bath is raised from its starting value. The agitation should be continued throughout the time that the bath is heated and is preferably continued for at least about 5 minutes after the bath has reached its ultimate temperature. In all instances, the agitation of the bath should be as vigorous as possible without injury to the knitted fabric or articles therein since, within limits, the greater the agitation, the greater the bulk and elasticity of the knitted fabric. The agitation can be effected by any suitable means and one may utilize such expedients as steam jets, sonic or supersonic sound waves, agitator paddles or the like. Generally a wash wheel type machine of either the horizontal or vertical type is satisfactory and for small articles such as hose, a conventional hosiery dye machine can be employed if the speed of rotation conventionally employed is doubled, for example, increased to 12 r.p.m. for a 25 pound machine. If one is processing knitted articles which are delicate in nature, placing a number of the articles loosely in a water permeable bag or the like during the period of agitation will avoid the possibility of snagging and stretching, and is generally an advantageous expedient. When employing this procedure with stockings, best results are obtained if there are no more than about 50 and preferably no more than 15 pairs to a single bag and in the case of sweaters, there should be no more than about 20 and preferably no more than about 10 to each bag.

It is an advantage of the invention that the agitated bath treatment can also serve as a scouring operation, if a surface active agent is added to the bath, and the scouring operation conventionally performed before dyeing can be eliminated. By this expedient, the total number of finishing steps remains the same as in prior art procedures. Any surface active agent or scouring composition containing builders or the like conventionally employed for the particular type of knitted fabric being processed is satisfactory and the selection of a particular agent is largely a matter of choice.

Following the agitated bath, and rinsing with clear water if a surface active agent has been employed, there are two alternatives that can be employed with ladies hosiery. A first procedure comprises retaining the stockings in the apparatus employed for the agitated bath and dyeing the same by conventional techniques. After removing excess moisture, for example by centrifugal extraction, the dyed stockings are removed and placed on a boarding form and heated for at least about 1 to to 2 minutes at a temperature of from about 200° F. to 300° F. and preferably of from about 220° F. to 260° F. The knitted articles are then removed from the boarding form and are packaged ready for use. An alternative procedure comprises removing the stockings from the apparatus in which they are given the agitated

bath, preboarding the stockings for at least about 1 to 2 minutes at a temperature of from about 200° F. to 300° F. and preferably from about 240° F. to 270° F., removing the stockings from the boarding form, dyeing and thereafter final boarding and packaging for use. In this procedure, the final boarding step is conducted in the same manner as the preboarding operation, except that the temperature employed is preferably from about 210° F. to 240° F.

In either procedure, as outlined above, all boarding operations should be conducted with a form at least as small as the smallest size for intended use, and since the heat of the boarding operation causes some shrinkage of the stockings, it is even possible to use a form size so small that the knitted article is slightly wrinkled before heat is applied. It is also important to use as narrow a form as is possible to result in the stockings having adequate widthwise stretch as well as lengthwise elasticity. Heating of the stockings during the boarding operation can be conducted by conventional means, for example, by placing them, while on the boarding form, in a steam chamber or the like.

For sweaters and the like the finishing procedure following the agitated bath treatment of this invention can be conventional. In the case of full fashion sweaters, the preferred procedure comprises simply pressing the sweater to size on a steam table or the like and thereafter dyeing the same. In the case of transfer sweater fabrics or the like, the tubular fabric is preferably given a light preliminary steaming and then cut and sewn. The sewn sweater is then given a final steaming to size and dyed.

Dyeing of fabrics or knitted articles processed according to this invention can be conducted by any conventional technique known to be suitable for the particular yarn from which the articles are made since the process of this invention does not materially affect the dyeing properties of the elasticized yarns being employed. If desired, resin finishes can be applied in a conventional manner and in the case of women's hosiery are generally helpful to reduce the tendency of the hose to snag or to pick. In the case of sweaters, it is usually advantageous to apply an antistatic agent and a softener and these can also be applied in a conventional manner.

