Patented June 18, 1935 2,005,539

UNITED STATES PATENT OFFICE

2,005,539

YARN

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No Drawing. Application May 1, 1933, Serial No. 668,816

1 Claim. (Cl. 117—52)

This invention relates to yarns and fabrics made therefrom, and is concerned more particularly with new yarns and fabrics made wholly of artificial silk, these yarns having novel characteristics, by virtue of which they can be used in the production of fabrics differing widely in hand, feel, appearance, and strength. The yarn of my invention may be made of various kinds of artificial silk and for best results it consists throughout of the same kind of artificial silk fibre. In some respects a yarn of the new type consisting entirely of organic derivatives of cellulose is preferred and the application of the invention to the production of such a yarn will be set forth in detail for purposes of illustration, although it is to be understood that the utility of the invention is not limited to the employment of that type of artificial fibre in the new yarn.

In the production of yarn from organic derivatives of cellulose, there are now commonly employed the organic esters, such as the acetate, formate, propionate, and butyrate, and cellulose ethers, such as ethyl cellulose, methyl cellulose, and benzyl cellulose. In accordance with the usual practice, these materials are formed into filaments of indefinite length, and yarn of the desired denier is made by combining the appropriate number of filaments. Such yarn made up of continuous filaments may be referred to as "regular" yarn.

More recently, some artificial silk yarn has been made from filaments of the organic derivatives of cellulose, and from viscose, nitrocellulose, etc., by first producing filaments in the ordinary manner and then cutting the filaments into shorter lengths of, for example, one-half to five inches. The short lengths thus produced are then spun in a manner similar to that employed in connection with cotton or wool, and by this procedure, there is produced a "spun" yarn of artificial silk which is soft and somewhat woolly. The spun yarn of a given artificial silk is weaker than regular yarn of the same material, but it may be used to produce effects not possible with the regular yarn.

One of the objections to the use of regular yarn is that it has little absorptive power and does not dye evenly and, as a consequence, when dyed regular yarn is woven into cloth, or cloth woven of regular yarn is dyed in the piece, the irregularities in the dyeing frequently become apparent. If the yarn is used as warp, the cloth may have "warp streaks", and if the yarn is weft, "shiners" and "bars" are likely to appear. "Shiners" are bright spots or areas and "bars" are stripe effects formed by variations in the color of the weft contained in successive shuttle bobbins. These irregularities do not appear in cloth produced from the spun yarn which takes dyes evenly because of its soft somewhat woolly character. However, spun yarn is too soft and weak for general use and its application in the production of fabrics is, therefore, greatly restricted.

I have discovered that a yarn produced by doubling regular and spun yarns is not subject to the objections mentioned and, in addition, has many advantages over yarns made either of regular or spun fibres alone. This new yarn can be made in various forms and woven into fabrics which vary widely in appearance, hand, feel, and strength. The new fabrics may be so made as to bear a close resemblance to soft vicunas or at the other extreme, they may have the characteristics of a hard twisted woolen fabric.

In producing the new yarn, I employ varying proportions of regular and spun yarn and the proportions may vary from 10% to 90% of spun yarn, with the remainder regular yarn in each instance. For most purposes, however, the variation in the spun yarn will lie within the range from 40% to 60%, with the remainder regular yarn. For example, for a soft woolly material, the new yarn will contain 90% spun filaments and 10% regular filaments, while for a serge for suitings, the yarn will preferably contain 60% spun and 40% regular. For hard twisted goods, the proportions may be 50% each of spun and regular, or less spun will be used as greater hardness is desired.

In making the new yarn, the spun yarn and the regular yarn are made in the ordinary way and they are then doubled with varying numbers of turns, depending on the characteristics that the final product is to have. The twist used in the doubling may vary from 1½ to 75 or more turns per inch but for ordinary purposes, the twist will run from 7½ to 25 turns. The twist of the regular and spun yarns so doubled will also vary over side ranges, the twist of the spun yarn varying, for ordinary purposes, from 7 to 40 turns per inch, and the twist of the regular similarly varying from 2½ to 40 turns. Variations in the twist of the yarns and in the turns in the doubling impart different degrees of lustre to the fabric woven of the yarn and also produce variations in the hand. Generally speaking, I use less turns in the doubling and less twist in the yarns which

are to be doubled, when the final yarn is to be made into a fabric which is soft and woolly, and employ more turns and more twist when the final product is to be harder and stiffer.

