TRICOT KNIT FABRIC HAVING BALANCED STRETCH CHARACTERISTICS, AND METHOD OF MAKING SAME

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ABSTRACT

A knit fabric having knit-in elastic yarns and substantially balanced stretch characteristics in the walewise and coursewise directions is described, as well as a method of making such a fabric. The fabric can be tricot knit to include knit in elastic yarns, and forms an oscillating cable pattern in the walewise direction. The fabric has good stretch characteristics in both the coursewise and walewise directions, with the stretch in the walewise direction being substantially the same as that in the coursewise direction. The fabric also has good opacity, even when stretched.
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BACKGROUND OF THE INVENTION

[0001] The invention is directed to a knit fabric particularly useful in the manufacture of undergarments and the like, and a method of making the same. More specifically, the invention is directed to an elastic tricot knit fabric having substantially balanced stretch characteristics in the coursewise direction versus the walewise direction and good opacity, and methods of knitting the fabric.

[0002] Tricot knit fabrics are commonly used in the manufacture of upholstery, apparel, and the like. Such fabrics are valued for their manufacturing speed and aesthetic characteristics.

[0003] One characteristic of traditional tricot fabrics is that they have unbalanced stretch in the coursewise direction versus the walewise direction, in particular in those tricot fabrics incorporating elastic yarns. For example, the stretch in the coursewise direction is about twice that of the stretch in the walewise direction in a typical elastic-containing tricot fabric. As a result, manufacturers using tricot fabrics to produce shaped articles such as fitted garments and undergarments must typically orient the pattern pieces on the fabric in a manner designed to optimize the fabric stretch in the direction desired on the garment or undergarment. This requires significant planning, and does not always lead to the most efficient utilization of the fabric. Furthermore, this requires the manufacturer to determine in which direction it is more important to have the primary stretch characteristics, often sacrificing stretch in other areas as a result.

[0004] Another challenge presented to garment manufacturers by tricot fabrics is that they tend to be sheer when stretched. This can be disadvantageous in many garment end uses, since the wearer may desire that the front or body remain “covered” irrespective of the amount that the garment is stretched. As a result, garment manufacturers are often forced to use multiple layers of fabric (e.g. such as one or more lining layers) to improve the opacity of the garment.

SUMMARY

[0005] The instant invention achieves substantially balanced stretch characteristics in an elastic tricot knit fabric. In addition, the fabric has good opacity, so as to provide good coverage, even when the fabric is in a stretched condition.

[0006] The fabric of the invention is desirably tricot knit using a three bar knitting arrangement. Preferably, at least one, and more preferably at least two of the bars knit substantially non-elastic yarns, while at least one bar knits elastic yarns. Because the elastic yarns are knit into the fabric structure itself so that they extend in a generally walewise direction, they provide the fabric with good stretch characteristics, and provide a good durable fabric construction, which retains its stretch characteristics.

[0007] As noted, the fabric of the present invention has substantially balanced stretch characteristics. In particular, the ratio of stretch in the coursewise direction versus the walewise direction is preferably between about 1 and about 1.5. In a preferred form of the invention, the ratio of stretch in the coursewise direction versus the walewise direction is about 1.25. In a particularly preferred form of the invention, the ratio of stretch is about 1, meaning that the stretch in the coursewise direction is substantially the same as the stretch in the walewise direction.

[0008] In addition, the fabric provides a unique desirable pattern of oscillating cables in the walewise direction, and has been surprisingly found to provide good opacity when stretched in any and/or all directions, without necessitating further processing or layering to enhance opacity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a photograph of the front side of a fabric of the invention; and

[0010] FIG. 2 is a stitch notation diagram showing the stitch pattern used to knit the fabric illustrated in FIG. 1.

DETAILED DESCRIPTION

[0011] In the following detailed description of the invention, specific preferred embodiments of the invention are described to enable a full and complete understanding of the invention. It will be recognized that it is not intended to limit the invention to the particular preferred embodiment described, and although specific terms are employed in describing the invention, such terms are used in a descriptive sense for the purpose of illustration and not for the purpose of limitation.

[0012] The fabric of the invention is desirably tricot knit using a three bar knitting arrangement. Preferably, at least one, and more preferably at least two of the bars knit substantially non-elastic yarns, while at least one bar knits elastic yarns. In a preferred form of the invention, twice as many guide bars knit substantially non-elastic yarns as knit elastic yarns. Because the elastic yarns are knit into the fabric structure itself (i.e. they form loops which form part of the fabric structure, as opposed to being laid-in or inserted), they provide the fabric with good stretch characteristics, and provide a good durable construction.