The invention will now be illustrated by the following specific examples:

Example I

A full fashioned hosiery machine is employed to knit ladies hosiery from nylon yarns prepared according to the process of U.S. application S.N. 274,358, filed March 1, 1952, employing a 15 denier monofilament yarn in the boot, 30 denier 10 filament yarn in the welt and 30 denier 10 filament yarn in the splice. The hose are removed from the knitting machine and placed in loosely knit cotton bags, 20 pairs to the bag. The bags of hosiery are then entered into a 25 pound hosiery dye machine geared to rotate at twice its usual speed or in other words geared to rotate at 12 revolutions per minute. Cold water at a temperature of 90° F. is entered into the machine, 0.1 pound of a sodium soap (Lux Flakes) are added and the machine is placed in operation. After 20 minutes, the temperature of the bath is gradually raised approximately 2° F. per minute until the bath is at the temperature of 120° F. and thereafter the temperature of the bath is raised approximately 4° F. per minute until the bath is at a temperature of 180° F. Agitation is continued for an additional 5 minutes at 180° F. at the end of which time the bath is dropped and the hosiery thoroughly rinsed in clear water. Without removing the hosiery from the dye machine, a dye bath is entered and the hose dyed in a conventional manner. After dyeing, the hose are thoroughly extracted, removed from the bath and boarded through a normal cycle of 1½ minutes at 250° F. The hosiery prepared in this manner have a very attractive dull satin like appearance and a degree of elasticity which permits them to be readily stretched through 3 or 4 size ranges. In wear tests it is found that the hose outwear conventional stockings by a considerable margin.

Example II

On a single feed circular knit machine there are knit a plurality of pairs of women's hosiery utilizing nylon yarn prepared by the method of co-pending U.S. application S.N. 274,358 and employing 20 denier 7 filament in the boot and 40 denier 13 filament in the welt, heel and toe. The hose are removed from the machine, placed in loose knit cotton bags with 15 pairs of hose to each bag and entered into a 25 pound hosiery dye machine geared for 12 revolutions per minute. Cold water at a temperature of 70° F. is entered into the machine and 0.1 pound of a sodium soap (Lux Flakes) is added for good detergency. The machine is placed in operation and after approximately 20 minutes the temperature of the bath is raised at the rate of 4 degrees per minute to a temperature of 120° F. and thereafter at a rate of 6° F. per minute until the bath is at the boil. The hose are then rinsed, excess moisture removed by extraction and the hose removed from the cotton bags and placed on boarding forms. The hose are passed through a preboarding cycle of one minute at 270° and thereafter removed and dyed in a conventional manner. The dyed hose are then final boarded through a cycle of 1½ minutes at 220° F. The finished hose display a very dull satin like appearance when off the leg and a very sheer even appearance when worn. In fact, the sheerness of the hose when worn compares favorably with that of 15 denier monofilament nylon hose made from conventional yarn. The hose display a good measure of elasticity and 3 or 4 sizes are adequate to cover the entire range.

Example III

A full fashioned knitting machine is employed to knit a plurality of pairs of ladies hosiery from nylon yarn, prepared according to the method of U.S. Patent No. 2,564,245, employing 20 denier 2 ply yarn in the boot and the same 2 ply yarn for the welt and splice. The knitted stockings are then removed from the machine, placed in cotton bags and finished according to the procedure of Example II. The finished hosiery display a noticeably greater degree of elasticity than hosiery made from the same yarns and finished in a conventional manner without the agitated bath as described above.

Example IV

On a 24 feed, 12 cut, interlock Wildman Jaquard TAI knitting machine there are knit in tubular form, two interlock sweater bodies from elasticized yarn prepared generally according to the procedure of U.S. application S.N. 274,358 except that it was, following the edge crimping operation and before being collected, overfed 22% to a heating zone maintained at 363° F. The two sweater bodies are then separated, labeled A and B, and placed in separate open-mesh, water-permeable bags.

Sweater A is placed in a Najort wheel type washer containing water at a temperature of about 80° F. and run for 30 minutes. At the end of this time a detergent composition (Orvus High Temp Granules) is added in an amount sufficient to produce noticeable suds, and the temperature of the bath is raised to 120° F. in 15 minutes with the machine in continuous operation. The temperature of the bath is then raised from 120° F. to 180° F. in ten minutes and operation of the machine is continued for an additional 5 minutes with the temperature of the bath held constant at 180° F. The sweater body is then rinsed in cold water for five minutes and tumble dried at 140° F. for 30 minutes.

Sweater body B is placed in a Najort washer containing water at 180° F. and sufficient detergent to result in noticeable foam, and is run for 30 minutes with the

temperature held constant. The sweater body is then rinsed in cold water for five minutes and tumble dried at 140° F. for 30 minutes. The procedure employed with sweater body B is conventional and is for comparison purposes only.

