Feb. 9, 1954 R. K. LAROS 2,668,564

WOVEN TEXTILE ITEM AND FILAMENT YARN

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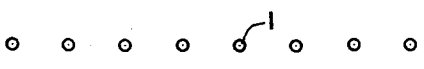

FIG-1

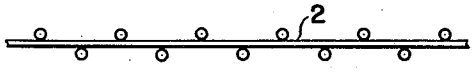

FIG-2

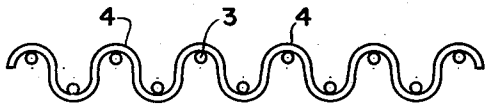

FIG-3

FIG-4

FIG-5

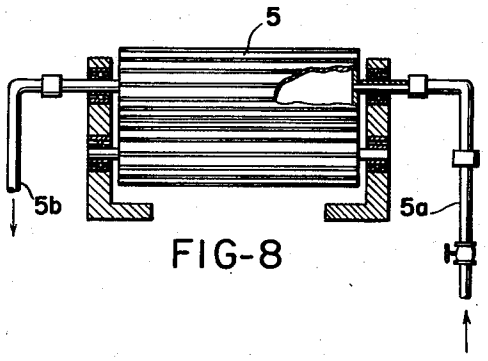

FIG-8

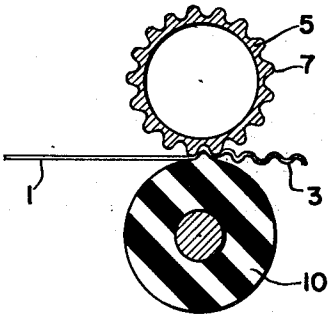

FIG-7

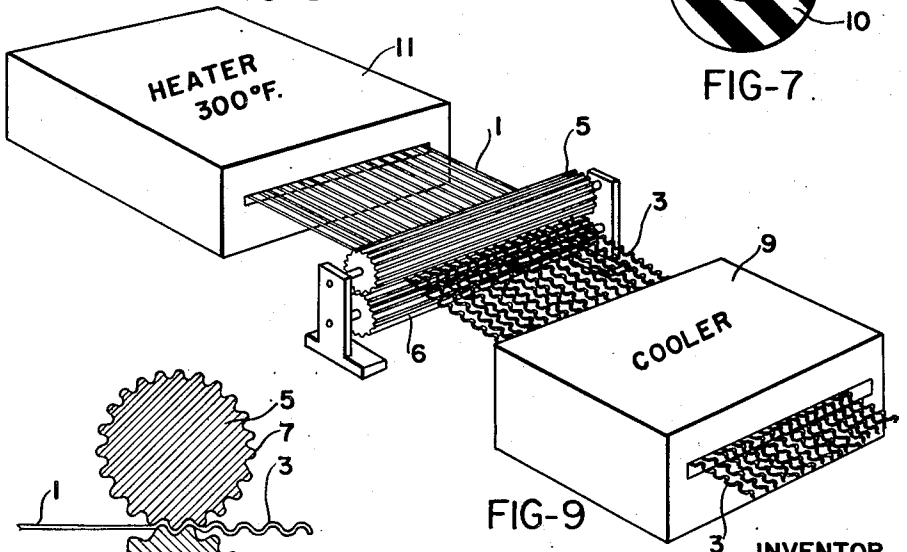

FIG-9

FIG-6

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WOVEN TEXTILE ITEM AND FILAMENT YARN

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12 Claims. (Cl. 139—420)

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This invention relates to yarn for use in the manufacture of dull, full fashioned hosiery.

It is an object of this invention to provide a yarn filament which, when knitted into a stocking or other textile item, will minimize the light-reflecting qualities of nylon or other yarns comprising similar synthetic fibers without depending upon the use of any chemical treatment and without necessitating any change in the textile machinery producing the textile item.

It is the object of this invention to provide nylon or other similar thermoplastic synthetic yarn in a permanent regularly formed sinuous body. In particular, it is desired to form a monofilament thermoplastic yarn with regular repetitive sinuous bends. This is particularly advantageous with nylon which is a monofilament thermoplastic yarn. Its smooth surface reflects light.

It is also an object of this invention to so form regular sinuous bends that this monofilament instead of reflecting all of the light which strikes it will refract the light at the bends.

Particularly in the hosiery industry, it is important to reduce the gloss or sheen in hosiery. There has been no success attending the efforts to reduce light-reflecting qualities of yarn. Such efforts as twisting the monofilament did little or nothing to reduce the gloss.