[0013] As noted, the fabric desirably has substantially balanced stretch between the coursewise and walewise directions, giving the fabric “square stretch” characteristics. In other words, the fabric stretches substantially the same amount in the “top to bottom” direction as it does in a “side-to-side” direction. In a preferred form of the invention, the fabric stretches from about 60 to about 160% in each of the coursewise and walewise directions, more preferably from about 100 to about 150%, and even more preferably about 75 to about 105%. (These degrees of stretch can be readily determined by performing ASTM Test Method D4964-1996, as will be readily appreciated by those of ordinary skill in the art.) The ratio of walewise stretch to coursewise stretch is approximately 1 to about 1.5. (In other words, the stretch in one direction is preferably no more than about 50% more or less than the stretch in the other direction, and more preferably the stretch in one direction is no more than about 25% more or less than that of the other direction.) In a particularly preferred form of the invention, the stretch in the coursewise direction is substantially equal to the stretch in the walewise direction (in other words, the ratio is about 1.)

[0014] The fabric can be knit from any type of yarns desired by the manufacturer. As mentioned, at least one bar
is desirably knit from substantially non-elastic yarns, while at least one bar is desirably knit from elastic yarns. Preferably, two bars are knit from substantially non-elastic yarns while one bar is knit from elastic yarns. The substantially non-elastic yarns can be of any variety chosen to provide the end fabric with the desired characteristics. For example, the yarns can be spun yarns, filament yarns, flat yarns, textured yarns, novelty yarns or the like. Furthermore, the yarns can be made from any type of fiber, including but not limited to synthetic fibers, natural fibers, and combinations thereof. For example, the yarns can be nylon, polyester, polyactide-based fibers (commonly known as “PLA”), polytrimethylene terephthalate fibers (“PET”), cellulose fibers, or the like, or combinations thereof. Furthermore, the elastic yarns can be of any desired variety, including but not limited to spandex, natural or synthetic rubber, traditionally non-elastic yarns, which have been structurally or mechanically modified to render them elastic, or combinations thereof. In a preferred form of the invention, the elastic yarns are spandex.

[0015] The yarns can be of any size, and will be selected to achieve the weight, thickness, and aesthetic appearance desired for the end fabric. Where the fabric is to be used in the manufacture of apparel such as lingerie or bathing suits, it has been found to use yarns about 75 denier or less in size. For example, 40 denier yarns have been found to perform well in the invention. However, yarns of any size can be utilized within the scope of the instant invention. Furthermore, the yarn sizes used in the various bars can be the same or different from those contained in the same and other guide bars.

[0016] As illustrated in FIG. 1, the fabric, shown generally at 10, desirably has a unique pattern of oscillating cables 12 in the walewise direction, and has been surprisingly found to provide good opacity when stretched in any direction and/or in plural directions, without the need for further processing or layering to enhance opacity. As will be readily appreciated, this is of particular advantage when the fabric is to be used in markets such as lingerie, where the ability for the fabric to obscure underlying body regions is of particular importance.

[0017] FIG. 2 illustrates an exemplary stitch notation that can be used to form the fabrics of the invention. As illustrated, the third bar is knit with three ends threaded in and three “threaded out” (i.e., no yarn was threaded in these positions on the guide bar.) However, it is noted that other threading arrangements (e.g. 4 ends in/4 ends out, or 5 ends in/5 ends out) could be used within the scope of the invention. Bar 3 was threaded with 40 denier filament flat (i.e. untextured) nylon yarns. In this example of the fabric production, Bar 3 had 1983 total ends supplied by three individual warp beams. The stitch pattern followed by guide Bar 3 was 2-1/1-2/2-1/1-2/1-4/0-0/1-1/0-0/1-/.

[0018] Bar 2 was fully threaded, meaning that all active positions were threaded, with 40 denier nylon flat yarns, for a total of 4020 ends supplied from three individual warp beams. Bar 2 followed a 3-4/1-0/ stitch pattern.

[0019] Bar 1 was also fully threaded, in this case, with 40 denier spandex yarns. Bar 1 followed a 1-0/1-2/- stitch pattern, with the spandex being input at typical run-in levels used to knit spandex in warp knit fabrics, as will be readily appreciated by those of ordinary skill in the art. A total of 4020 ends were supplied from three individual warp beams.

[0020] The fabric produced in this example had a weight of about 6.24 oz/sq yd, and a stretch of about 100% in each of its coursewise and walewise directions when tested according to ASTM D4964-1996. This fabric would have particular utility in the production of brassieres, due to its high opacity and strong, balanced stretch characteristics.

