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METHOD OF MAKING CRIMPED YARN

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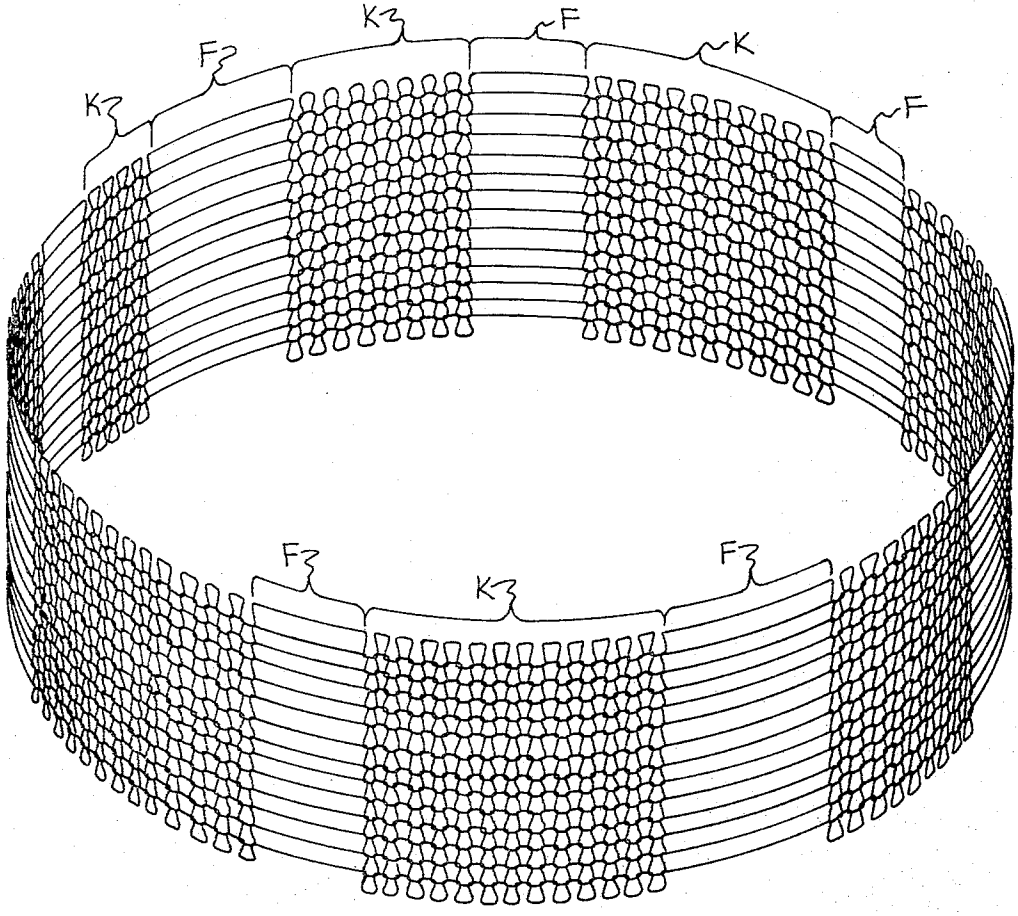


Fig-1

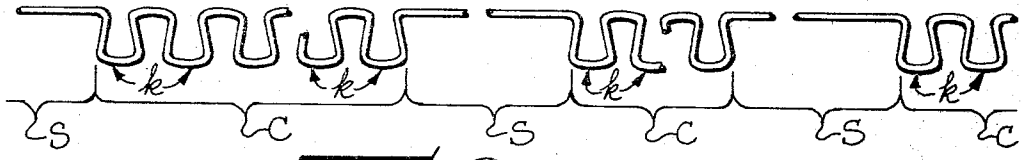


Fig-2

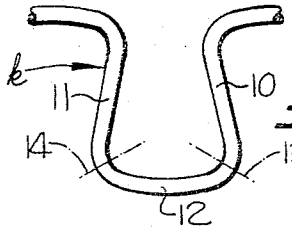


Fig-3

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METHOD OF MAKING CRIMPED YARN

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This invention relates generally to improvements in a crimped yarn of the type that is formed by knitting a fabric, setting the stitch loop configuration in the yarn and then unraveling the fabric to obtain the crimped yarn, and more particularly to a yarn of this type and method of forming the same wherein substantially straight or uncrimped sections and crimped sections are serially arranged along the length of the yarn.

