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CONTINUOUS FILAMENT CREPE YARN AND FABRIC PRODUCT

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Fig. 1

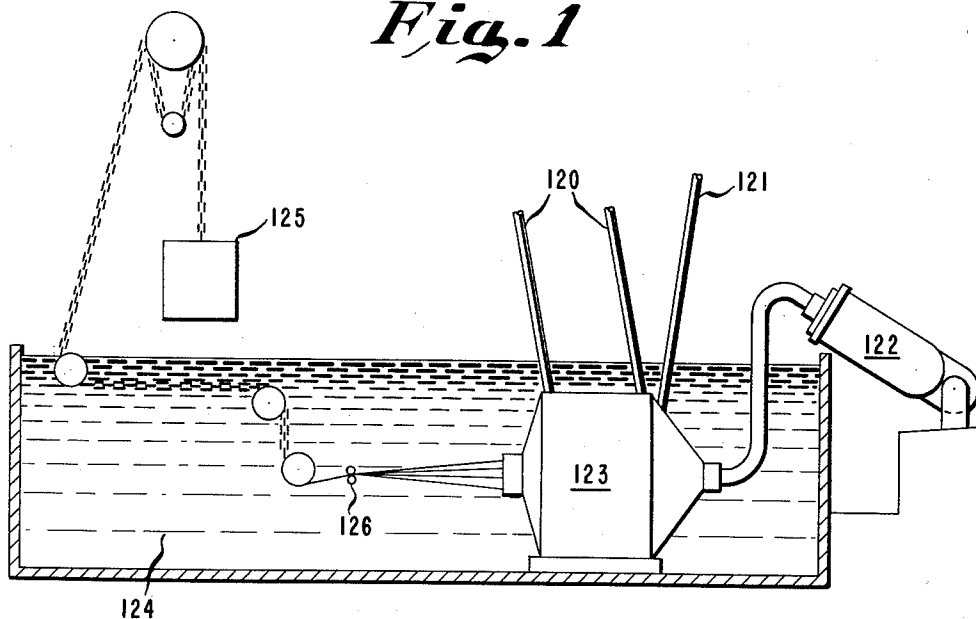


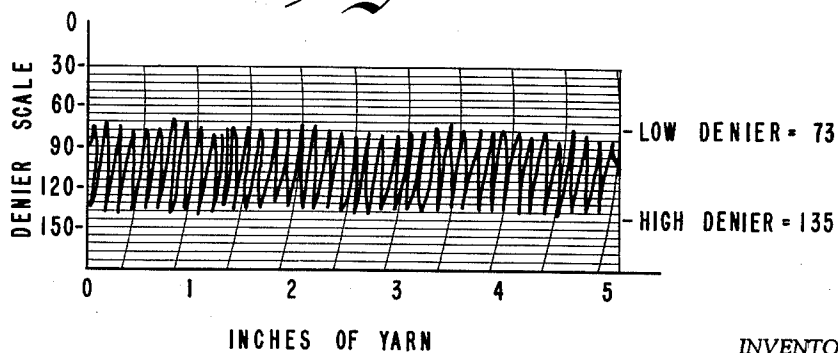
Fig. 2



Fig. 4



Fig. 3



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1

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Original application Nov. 27, 1956, Ser. No. 624,602, now Patent No. 2,820,986, dated Jan. 28, 1958. Divided and this application July 25, 1957, Ser. No. 674,077

1 Claim. (Cl. 139-426)

This invention relates to novel and useful filaments, yarns and fabrics. More particularly, it relates to a filament which varies in denier along the filament length and to a yarn and fabric made from such filaments.

It is an object of the present invention to provide a filament which varies in denier along the filament length. A further object is to provide a yarn made from such filaments. A still further object is to provide a crepe-like fabric made from such filaments and yarns. Other objects will become apparent from the descriptions, the drawings, and the claims.