The excessive gloss or sheen of nylon is objectionable in stockings because it gives the appearance to a woman's limb of greater size and also detracts from the general appearance of her garments. Likewise, such yarn of nylon when woven into garments of various types is objectionable for the same reason.

For the purpose of description, and acting as my own lexicographer, I name the subject of this invention, that is yarn formed with regular sinuous bends, as "crinkle." I prefer with such yarn as many as 100 "crinkles" to the inch. The finished result shows an almost total absence of the customary gloss associated with nylon yarn.

It is a further object of the invention to provide a markedly increased resistance in the stocking to snagging, that is, it makes it much more snag-resistant. This increased strength is also an advantage in other garments made of nylon yarn.

A further object of this invention is to provide this yarn for use in seamless as well as in full-fashioned hosiery and in all knitted and woven fabrics.

As nylon is a thermoplastic yarn, it is capable of being deformed within this sinuous body as

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hereinafter described and of retaining that body or shape permanently. It is necessary to deform it at a temperature within the capabilities of nylon at less than the so-called "boarding" temperature necessarily used in the manufacture of stockings and the like.

Drawings of Figures 1, 2, 3 and 4 refer to this phenomena in conventional woven goods.

Referring to the drawings:

Figure 1 shows in section a conventional warp of nylon filament yarn;

Figure 2 shows a conventional warp during the weaving operation as the filling yarn is inserted;

Figure 3 is a similar view to Figure 2, showing the formation that the filling yarn takes immediately after the weaving operation and after the sheds change;

Figure 4 shows the same section after the filling yarn has been preset and permanently formed by a heat setting operation;

Figure 5 shows the appearance of the same yarn after it has been removed from the cloth. You will note that it has permanent crinkles in the yarn;

Figure 6 shows in section one method of treating the yarn to impart to it the permanent "crinkles";

Figure 7 is an alternative method of imparting the crinkle;

Figure 8 is another alternative method of imparting this deformation to the yarn by use of a heated roll. A heated fluid is introduced into the interior of the roll through the pipe 5*a* and escapes through pipe 5*b*;

Figure 9 is a perspective of a typical mechanism for heating, deforming and cooling the deformed filament yarn. The yarn is passed through the heating chamber 11 maintained at the desired temperature by any suitable means (not shown) and after leaving the deforming rolls 5 and 6 passes through chamber 9 maintained at reduced temperature by any suitable means (not shown) to cool the yarn and set the bends therein.

Referring to Figures 1 and 2 which show the conventional straight nylon yarn as woven into fabric, numeral 1 indicates the warp and 2 indicates the woof.

Figures 3 and 4 show how the crinkles are put in the yarn in one method of manufacture, as indicated by the numerals 3 and 4.

It has been found that it is preferable, although not essential, to form these sinuous bends approximately 100 to the inch. Thus, these permanent crinkles formed in the yarn prior to

knitting at an elevated temperature, above room temperature but below the so-called hosiery preboarding temperature, permit the yarn, to be so formed with its sinuous curves and still be subject to the pre-boarding heat in the process of manufacture of the stocking.

To this end the following is a typical process of producing the "crinkle" formation with the sinuous curves.

The monofilament nylon yarn can be fed in parallel strands between male and female rolls having transverse ridges and depressions and configurations of sinuous curves to be imparted to the nylon yarn. This operation has been carried out at a temperature of approximately 300° F. The yarn can be heated sufficiently in advance of its deformation to make that step one that is easily and accurately performed. Alternatively, such deformation may take place between a steel or some other hard surfaced material and a similar roll made of a softer material such as rubber.

Referring to the drawings, the nylon filaments in their straight condition are designated 1 or 2. They pass between rolls 5 and 6 which have matching ribs 7 and depressions 8. The rolls may be heated so that at the time of formation the crinkles are deformed and permanently heat set. Immediately upon cooling, the yarn is ready for knitting or weaving.

Other methods may be used to heat the yarn as it approaches the rolls.

It will be observed that it is also possible, as shown in Figure 7 to utilize a steel roll or one made of bronze or some other similar suitable material and a yielding roll 10, preferably one made of rubber or some suitable substitute. It is to be understood that it is preferred that the yarn be formed into a series of sinuosities of equal spacing, equal depth and equal curvature but this is not absolutely essential. It is possible to form these bends with a relatively sharp angle at the base of the bend or there may be other modifications that will be feasible.