It is well known to obtain what is generally known as a "knit-de-knit" crimped yarn by knitting a plain fabric of a thermoplastic yarn, heat-setting the fabric and then unraveling the same, in the manner disclosed in the Frank R. Page Patent No. 2,601,451, dated June 24, 1952. This type of crimped yarn has a regular pattern of successive and uniformly spaced crimps which each have the configuration of a knitted stitch loop. When this yarn is again knit, the stitch loops are distorted throughout the fabric and it has substantially uniform stretchability throughout.

With the foregoing in mind, it is a main object of the present invention to provide a crimped yarn including straight or uncrimped sections and crimped sections serially arranged along the length of the yarn and wherein each of the crimps, when in relaxed condition, have the configuration of a knitted stitch loop. The crimped yarn of the present invention can then be knit or woven to form a fabric having a novelty pattern therein and having varying degrees of stretchability in various portions thereof.

It is another object of the present invention to provide a crimped yarn of the type described wherein the straight sections and crimped sections are of varying lengths and arranged along the length of the yarn in a pattern which repeats only after a substantial length of the yarn.

It is another object of the present invention to provide a method forming a crimped yarn of the type described wherein a fabric is originally knit with successive courses having straight portions formed by yarn floats or the like and portions formed of stitch loops, the straight and stitch loop portions are then set in the yarn, and then the yarn is unraveled to recover the crimped yarn therefrom.

It is another object of the present invention to provide an alternative method of forming a crimped yarn of the type described wherein the yarn is initially knit to form a plain fabric having regularly recurring stitch loops in every course, the knit fabric is then set in selected areas while leaving the remaining areas unset to thereby set the configuration of the knitted stitch loops in the yarn in corresponding selected areas of the fabric, and then the fabric is unraveled to recover the crimped yarn therefrom.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which:

FIGURE 1 is an isometric view of a fabric tube which is knit in accordance with the preferred method wherein the alternating straight and stitch loop portions are formed in successive courses of the fabric;

FIGURE 2 is a short section of the crimped yarn of the present invention, with parts broken away, the crimped yarn being obtained by unraveling the tube shown in FIGURE 1, after the fabric has been set; and

FIGURE 3 is an enlarged elevation of one of the stitch loops that defines a crimp in the crimped section of the yarn.

The crimped yarn of the present invention, as illustrated in FIGURE 2, includes substantially straight sections S alternating with crimped sections C. The straight and crimped sections are serially arranged along the length of the yarn and portions of the yarn have been broken away in FIGURE 2 so that several of the successive sections can be illustrated. Each of the crimped sections C has a sufficient number and size of successive crimps therein to impart substantial stretchability and recoverability to the yarn. The individual crimps are indicated at *k* in FIGURE 2 and, as shown in FIGURE 3, each crimp has the configuration of a knitted stitch loop, when the yarn is in relaxed condition.

It is preferred that the alternating straight sections S and the crimped sections C be of varying lengths along the length of the yarn Y. It is also preferred that the crimps *k* be equally spaced in the crimped sections C, however, it is to be understood that it may be desirable in some instances to provide irregular spacing between the crimps *k*. Also, while the crimps *k* are shown as having the configuration of a plain or jersey knit stitch loop, it is to be understood that they could have the configuration of other types of knit stitch loops.

As shown in FIGURE 3, each crimp *k* has the configuration of a knitted stitch loop that includes a pair of spaced apart leg portions **10**, **11** which are connected at their lower ends by a bight portion **12**. The juncture of the leg portions **10**, **11** with the bight portion **12** is defined by the respective dash-dot lines **13**, **14**. The leg portions **10**, **11** converge toward each other from the bight portion **12** to a medial portion, where they diverge away from each other and extend to adjacent crimps *k*.

The present crimped yarn is preferably obtained by knitting a substantially straight thermoplastic yarn into a tubular fabric, such as shown in FIGURE 1. As successive courses are knit, plain stitch loops are formed on groups of adjacent needles to form plain knit walewise extending stitch loop sections K while forming walewise extending unknitted or floated sections F between the knit sections K. This type of tubular fabric can be easily knit on a circular knitting machine by maintaining the needles inactive or removing the needles from those portions of the needle cylinder corresponding to the floated sections F, while forming plain stitch loops on the groups of needles in those portions of the needle cylinder corresponding to the knit sections K. As shown in FIGURE 1, the alternating knit and float sections extend completely around the tube and they preferably vary in width in a random and non-repeating manner. The number of needles in the active and inactive groups may be varied in any desired manner and although the same needles knit in successive courses of the fabric shown in FIGURE 1, it is to be understood that the needles in the knitting machine may be manipulated in such a manner that in succeeding courses, different groups or numbers of needles may be rendered active and inactive to thereby vary the pattern of the stitch loops and floats in successive courses.