In accordance with the present invention, a filament of from 1 to 15 denier and varying in denier along the filament length is provided; the denier variations of the said filament having a contrast of at least 1.5 and occurring at least 3 times per inch along the filament length. By denier variation is meant that the cross-section of the filament varies regularly between thick and thin along the filament length. In measuring the number of such variations along the filament length, the distance from the thickest portion of the filament to the next thickest portion of the filament or, conversely, from the thinnest portion to the next thinnest portion, is the length of one denier variation. In accordance with this invention, at least 3 such denier variations occur along each inch of the filament length. By the term "contrast" is meant the ratio of the average denier of the thickest portion of the filament to the average denier of the thinnest portion of the filament. Thus, when the thick portion of the filament has an average denier of 3 and the thinnest portion has an average denier of 1.5, the contrast is 2. These filaments, when formed into a multi-filament yarn with aligned denier variations among the parallel filaments, are of a low twist crepe-like variety.

The yarn described above is produced by the use of the apparatus described in U.S. application Serial No. 624,602, filed November 27, 1956 now U.S. Patent 2,820,986.

FIGURE 1 is a diagrammatical sketch of the spinning set-up for the variable denier yarns of this invention;

FIGURE 2 is an illustration of a variable denier, continuous, multi-filament yarn;

FIGURE 3 is a capacitometer chart showing the denier variation of one of the continuous, multi-filament yarns of this invention.

FIGURE 4 illustrates an open plain weave fabric woven of the variable denier yarn described above.

FIGURE 1 represents a diagrammatical sketch of a typical spinning set-up for producing the variable denier yarns of the present invention. The spinning solution is supplied by a conventional pump 122 to the apparatus

2

123 described in U. S. Patent No. 2,820,986. The apparatus 123 is flushed and cooled (or sometimes heated) by means of a fluid which is supplied to it through exit and entrance pipe 120. The power needed to run the apparatus 123 is supplied by the electrical lead 121. The spinning solution leaves the apparatus 123 at the spinneret face and enters the coagulating bath 124 which coagulates the spinning solution to form continuous filaments. The filaments are uniformly converged at the convergence point 126 and are then taken by means of a roller arrangement to a conventional wind-up system 125.

FIGURE 2 is a diagrammatical sketch of one of the variable denier, continuous, multi-filament yarns of the present invention. As is shown by the sketch, the yarns are composed of a number of filaments with denier variations which are in substantial alignment.

FIGURE 3 is a capacitometer chart showing the denier variations of one of the variable denier, continuous, multi-filament yarns of this invention. As shown by the chart for a yarn containing 8 denier variations per inch, all of the thick portions of the yarns have substantially the same denier and, in addition, the narrow portions of the yarn are all of substantially the same denier giving a denier variation which is substantially the same along the whole filament length.

The invention will now be described with respect to regenerated cellulose filaments and yarns. The invention, however, is not restricted thereto but is meant to include variable denier yarns produced from other filament-forming materials such as cellulose nitrate, cellulose acetate, vinyl polymers, acrylics, glass, polyamides, proteins, polyesters, etc.

The apparatus described in U.S. Patent No. 2,820,986 and shown in FIGURE 6 of said patent is employed using an upstream pressure of 67 pounds per square inch in the conduit and a piston speed of 240 cycles per second; 100 cc. of water per minute is run through the apparatus in order to cool and flush it. A viscose solution containing 7% recoverable cellulose and 6% total alkali, calculated sodium hydroxide, is filtered, deaerated, and ripened to a salt index of 4.2 and a viscosity of 39 stokes. The viscose is then extruded through the spinneret (holes 0.003 inch in diameter), into a coagulating and regenerating bath containing by weight, 11% sulfuric acid, 19.5% sodium sulfate, 0.7% zinc sulfate, and 2.0% glucose. The bath is maintained at a temperature of 55° C. After extrusion the filament is passed over a Y guide which is placed 5 inches from, and directly in front of, the spinneret face. The yarn is then passed for a distance of 40 inches through the bath and up to and around a feed wheel and finally into a rotating bucket. The rotating bucket imparts to the yarn a twist of from about 2 to 4 turns per inch (depending on the spinning speed) and winds the resulting twisted yarn into a cake. A spinning tension of about 0.11 gram per denier is used in this procedure. The spinning arrangement is shown in FIGURE 1. The cake is washed, desulfured, finished, dried and wound into cones in the conventional manner. Table I below gives the characteristics of the yarn produced by this procedure.

