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KNITTED FABRICS AND THEIR PRODUCTION

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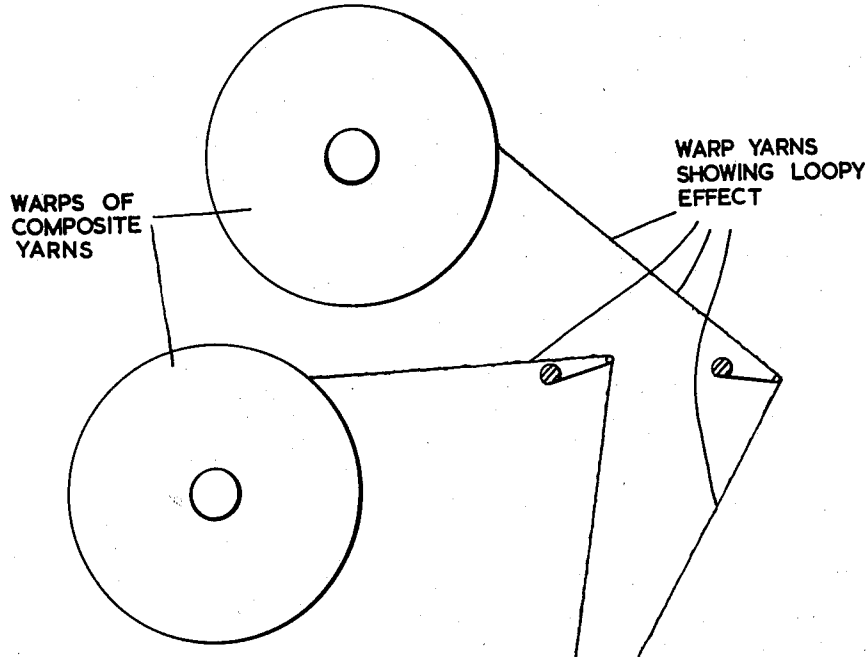


FIG. 1

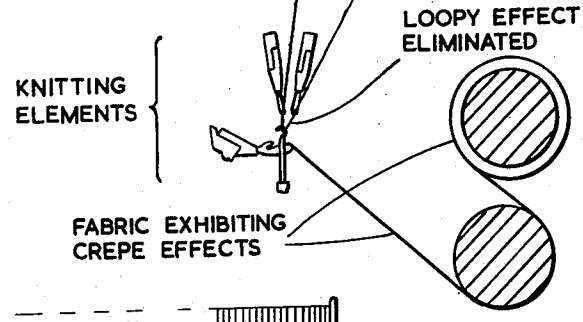
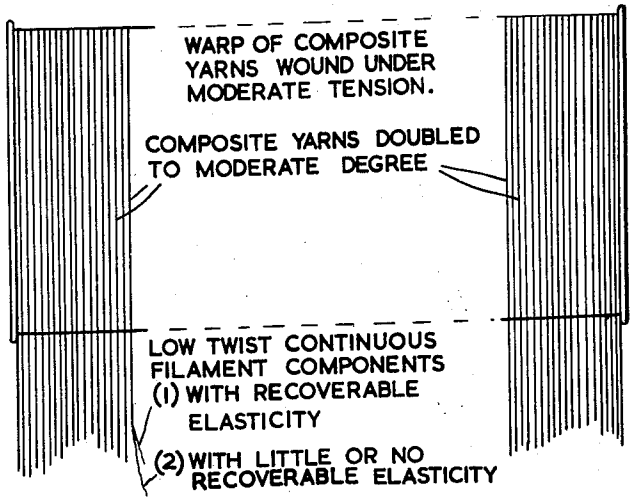


FIG. 2



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KNITTED FABRICS AND THEIR PRODUCTION

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9 Claims. (Cl. 28—72)

This invention relates to knitted fabrics, especially warp knitted fabrics, and is particularly concerned with a method of producing knitted fabrics exhibiting a pleasing, crepe-like surface effect.