The new yarn takes dyes evenly and with uniformity and shows no variations such as occur in regular yarn. This is probably due to the regular element of the new yarn becoming partially embedded in the spun element, which has substantial absorptive power and dyes evenly. In any event, it is immaterial whether or not the regular yarn in the new product is uniformly dyed since it appears to be concealed in the spun material to such an extent that unevenness in dyeing of the new yarn is not apparent.

While the spun yarn alone is unsatisfactory because of its softness and lack of strength, and the regular yarn is of limited application because of the appearance, hand, and feel it imparts to goods made from it, the new yarn is free of these defects. It is stronger and more elastic than spun yarn of the same size, and it can be used to produce effects varying over a wide range, and incapable of being produced with regular yarn. It can be produced in a form such that fabrics made from it have a softness substantially equal to that of those produced from spun yarn alone, and fabrics made of the new yarn may also closely approach those of regular yarn alone, in strength. These effects are obtained by variation in the proportions of the two elements of the new yarn, and by variation in the turns in the doubling and the twists of the spun and regular yarns which are plied together.

Another advantage of the new yarn is that fabrics made from it are practically wrinkle proof, while those of regular yarn alone are particularly subject to wrinkling. The new yarn can thus be employed most advantageously in making summer suitings and a cloth made of the new yarn will hold a crease far better than similar fabrics made wholly of linen, silk, or wool. Regular yarn cannot be employed for such suitings because of the appearance they would have, and spun yarn produces fabrics too soft and weak for such use. A further objection to such suitings made of regular yarn is that they transfer heat easily and thus are warm in the sun and cold in the evening. Suitings made from the new yarn transfer heat slowly and are much more comfortable.

For many purposes, I prefer to make the new yarn wholly of organic derivatives of cellulose as above-mentioned, since a yarn thus made does not shrink, is moth-proof, will not decompose, does not greatly absorb moisture, and will not crepe. However, many of the advantages of the invention may be obtained by making the new yarn wholly of other artificial silks.

The variations in the hand, feel, appearance and strength of fabrics made of the new yarn are accomplished not only by varying the proportions of spun and regular filaments in the yarn and by variation in the turns and twist but also by varying the sizes of the two yarns which are twisted together to form the final product and by properly selecting the materials to be employed. While the production of the new yarn of organic derivative of cellulose is preferred for many purposes, yarn made in accordance with the invention and consisting of spun and regular strands of other artificial silks such as viscose, nitrocellulose, cuprammonium artificial silk, etc., is superior to yarns made of those materials and consisting wholly of either spun staple or continuous filaments.

In producing fabrics by the use of the new yarn, it is also possible to obtain a wide variation in hand, feel, appearance, and strength by the use of different combinations of warp and weft. For example, a fabric made with the new yarn used both for warp and weft differs considerably in the characteristics mentioned from a fabric made with a spun warp and a weft of the new yarn. Other combinations include new yarn as warp and spun yarn as weft, regular yarn as warp and new yarn as weft, and new yarn as warp and regular yarn as weft.

The new yarn may be produced wholly of lustrous fibres or in part of such fibres and in part of pigmented fibres which are substantially without luster. A variation in the proportions of these two types of fibres permits a wide variation in the appearance of the yarn and of the fabrics made therefrom.

The new yarn may be employed in the production of fabrics, having a wide variety of uses, and a form of the new yarn may be made which is particularly adapted for the production of woven fabrics, such as summer suitings, and of knitted fabrics. Such knitted fabrics are excellent for bathing suits and the new yarn is also well adapted for the production of sweaters, stockings, etc. Another use of the new fabrics is for the interior upholstery of automobiles, and for this use also, the yarn may best be made wholly of organic derivatives of cellulose, since dirt and grease spots may be easily removed by soap and water from fabrics made of such yarns without producing spots, and the fabrics dry rapidly after cleaning.

I claim

A yarn which is made entirely of one kind of artificial silk and comprises two strands doubled together, one of these strands being of spun fibres of a staple length ranging from about ½ to about 5 inches, this strand having a twist ranging from about 7 to about 40 turns per inch, the other strand being made of continuous filaments and having a twist ranging from about 2½ to about 40 turns per inch, the two strands being doubled together with a twist varying from about 7½ to about 25 turns per inch.

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