TABLE I
Variable Denier Yarns

Ex.	Denier	Number of Filaments	Spinning Speeds, yards/ per min.	Denier Variations/ Inch	Contrast
1-----	100	40	100	4	2.2
2-----	100	40	50	8	1.9
3-----	200	90	75	6	2.8

Table II below gives the physical properties of the variable denier yarns produced above.

TABLE II

Ex.	Denier	Num ber of Filaments	Breaking Strength (G.)			Elongation, Percent			Twists per inch
			Dry	Wet	Loop	Dry	Wet	Loop	
1-----	100	40	80	44	84	6	11	5	2.2
2-----	100	40	71	32	74	7	17	7	2.7
3-----	200	90	112	54	110	7	15	7	3.1

The yarns described above are woven into a plain weave cloth having 96 ends in the warp and 72 ends in the filling. The resulting fabrics have a pleasing crepe-like appearance.

The multi-filament yarns which are produced in accordance with the present invention are those composed of the hereinbefore described filaments wherein the denier variations are in substantial alignment. In general these yarns have a total denier of from about 50 to about 400 and are composed of from about 10 to about 400 filaments; each filament having a denier of from about 1 to about 15, a contrast of at least 1.5 and at least 3 denier variations per inch. In the preferred embodiment of the present invention the total denier of the yarn ranges from about 100 to about 200 and is composed of filaments having a denier of from 1 to about 5, a contrast of from 1.5 to about 4 and from 3 to about 9 denier variations per inch.

In producing the variable denier yarns of the present invention there are four basic requirements: (1) Extremely rapid variation in the flow of filament-forming solution through the spinneret; (2) Rapid setting of the filaments as they emerge from the spinneret; (3) Uniform convergence of the filaments so that the variations in denier are not allowed to become out of alignment from filament to filament; and (4) Constant speed draw-off.

The yarns of this invention, composed of the variable denier filaments, are useful for preparing crepe-like fabrics which are particularly useful in the light-weight fabric wearing apparel field. The usual method of manufacturing fabrics exhibiting crepe-like effects is to weave a fabric consisting wholly or in part of yarns of high twist and to

subject the fabrics so obtained to treatment with hot aqueous liquids. The treatment with hot aqueous liquids causes the high twist yarns to shrink and cockle thus imparting to the fabric the characteristic crepe appearance.

In the case of fabrics which consist only partially of high twist yarns, the high twist yarns are evenly distributed in the fabric, e.g., the filling may consist of high twist yarns while the warp consists of yarns of ordinary low twist. In consequence, crepe fabrics as ordinarily produced exhibit a crepe effect which is uniform over all their surface. Crepe yarns are usually twisted 45 to 70 twists per inch and twists as high as 85 twists per inch have been used. This high degree of twist greatly increases the cost of producing the yarn and consequently crepe fabrics are relatively expensive. In addition, the highly twisted yarn in the fabric makes the fabric dimensionally unstable to wetting and drying and therefore crepe fabrics must always be dry-cleaned. The crepe-like fabrics produced from the yarns of the present invention have the advantage of providing a much lower cost fabric, due to the low degree of twist, and the fabric, in addition, has dimensional stability, e.g., it may be laundered rather than dry-cleaned.

The fabrics which are produced from the filaments and yarns of the present invention may be dyed in the conventional manner and are useful in many different types of fabrics. They are particularly useful in the fine dress goods field for the making of blouses, skirts and dresses in direct dyed fabrics or print cloths.

Many modifications will be apparent to those skilled in the art from the reading of the above without a departure from the inventive concept.

This application is a division of United States application Serial No. 624,602, filed November 27, 1956 now U.S. Patent 2,820,986.

What is claimed is:

A crepe-like fabric woven of about 2 to 3 turns per inch twist, multi-filament yarn having a total denier from about 50 to about 400 which varies along the yarn in a rapidly repeating low-high cycle, the yarn being composed of 1 to 5 denier continuous filaments which vary in denier along the filament length, each filament having a denier contrast of from 1.5 to about 4 and from 3 to about 9 denier variations per inch of filament length, the denier variations of the filaments being in substantial alignment to provide a corresponding variation in total denier along the yarn.

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