It has been found that this mechanical distorting of the yarn with as many as 100 "crinkles" to the inch produces a stocking, for instance, that can be produced in the conventional manner and which furnishes a completed article that refracts the light and does not reflect it. It has a beautiful, soft appearance with the complete elimination of the shiny, artificial, metallic appearance of nylon yarn which is so highly light-reflecting and so objectionable in stockings and other garments.

Another result is the snag-resistance of stockings and other garments made from yarn of this type. The same tension in knitting is applied. The resulting product is one that has much longer life, is much less likely to be injured and "run," and provides an appearance that is consistent with the clothes of the female wearer. The light diffusion resulting from this type of yarn presents a product that has many merchandising advantages and an unusual appearance in the finished stocking which suggests the desired dullness to the consumer when the stocking is displayed on the retail counter or the limb of the wearer.

My copending application of even date herewith, Serial No. 254,779, entitled "Method of Manufacturing Filaments," and my copending application of even date herewith, Serial No. 254,780, entitled "Stocking," cover the method of manufacture and the resulting product described herein.

It will be understood that it is desired to include within this invention materials other than nylon, that is, any thermoplastic or thermosetting synthetic or natural fiber that can have applied to it the sinuosities known as "crinkles" and it is desired to include such variations in temperature, methods of formation and articles from which the material is woven as may properly fall within the scope of the appended claims.

It is understood that yarns of any denier can be employed and that this invention is not limited to monofilament or multifilament yarn.

It is understood that there is comprehended within the invention and the following claims the use of synthetics, glass, as well as vegetable and animal textile materials.

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

1. As a new article of manufacture, a normally high gloss continuous filament yarn formed from a thermoplastic fiber-forming material, said yarn having a large number, of the order of approximately one hundred per inch, of permanent, regularly spaced sinuous bends of substantially equal depth and being characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein.

2. A new article of manufacture in accordance with claim 1 characterized in that the normally high gloss yarn is formed from a synthetic, thermoplastic fiber-forming material.

3. As a new article of manufacture, a normally high gloss continuous filament nylon yarn having a large number, of the order of approximately one hundred per inch, of permanent, regularly spaced sinuous bends of substantially equal depth and characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein.

4. As a new article of manufacture, a woven textile item at least one of the warp and woof of which is formed of normally high gloss yarns of a thermoplastic fiber-forming material having a large number, of the order of approximately one hundred per inch, of preformed, permanent, regularly spaced sinuous bends of substantially equal depth and characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein.

5. As a new article of manufacture, a woven textile item in accordance with claim 4 further characterized in that the normally high gloss yarns are formed of a synthetic, thermoplastic fiber-forming material.

6. As a new article of manufacture, a woven textile item at least one of the warp and woof of which is formed of normally high gloss nylon yarns having a large number, of the order of approximately one hundred per inch, of preformed, permanent, regularly spaced sinuous bends of substantially equal depth and characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein.

7. As a new article of manufacture, a woven textile item the warp and woof of which are formed of normally high gloss yarns of a thermoplastic fiber-forming material having a large number, of the order of approximately one hundred per inch, of preformed, permanent,

regularly spaced sinuous bends of substantially equal depth and characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein.

8. As a new article of manufacture, a woven textile item in accordance with claim 7 further characterized in that the normally high gloss yarns are formed of a synthetic, thermoplastic fiber-forming material.

9. As a new article of manufacture, a woven textile item the warp and woof of which are formed of normally high gloss nylon yarns having a large number, of the order of approximately one hundred per inch, of preformed, permanent, regularly spaced sinuous bends of substantially equal depth and characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein.

10. As a new article of manufacture, a woven textile item in accordance with claim 9 further characterized in that the bends in the warp engage the bends in the woof at the bottom of each bend.

11. As a new article of manufacture, a woven textile item at least one of the warp and woof of which is formed of normally high gloss yarns of a thermoplastic, fiber-forming material having a large number, of the order of approximately one hundred per inch, of preformed, permanent, regularly spaced sinuous bends of substantially equal depth and characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein, the depth of the bends being substantially equal to the thickness of the textile item.

12. As a new article of manufacture, a textile item at least a portion of which is formed of normally high gloss yarns of a thermoplastic fiber-forming material having a large number, of the order of approximately one hundred per inch, of preformed, permanent, regularly spaced sinuous bends of substantially equal depth and characterized by uniformly low to substantially no gloss solely as a result of the regular spacing and number of bends therein.

RUSSELL K. LAROS.

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