[0021] The fabrics of the invention, due to their unique combination of balanced stretch, opacity when stretched, and desirable oscillating cable appearance, can be used in a variety of end uses, including but not limited to undergarments, garments, swimsuits, upholstery, and the like. In particular, the fabrics are useful in the manufacture of brassieres, and particularly those where the size of the cups is designed to be selectively modified by the wearer through the insertion of supplemental padding, and those designed to be circumferentially adjusted to enhance the uplift of the wearer’s cleavage. Because of the balanced stretch feature of the fabrics, the fabrics enable this adjustment of the garment while maintaining the stretch and support in all directions.

[0022] As noted above, a three guide bar arrangement has been found to produce desirable fabrics according to the instant invention. In one aspect of the invention, less than all of the guides in an individual guide bar (e.g. the third guide bar) contain yarns during the knitting process. Particularly preferred is an arrangement of alternating sets of threaded and unthreaded guides, with the threaded guides containing yarns and the unthreaded guides not containing yarns. For example, it has been found to be desirable to provide alternating sets of threaded and unthreaded guides, with the same number of guides being in the threaded guide sets as are in the unthreaded guide sets. (e.g., three, four, five, etc.)

[0023] In the 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 purpose of limitation, the scope of the invention being defined in the claims.

We claim:
1. An elastic-containing tricot fabric having a first degree of stretch in the coursewise direction and a second degree of stretch in the walewise direction, wherein the ratio between the first and second degrees of stretch is about 1 to about 1.5.
2. The fabric according to claim 1, wherein the ratio between the first and second degrees of stretch is about 1 to about 1.25.
3. The fabric according to claim 1, wherein the first degree of stretch in the coursewise direction is substantially equal to the second degree of stretch in the walewise direction.
4. The fabric according to claim 1, wherein said fabric defines a pattern of oscillating cables extending in a walewise direction along the fabric.
5. The fabric according to claim 1, wherein the first degree of stretch is about 60% to about 160% when tested according to ASTM D4964-1996.
6. The fabric according to claim 1, wherein the second degree of stretch is about 60% to about 160% when tested according to ASTM D4964-1996.
7. The fabric according to claim 1, wherein the first degree of stretch is about 75% to about 105% when tested according to ASTM D4964-1996.
8. The fabric according to claim 1, wherein the second degree of stretch is about 75% to about 105% when tested according to ASTM D4964-1996.
9. The fabric according to claim 1, wherein the first degree of stretch is about 75% to about 105% and the second degree of stretch is about 75% to about 105% when the fabric is tested according to ASTM D4964-1996.

10. A tricot knit fabric having knit in elastic yarns, wherein the ratio of stretch in the walewise direction of said fabric versus the stretch in the coursewise direction is between about 1 and about 1.5.

11. The fabric according to claim 10, wherein the stretch in each of the coursewise and walewise directions is about 60% to about 160% when tested according to ASTM D4964-1996.

12. The fabric according to claim 10, wherein the stretch in each of the coursewise and walewise directions is about 60% to about 160% when tested according to ASTM D4964-1996.

13. The fabric according to claim 10, wherein said fabric is formed from a three guide bar arrangement, wherein the third guide bar follows a 2-1/1-2-1/1-2-1/1-0/0-1-1/0-1// pattern, the second guide bar follows a 3-4/1-0// pattern, and the first guide bar follows a 1-0/1-2// pattern.

14. The fabric according to claim 13, wherein the third guide bar forms a plurality of spaced apart oscillating cables in the fabric.

15. The fabric according to claim 13, wherein portions of fabric made from yarns supplied by the second and third guide bars comprise substantially non-elastic yarns and portions of the fabric made from yarns supplied by the first guide bar comprise elastic yarns.

16. A method of making a knit fabric comprising the steps of:
   knitting a third guide bar in a 2-1/1-2-1/1-2-1-0/0-1-1-0/1// pattern, and knitting a second guide bar in a 3-4/1-0// pattern; and
   knitting a first guide bar threaded with elastic yarns in a 1-0/1-2 pattern, to thereby form a fabric having substantially balanced stretch characteristics.

17. A method according to claim 16, wherein said third guide bar is threaded with substantially non-elastic yarns.

18. A method according to claim 16, wherein less than all of the guides in the third guide bar contain yarns.

19. A method according to claim 18, wherein said third guide bar defines a first plurality of guides which contain yarns and a second plurality of guides which do not contain yarns.

20. A method according to claim 19, wherein said first plurality of guides and said second plurality of guides form alternating sets of threaded and unthreaded guides, with the threaded guides containing yarns and the unthreaded guides not containing yarns.

21. A method according to claim 20, wherein each alternating set of threaded guides contains the same number of guides as each alternating set of unthreaded guides.

22. A method according to claim 21, wherein each set of threaded guides comprises three guides and each set of unthreaded guides comprises three guides.

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