After the fabric is knit, the stitch loop configuration is set in the yarn. Then, the yarn is unraveled to recover the crimped yarn Y therefrom (FIGURE 2). It is preferred that the fabric (FIGURE 1) be knit of a yarn having thermoplastic properties, such as nylon, so that the stitch loop configuration can be set therein by heat-setting the fabric.

In accordance with the present invention, the crimped yarn may also be obtained by an alternative method wherein the initial fabric is knit of plain, evenly spaced stitch loops throughout. Then, only selected areas of the

fabric are set while the remaining areas are left unset. Then, when the fabric is unraveled the yarn will have alternate crimped sections with stitch loop configurations set therein and straight sections where the unset stitch loops straighten out. It is preferred that the initial fabric be knit of a thermoplastic yarn and then only selected areas be heat-set.

Since the heat-setting of a thermoplastic yarn usually affects its dyeability to some extent, the heat-set crimped sections of the yarn obtained by this alternative method will have a slightly different affinity for dye from the unset straight sections. In some instances, this may be a desirable feature as it will cause a fabric that is woven or knit from this crimped yarn to dye with varying shades of the color and produce an unusual effect. However, if this uneven dyeing characteristic is objectionable, the crimped yarn with heat-set and unset sections may be again heat-set while relaxed to set the total length of the yarn and thereby level out the dye affinity throughout the length of the yarn.

A wide variety of crimped yarns may be produced in accordance with the present invention. The yarn is preferably of the continuous filament type and may include one or more filaments. The size of the individual crimps in the crimped sections can be varied by varying the length of stitch drawn in the initial fabric and the spacing between stitch loops can be varied by knitting the initial fabric on knitting machines of different sizes and gauges. The crimped yarn of the present invention may be utilized in knitting, weaving, tufting, braiding, etc.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

We claim:

1. A method of making a yarn having substantial stretchability and recoverability and including substantially straight sections serially arranged with crimped sections, said method comprising the steps of
   (a) knitting a fabric of a straight yarn while forming successive courses having substantially straight portions serially arranged with portions formed into stitch loops,
   (b) setting the straight and stitch loop portions in the yarn, and
   (c) unraveling the fabric to recover the yarn therefrom with the unraveled stitch loop portions defining crimped sections wherein each crimp when in relaxed condition has the configuration of a knitted stitch loop.

2. A method according to claim 1 wherein said straight portions are formed of varying lengths.

3. A method according to claim 1 wherein said stitch loop portions are formed of varying lengths.

4. A method according to claim 1 wherein said straight portions and said stitch loop portions are formed of varying lengths.

5. A method of making an irregularly crimped yarn having substantial stretchability and recoverability and including substantially straight sections serially arranged with crimped sections, said method comprising the steps of
   (a) knitting a fabric of a substantially straight thermoplastic yarn while forming successive courses having substantially straight portions serially arranged with portions formed into stitch loops, and while forming said straight portions and said stitch loop portions of varying lengths,
   (b) heat-setting the fabric and setting the straight and stitch loop portions in the yarn, and
   (c) unraveling the fabric to recover the yarn therefrom with the unraveled stitch loop portions defining crimped sections wherein each crimp when in relaxed condition has the configuration of a knitted stitch loop.

6. A method of making a yarn having substantial stretchability and recoverability and including substantially straight sections serially arranged with crimped sections, said method comprising the steps of
   (a) knitting a fabric of a straight yarn while forming successive courses consisting of stitch loops,
   (b) setting the fabric in selected areas while leaving the remaining areas of the fabric unset and setting the stitch loops in the yarn in said selected areas of the fabric, and
   (c) unraveling the fabric to recover the yarn therefrom with the stitch loops in the yarn of said selected areas of the fabric defining crimped sections wherein each crimp when in relaxed condition has the configuration of a knitted stitch loop.

7. A method according to claim 6 wherein adjacent set selected areas are varied in size relative to each other.

8. A method according to claim 6 wherein said set selected areas are varied in size relative to adjacent unset remaining areas.

9. A method of making an irregularly crimped yarn having substantial stretchability and recoverability and including substantially straight sections serially arranged with crimped sections, said method comprising the steps of
   (a) knitting a fabric of a substantially straight thermoplastic yarn while forming successive courses consisting of stitch loops,
   (b) heat-setting the fabric in selected areas of varying size while leaving remaining areas of varying size of the fabric unset and setting the stitch loops in the yarn in said selected areas of the fabric, and
   (c) unraveling the fabric to recover the yarn therefrom with the stitch loops in the yarn of said selected areas of the fabric defining crimped sections wherein each crimp when in relaxed condition has the configuration of a knitted stitch loop.

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