Following drying, each of the sweater body samples are sectioned for testing purposes. Sweater body A was found to have a single layer thickness of 66.8 mils, a double layer thickness of 131.0 mils (Standard A.S.T.M. thickness test except using a 2 inch diameter foot), and was found to weigh 5.43 ounces per square yard. Sweater body B was found to have a single layer thickness of 60.1 mils, a double layer thickness of 118.8 mils and to weigh 5.24 ounces per square yard. The weight of a sweater fabric of this type per square yard is not exceedingly important although the fabric should weigh between 5 and 7 ounces per square yard, for the reason that fabrics within this weight range have the most universal appeal, and fabrics having a weight outside this range are generally considered unsatisfactory for ladies sweaters. Of course, other factors being equal, a light weight fabric is also preferred for the reason that the cost of manufacture is slightly less. The thickness of the fabric, however, is of great importance and as a general rule a sweater fabric of this type having a double layer thickness of less than 125 mils, as determined by the above test, is considered to be unsatisfactory. It will be seen, therefore, that the process of this invention results in a highly desirable sweater fabric in instances where prior art procedures result in fabrics which are completely unsatisfactory for the purpose intended.

Example V

On a 24 feed, 12 cut, interlock Wildman Jaquard TAI knitting machine there are knit in tubular form, a plurality of interlock sweaters using a yarn composed of two plys of 70/34 type 200 nylon elasticized generally according to the disclosure of U.S. Patent No. 2,575,839. A length of tubular knit fabric composed of five sweater blanks is placed in a water-permeable, open-mesh bag and the bag is then placed in a wheel type washer containing water at a temperature of approximately 80° F. The machine is operated for 30 minutes, and a detergent (Orvus High Temp Granules) is then added, to result in noticeable foam. The machine is then run for an additional 30 minutes with the temperature of the bath at approximately 80° F. With the machine in constant operation, the temperature of the bath is thereafter raised at a rate of 2 to 3 degrees per minute to 120° F., and then at a rate of 4 to 6 degrees per minute to 180° F. Operation of the machine is continued with the temperature of the bath at 180° F. for five minutes and the knit sweater blanks are then removed and scoured in cold water for five minutes. The sweater blanks are then tumble dried at 140° F. for 30 minutes and one of the blanks is sectioned for testing. The knitted fabric of this blank is found to have a double layer thickness of 136.0 mils by the test employed in Example IV and to weigh 6.13 ounces per square yard. The remaining sweater blanks are given a light steaming, cut and sewn, steamed to shape, and thereafter dyed in a conventional manner. These sweaters are found to have an excellent hand and appearance and to provide excellent cover as would be expected from the tests on thickness and weight.

Example VI

Example V is repeated except that the yarn employed is a 2 ply 70/34 type 200 nylon processed generally according to the disclosure of U.S. Patent No. 2,564,245 with the exception that it is overfed 8% into a heaing zone maintained at 190° F. during the plying operation. A typical sweater fabric according to this procedure is found to have a double layer thickness of 136.1 mils, and to weigh 6.58 ounces per square yard, and as would be indicated from these figures, sweaters of this fabric have an excellent hand and appearance, and provide excellent cover.

Having thus described my invention what I desire to claim and secure by Letters Patent is:

1. A method for finishing textile products knitted from elasticized non-torque yarns containing heat settable internal latent stresses in the fibers which cause the yarn to assume a convoluted linear configuration when heated in a relaxed state which comprises wetting said textile products in an aqueous bath having a temperature of not more than about 100° F. and thereafter heating the wetted textile products to a minimum temperature of about 140° F. while continually agitating the same.

2. A method according to claim 1 wherein said textile products are formed from yarn which has been elasticized by a procedure which comprises passing the yarn under tension and at an elevated temperature about the sharpened edge of a blade member.

3. A method according to claim 1 wherein said knitted textile products are sweaters and the wetted sweaters are heated to a terminal temperature of at least about 180° F.

4. A method for finishing nylon knitted products formed from elasticized non-torque yarns containing heat settable internal latent stresses in the fibers which cause the yarn to assume a convoluted latent configuration when heated in a relaxed state which comprises placing said knitted products in an aqueous bath having a temperature of not more than about 100° F., and thereafter gradually raising the temperature of the bath to a minimum of about 140° F. while continually agitating the same.

5. A method according to claim 4 wherein said knitted products are placed in open-mesh flexible containers to prevent injury thereto during the time that they are in the agitated bath.

6. A method for finishing knitted textile products formed from elasticized non-torque yarns containing heat settable internal latent stresses in the fibers which cause the yarn to assume a convoluted linear configuration when heated in a relaxed state which method comprises placing said knitted textile products in an aqueous bath having a temperature of not more than about 100° F., raising the temperature of the bath at a rate of not more than 5° per minute until the temperature of the bath is at least 120° F. and thereafter raising the temperature of the bath at a rate of not more than 10° F. per minute until the temperature of the bath is at least 140° F., and agitating the bath continually during the time that the temperature thereof is being elevated.