According to the present invention a method of making a knitted fabric exhibiting a crepe effect comprises winding composite yarn containing continuous filaments having a material range of fully recoverable elasticity and continuous filaments having a lower range of recoverable elasticity into a package under a moderate tension whereby both kinds of filaments are extended, the former recoverably and the latter permanently, withdrawing said yarn from said package and knitting it into a fabric. Preferably a plurality of the composite yarns are wound together into a warp package, and are knitted on withdrawal from said package into a warp-knit fabric. The fabric according to the invention, resulting from the method defined above, exhibits a pleasing crepe-like surface effect by reason of the presence, on the surface of the fabric, of very short slack lengths or loops of the continuous filaments of the second kind, i.e. those having low or negligible range of recoverable elasticity. These are apparently due to the fact that all the filaments of the yarn are somewhat extended on being wound into a warp and, on relaxation of the tension after the yarn has been knitted into the fabric, the filaments of the first kind recover their original length while filaments of the second kind do not wholly do so but are contracted by the filaments of the first kind so that their excess length is formed into short, slack lengths or loops. On withdrawal of the composite yarns from the package, they can be relaxed, whereupon slack loops of the permanently extended yarns are visibly developed, the loops disappearing as the yarns are re-tensioned during knitting.

The procedure characteristic of the invention and outlined above is schematically illustrated in the accompanying drawing in which:

Figure 1 is a diagrammatic side elevation of the elements of a warp knitting machine in which the composite yarns are being knitted, and

Figure 2 is a view of the warp of composite yarns being knitted.

The composite yarn employed for the purpose of the present invention can be prepared by doubling two or more components, one consisting of continuous filaments of the first kind and the other of continuous filaments of the second kind. The slack filament lengths are not normally developed in the yarn by the doubling operation but, after the yarns have been wound under moderate tension into a warp, slack lengths or loops of the filaments appear on the yarns exposed on the outer surface of the warp. It is surprising that yarn exhibiting such an effect can be successfully warp knitted. It is found, however, that when the warp is placed in the warp knitting machine, although the effect becomes even more marked as the yarn is unwound from the warp to be knitted on the needles of the machine, it disappears between the guides of the machine and the needles and

knitting takes place in a normal manner. On subsequent relaxation of the yarns, after they have been knitted into a fabric, the slackness of the filaments of the second kind reappears, but in the form of very short slack lengths, limited by the lengths of the free portions of the yarn in the knitted loops.

Suitable materials for the filaments of the first kind, i.e. having a substantial range of recoverable elasticity, are the synthetic linear polymers having a substantial degree of crystallinity or otherwise exhibiting strong interchain molecular forces such as polyamides, e.g. polyhexamethylene adipamide, polyhexamethylene sebacide and polyaminocaproic acid; polyesters, e.g. polyethylene terephthalate; polythene; polyaminotriazoles; polyacrylonitrile and polyvinylidene chloride. Filaments of this kind, after extrusion and appropriate cold- or hot-drawing to increase their tenacity and diminish their extensibility at break, exhibit a substantial range of fully recoverable elasticity; that is to say, they can be extended to a substantial degree, and over a substantial range of tensions and still return completely to their original length when the tension is relaxed. In this respect they differ from continuous filaments of other kinds, e.g. filaments of cellulose acetate or other organic derivative of cellulose, or of regenerated cellulose such as viscose or cuprammonium filaments or filaments of synthetic linear polymers not exhibiting strong interchain forces such as polyvinyl chloride and its copolymers with minor proportions of vinyl acetate. Filaments of this kind, on being extended even to a small degree and under very moderate tensions, do not wholly recover their original length on relaxation of the tension, and are suitable for use as the second component for the purposes of the present invention. It is preferable, when preparing the composite yarn by doubling the component filaments together, that the ends to be doubled should have either no twist, or only a small degree of twist, e.g. of the order of 1 turn per inch or less. The doubling twist employed in the doubling of components together should itself be moderate in degree and depends on the total denier of the composite yarn, in general accordance with the "inverse square root" rule. For a composite yarn of a total denier of the order of 100, a doubling twist of the order of 1 to 10 turns per inch is suitable. Warping of the doubled yarn can be effected by methods commonly employed in the preparation of warps for warp knitting. Thus packages of yarn of a kind adapted for the drawing of the yarn over-end from the packages can be mounted in a creel furnished with tension devices for imparting to the yarns suitable tension, say 5–10 grams or more according to the yarn denier, and for guiding the yarns to the beam during warping. Alternatively, the package may be such, e.g. flanged bobbins, as to be rotated as the yarn is drawn off, the creel being provided with means for braking the bobbins in their rotation so as to tension the yarns as they proceed to the beam.

