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COMPOSITE YARN STRUCTURE AND METHOD FOR PRODUCING SAME

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This invention relates to a composite yarn structure and a method for making it, and more particularly relates to a yarn structure which comprises a slit film of polypropylene and combined with a yarn which can be bulked thermofibers, spun yarn and the like.

It has been known in the past that various types of yarns and materials can be combined to produce composite structures which have certain style advantages, especially when the composite yarn structures are formed into a fabric. One type of composite yarn structure which has been produced for purposes of imparting highlights, lusters, and similar style advantages to the yarn and subsequent fabrics has consisted of a metallic film component and a supporting yarn which in some cases has been of thermoplastic material. However, this type of composite yarn has been made in a manner which requires laminating of the metallic film component and is therefore not only difficult to manage but also expensive and time consuming. Furthermore, the composite yarn produced has not had suitable breaking strength characteristics. Other types of composite yarn structures have consisted of film components of other materials, such as cellulose or polyester to impart the desired style advantages of highlights and lusters but have not been successful in overcoming the cost and processing disadvantages which have been necessarily employed for imparting the desired style advantages.

Accordingly, it is an object of the invention to provide a composite yarn structure having style advantages of highlights and lusters which can be made by an inexpensive method.

It is another object of this invention to provide a composite structure, one part of which can be dyed and the other part retaining a highlight or luster therein.

It is another object of this invention to provide a composite yarn structure having a light reflective yarn component which is dye resistant.

It is another object of this invention to provide a method of making a composite light reflective yarn structure which is easily managed and inexpensive.

Generally, the composite yarn structure of this invention includes a clear polypropylene film component and preferably a thermoplastic bulk yarn. The clear polypropylene film is especially prepared and slit in such a manner as to provide a film of polypropylene of narrow width which has a rectangular cross section. In preparation of the film component of the composite yarn of this invention, care must be taken not to crush the edge so as to thus weaken the film and, accordingly, the composite yarn of this invention.

The polypropylene film which is employed is bi-axially oriented and is heat set to produce a very stable and strong film which is substantially unreactive to dyes using normal techniques.

The thermoplastic bulk yarn component of the composite yarn is of either the stabilized or stretch type, depending upon the ultimate properties desired in the fabrics to be produced therefrom.

The method of preparation of the yarn of this invention may involve one of three separate techniques. The first of these techniques is to prepare the thermoplastic component from continuous filament nylon or other yarn and then to combine it with the slit polypropylene film by means of a doubler or down twister. A second method is to utilize the hollow spindle technique commonly employed for producing core yarns by feeding the film component through the hollow spindle in an upward direction and to twist the thermoplastic yarn component around it. The third technique is to apply an amount of twist to the polypropylene film to create a slightly different effect and then to combine it with the thermoplastic fiber by either of the techniques previously described.

An additional way which is not essentially different from the methods previously described in preparing the yarn of this invention is to utilize what is known in the trade as a "fancy doubler" which involves two or more sets of feed rolls, one of which is operating at a different speed from the others, thereby producing an overfeed of one component with respect to the others.

The next step in the preparation of the yarn of this invention is to dye the composite yarn structure using normal dyes and normal techniques. Of course, it is a well-known technique to use the yarn as produced without dyeing to produce a fabric from such yarn and then to dye the fabric in the piece or to make garments therefrom and dye the garments in the piece.

In any of these instances the result is that the thermoplastic yarn component will be dyed the shade which is desired whereas the polypropylene will not appreciably accept the dye and will remain in its normal undyed condition.

The fabric thus produced has an appearance which is vaguely similar to that of a fabric produced from a laminated yarn having metallic component and yet it is quite different in that there is much more subtle luster provided and a strikingly different effect produced.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings.

FIG. 1 illustrates a schematic threading diagram for a hollow spindle technique for producing the composite yarn structure of this invention;

FIG. 2 illustrates an enlarged schematic view of the composite yarn structure of this invention; and

FIG. 3 illustrates a view taken at line 3—3 of FIG. 2.

For the purpose of illustration, the hollow spindle technique has been selected as typifying the method by which the yarn of this invention would be produced. It should be understood that the other techniques described above may be employed and examples of those techniques will be described below.

Referring to FIG. 1 a supply package 10 of a bi-axially oriented heat-set polypropylene slit film 11 is mounted in face contact with a drive roll 12 to be driven thereby.

The slit film is substantially rectangular in cross section and is uniform and stable throughout its length. An example of the polypropylene slit film is the slit film sold by the Melton Corporation which is made from film manufactured and sold by the Hercules Powder Company under the trademark "HERCULON." The slit film 11 is directed upwardly over a guide roll 13 through the center of a hollow up-twister spindle 14 of any suitable known construction which is rotatably driven by a suitable motor 15.