7. A method according to claim 6 wherein said bath is agitated at least 15 minutes before the temperature thereof is raised from its initial value.

8. A method according to claim 6 wherein said knitted textile products are nylon hose and said hose while in said bath are retained in open-mesh flexible containers with not more than 50 pairs of hose in each container.

9. A method according to claim 6 wherein said knitted textile products are nylon sweaters and said sweaters while in said bath are retained in open-mesh flexible containers with not more than 20 sweaters in each container.

10. A method according to claim 6 wherein a detergent is added to said bath to effect scouring of said textile products.

11. A method according to claim 10 wherein said detergent is sodium soap.

12. A method for finishing nylon hose knitted from elasticized non-torque yarns containing heat settable internal latent stresses in the fibers which cause the yarn to assume a convoluted linear configuration when heated in a relaxed state which method comprises placing the hose in flexible open-mesh containers with not more than 50 pairs of hose per container and entering the same into an aqueous bath having a temperature of not more than about 100° F., raising the temperature of the bath at a rate of not more than 5° per minute until the bath is at a temperature of at least 120° F. and thereafter raising the

temperature of the bath at a rate of not more than 10° F. per minute until the bath is at a temperature of at least 140° F., said bath being agitated continuously during the time the temperature thereof is being elevated and for at least 15 minutes prior to the time that the temperature of the bath is raised from its initial value, extracting excess moisture from said hose, placing said hose on a boarding form and passing said hose while on said forms through a boarding cycle of at least one minute at a temperature of from about 200° F. to 300° F.

13. A method for finishing nylon hose knitted from elasticized non-torque yarns containing heat settable internal latent stresses in the fibers which cause the yarn to assume a convoluted linear configuration when heated in a relaxed state which method comprises placing the hose in flexible open-mesh containers with not more than 50 pairs of hose per container and entering the same into an aqueous bath having a temperature of not more than about 100° F., raising the temperature of the bath at a rate of not more than about 3° F. per minute until the bath is at a temperature of at least 120° F. and thereafter raising the temperature of the bath at a rate of not more than about 6° F. per minute until the bath is at a temperature of at least 140° F., said bath being agitated continuously during the time the temperature thereof is being elevated and for at least 15 minutes prior to the time that the temperature of the bath is raised from its initial value, extracting excess moisture from said hose, placing said hose on a boarding form at least as small as the smallest size for which the hose are intended, passing said hose while on said form through a boarding cycle of at least one minute at a temperature of from about 240° F. to 270° F., dyeing said hose and final boarding said hose on a form at least as small as the smallest size for which the hose are intended utilizing a cycle of at least one minute at a temperature of from about 210° F. to 240° F.

14. A method for finishing nylon hose knitted from elasticized non-torque yarns containing heat settable internal latent stresses in the fibers which cause the yarn to assume a convoluted linear configuration when heated in a relaxed state which method comprises placing the hose in flexible open-mesh containers with not more than 50 pairs of hose per container and entering the same into an aqueous bath having a temperature of not more than about 100° F., raising the temperature of the bath at a rate of not more than about 3° per minute until the bath is at a temperature of at least about 120° F. and thereafter raising the temperature of the bath at a rate of not more than about 6° F. per minute until the bath is at a temperature of at least 140° F., said bath being agitated continuously during the time the temperature thereof is being elevated and for at least 15 minutes prior to the time that the temperature of the bath is raised from its initial value, dyeing said hose, and boarding said hose on a form at least as small as the smallest size for which the hose are intended utilizing a cycle of at least one minute at a temperature of from about 220° F. to 260° F.

15. Elastic knit textile products finished according to the method of claim 1.

16. A method for finishing nylon textile products knitted from elasticized non-torque yarns containing heat settable internal latent stresses in the fibers which cause the yarn to assume a convoluted linear configuration when heated in a relaxed state which method comprises placing said textile products in an aqueous bath having a temperature of not more than about 80° F., agitating the bath for at least about 15 minutes, thereafter raising the temperature of the bath at a rate of not more than about 3° per minute until the temperature of the bath is at least 120° F., and thereafter at a rate of not more than about 5° per minute until the temperature of the bath is at least about 140° F., and agitating said bath continually during the time that the temperature thereof is being elevated.

17. A process according to claim 13 wherein said textile products are formed from yarn which has been elasticized by a procedure which comprises passing the yarn under tension and at an elevated temperature about the sharpened edge of a blade member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,185,627	Croft	Jan. 2, 1940
2,685,120	Brant	Aug. 3, 1954
2,711,627	Leath et al.	June 28, 1955
2,907,094	Murray	Oct. 6, 1959