While the invention has been described above in its most important aspect, namely the production of a warp-knitted fabric from a warp of composite yarns, it may be possible to supply the yarns directly from individual packages, provided that the packages have been wound under moderate tension, e.g. in a rewinding operation following the doubling step, so as to develop the desired effect. Such individual packages may be used to supply a warp knitting machine (though for this purpose a warp is generally to be regarded as more convenient) or they may be used to supply knitting machines of other types, e.g. circular machines or straight-bar hosiery machines.

The following are some examples of warp-knitted fabrics, and the method of their production in accordance with the invention.

Example I

A yarn consisting of 10 filaments of polyhexamethylene adipamide, with a total denier of 30 and a twist of 0.5 turn per inch is doubled, to 5 turns per inch of doubling twist, with a yarn consisting of 13 continuous filaments of cellulose acetate having a total denier of 55 and twist of 0.18 turn per inch. The resulting yarns are wound into a warp under a tension of 5 to 8 grams per individual yarn and the warp is supplied to a warp knitting machine and knitted into a lock-knit fabric. The resulting fabric is of excellent stability and exhibits a pleasing crepe effect on its surface.

Example II

A yarn consisting of 6 filaments of polyaminocaproic acid, having a total denier of 30 and a twist of 0.2 turn per inch is doubled to 5 turns per inch with a cellulose acetate yarn of the kind employed in Example I. The yarns are warped and then knitted in the same manner as in Example I.

Example III

A fabric is prepared as in Example II except that the component yarns are doubled together with a doubling twist of 2½ turns per inch.

Example IV

A fabric is prepared as in Examples II and III except that the component yarns are doubled together with doubling twist of 7 turns per inch.

Having described my invention, what I desire to secure by Letters Patent is:

1. A method of making a knitted fabric exhibiting a crepe effect, said method comprising winding composite yarn containing continuous textile filaments having a material range of fully recoverable elasticity and continuous textile filaments having a lower range of recoverable elasticity into a package under a moderate tension whereby both kinds of filaments are extended, the former recoverably and the latter permanently, withdrawing said yarn from said package and knitting it under tension into a fabric.

2. Method according to claim 1 comprising winding a plurality of the composite yarns together into a warp package and knitting them on withdrawal from said package into a warp-knit fabric.

3. Method according to claim 1 comprising relaxing the yarn on withdrawing it from the package so as to develop slack loops of the permanently extended filaments, and re-tensioning the yarn during knitting so as to take up said slack loops.

4. Method according to claim 1 wherein the recoverably extended filaments are of a synthetic linear polymer exhibiting strong interchain molecular forces.

5. Method according to claim 1 wherein the permanently extended filaments are of cellulosic material.

6. Method according to claim 1 wherein the composite yarns are formed by doubling together yarns each consisting of component filaments of one kind and having a twist of less than 1 turn per inch.

7. Method according to claim 6 wherein the yarns are doubled together with less than 10 turns per inch.

8. Method according to claim 1 wherein the permanently extended filaments have a greater total denier in the composite yarn than in the remaining filaments.

9. A knitted fabric exhibiting crepe effects and produced by the method claimed in claim 1.

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