A supply package 16 of a thermoplastic yarn 17 which has been previously subjected to a crimping technique such as false twisting or stuffer box crimping is mounted on the head of the spindle 13 for rotation therewith.

In operation, the slit film 11 is advanced in an upwardly directed stream through the core of the up-twister spindle 14 and supply package 16 and the thermoplastic yarn 17 is pulled in an upward direction to ply with the slit film.
by twisting around the slit film 11 upon rotation of the supply package 16 with the spindle 13. The composite yarn structure 18 which is thus formed is directed through a suitable pigtail 19 a guide 20 and transverse guide 21 onto a take-up means, such as a bobbin 22, which is driven by a suitable drive roll 23.

By correctly adjusting the speed of the drive rolls 12 and 23, the proper amount of tension can be imparted to the slit film 11 to maintain it as the core with the yarn 17 wrapped around it. Also, by regulating the speed of the spindle 14 in reference to the speed of the slit film 11, the number of twists of the yarn 17 on the slit film 11 can be varied. For example, the number of twists can vary from 3 to 20 turns per inch depending on the desired style advantages.

The yarn 18 which is produced is schematically illustrate din FIGS. 2 and 3 in which the thermoplastic bulk yarn component 17 is wrap around the film component 11 as illustrated.

Following the take-up of the composite yarn structure on the bobbin 22 the yarn is dyed. The dyeing can be accomplished in any suitable manner, such as, in a system utilizing packages or skins. Alternatively, the composite yarn structure can also be dyed after it is formed into a fabric by suitable methods, such as, in a conventional beck or jig or dyed in the garment-like form in a rotary machine. However, in any dyeing method, the slit film 11 is not dyed since it is appreciably dye resistant due to its bi-axial orientation and inherent nature of the polypropylene.

Thus, a fabric which is formed from the composite yarn structure will possess a novel muted luster appearance due to the light reflective surfaces of the slit film at a low cost which has not been previously obtainable.

A typical example of the composite yarn of this invention comprises a stretch 200 denier black dope dyed nylon yarn component permanently crimped by a false twist method and a slit film component which has been prepared by slitting a polypropylene film which is bi-axially oriented and heat set into a normal width of about 1/4 of an inch and has a denier of about 75 and which is a product of the Melton Corporation. The two components are combined by means of the hollow spindle technique described above with the cramped yarn component being plied around the slit film component with 6 to 7 turns "S" twist.

The cramped yarn component may either be a single end or a balanced two-ply yarn. The slit film component may either be untwisted or have some 3 to 20 turns twist per inch which twist may be in the same direction or in the opposite direction of the twist of the final composite yarn structure for special effects.

It should be realized that in the event a dope-dyed material is employed for the wrapping yarn component 11 no additional dyeing is needed.

While this invention has been described in terms of preferred structures and preferred methods for producing those structures, it will be readily apparent to those who are skilled in the art that there are a number of other ways in which the yarn can be prepared and that the ultimate resulting fabric appearance will depend in large measure on the particular stitch construction which is employed, whether it be a knitting technique or a weaving technique.

Having thus described the invention, it is not intended that it be so limited as changes may be readily made therein without departing from the scope of the invention. Accordingly, it is intended that the subject matter described above and shown in the drawings be interpreted as illustrative and not in a limiting sense.

What is claimed is:
1. A composite yarn structure comprising a continuous filament thermoplastic stretch yarn component and a ribbon-like component having substantially less dye receptivity than said stretch yarn component.
2. A composite yarn structure as set forth in claim 1 wherein said ribbon-like component includes a clear slit film polypropylene.
3. A composite yarn structure as set forth in claim 2 wherein said slit film polypropylene is bi-axially oriented.
4. A composite yarn structure as set forth in claim 3 wherein said slit film polypropylene is heat set.
5. A composite yarn structure as set forth in claim 1 wherein said stretch yarn component is twisted around said ribbon-like component.
6. A composite yarn structure as set forth in claim 5 wherein said ribbon-like component is twisted in an opposite direction from the twist of the composite yarn structure.
7. A method of forming a composite yarn structure having a continuous filament stretch yarn component and a bi-axially oriented slit film polypropylene component comprising the steps of advancing a first stream of the yarn component from a supply thereof, advancing a second stream of the ribbon-like component from a supply thereof, and plying said first stream and said second stream together to form a composite yarn structure.
8. A method as set forth in claim 7 which further comprises the step of dyeing the composite yarn structure for imparting a dye to said yarn component without appreciably imparting dye to said ribbon-like component.

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