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(54) **Elastic knitted fabric**

(57) A weft knitted elasticated fabric produced from a combined ground yarn which is formed into knitted loops on selected courses and which comprises an elastomeric yarn combined with an accompanying non-elastomeric yarn, the elastomeric yarn having a yarn count in the range of 70 to 160 dtex and the accompanying yarn having a yarn count in the range of 5 to 80 dtex.

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Description

[0001] The present invention relates to a knitted elasticated fabric primarily intended for use in the manufacture of garments.

[0002] The invention relates in particular to weft knit elasticated fabrics, and especially circularly knit fabrics suitable for use in the manufacture of seamless garments.

[0003] The fabric of the present invention may be utilised in garment manufacture so as to exert a desired degree of compression onto the body of the wearer in predefined regions of the garment in order to shape and/or provide support for those parts of the body covered by said predefined regions. This enables the fabric to provide "all-round" control.

[0004] It is also possible for the fabrics of the invention to be incorporated into a garment so as to provide elastication in desired parts of the garment for improving the fit or support of the garment on the body of the wearer, eg. the fabric may form a body encircling band in order to act as a waist band for the garment or may for example form the wing areas of a brassiere.

[0005] Control fabrics are known for the manufacture of foundation garments such as girdles. These control fabrics are usually produced from heavy, covered, synthetic or natural rubber yarns and so tend to have poor drape (i.e. they are relatively stiff), of coarse handle (i.e. feel coarse when rubbed), of hard feel (i.e. are not soft to the touch) and be relatively heavy in weight. These fabrics therefore have a very different performance to the normal, non-elasticated, fabrics used for the construction of ladies underwear and so are not normally considered for the manufacture of anything other than specific foundation garments.

[0006] It has been recognised by the present applicants that new powerful relatively lightweight elastomeric yarns make it possible to produce lightweight fabrics having a similar compressive performance to the heavier weight covered synthetic or natural rubber yarns. However use of these new lightweight elastomeric yarns does not solve other problems associated with heavy control fabrics such as poor handle, drape and hard feel. Also use of a high content of elastomeric yarns can cause the fabric to generate an undesirable rustling sound when handled.

[0007] It is a general aim of the present invention to provide a lightweight control fabric that has a relatively high modulus of elasticity but yet exhibits similar drape, handle and feel properties to a normal non elasticated fabric as used for garment construction.

[0008] A further aim of the invention is to provide such a control fabric having an acceptably low rustling sound when handled.

[0009] According to one aspect of the present invention there is provided a knitted control fabric having a weight in the range of 150 to 250 gm/m² and a modulus of elasticity (as hereinafter defined) in the range of 120

g to 500 g (at 40% extension under 1.5kg on the second cycle of extension).

[0010] According to another aspect of the present invention there is provided a weft knitted elasticated fabric produced from a combined ground yarn which is formed into knitted loops on selected courses, the combined ground yarn including an elastomeric yarn having a yarn count in the range of 70 to 160 dtex and an accompanying yarn having a yarn count in the range of 5 to 80 dtex.

[0011] In the present specification the modulus of elasticity is determined by the industry standard P15a test. This test involves stretching the fabric to its maximum extension, fully relaxing the fabric and then measuring the force (in grams) required to maintain the fabric at a 40% extension.

[0012] In this specification a combined ground yarn is a yarn comprising at least two separate yarns, an elastomeric yarn and an accompanying non-elastomeric yarn, which are combined together to form knitted stitches. The combined ground yarn may be a covered yarn wherein the elastomeric yarn defines the core of the covered yarn and the accompanying yarn defines a covering yarn. Alternatively, the combined yarn may be in the form of a bare elastomeric yarn plated with an accompanying yarn.

[0013] The accompanying yarn is chosen to provide a desirable soft feel and good drape to the fabric and also is preferably chosen in combination with the knitted gauge to provide a fabric which in its unstretched condition is substantially opaque.

[0014] The accompanying yarn is also preferably chosen to provide the fabric with a clean/sharp appearance, i.e. the surface of the fabric is substantially devoid of projecting fibre ends or hairs.

[0015] Preferably the accompanying yarn may be a multifilament or microfilament yarn such as a polyamide yarn or may be a hollow fibre yarn. Preferably, when the combined yarn is a covered yarn, the covering yarn is a continuous yarn which is applied by a covering technique so as to have a number of twists in the range of 600-1000 twists per metre (TPM). The covering yarn may be applied as a single or double covering.

[0016] The number of twists per meter may be varied within this range in order to provide the required softness and clean/sharp fabric appearance. In this respect, a lower number of twists tends to provide a softer feel of the fabric but tends to reduce the clean / sharp appearance of the fabric. In addition the lower the number of twists per metre of the covering yarn, the less the stiffening affect of the covering yarn on the elastomeric core and hence the better the drape of the fabric.

[0017] Conversely, the higher the number of twists, the stiffer the affect of the covering yarn on the elastomeric core and so the poorer the drape of the fabric. Also the higher the number of twists also provides a harder feel but provides a cleaner / sharper appearance for the fabric.

[0018] The elastomeric core is preferably an elastane, preferably a soft elastane, such as for example LYCRA T902 (RTM) or a low modulus gentle stretch elastane such as LINEL (RTM) as supplied by Fillattice SpA.

[0019] In order to increase the power or modulus of elasticity of the elastomeric yarn, it is preferred to draw the elastomeric yarn prior to covering. Preferably drawing of the elastomeric yarn is performed at a draw ratio in the range of 3-5:1.

[0020] When the combined yarn is a bare elastomeric yarn plated with an accompanying yarn, the elastomeric yarn is knitted under tension to provide the desired power or modulus of elasticity of the fabric.

[0021] It is envisaged that the performance of the fabric may be altered in a predefined manner by incorporating an additional combined ground yarn comprising an elastomeric yarn and accompanying yarn. The additional combined ground yarn may comprise an elastomeric yarn having a yarn count in the range of 40 to 130 dtex and an additional yarn having a yarn count in the range of 5 to 80 dtex. The additional combined ground yarn may be formed into knitted loops on pre-selected courses interposed between said selected courses of the combined ground yarn and the dtex value of the additional combined ground yarn elastomeric yarn is chosen to be different to the dtex value of the ground yarn elastomeric core.

[0022] Accordingly, if a large predetermined number, say more than 5, adjacent courses of the additional combined ground yarn are provided then a coursewise band of reduced or increased modulus of elasticity may be formed in-between adjacent areas formed by adjacent courses of the combined ground yarn.

[0023] Alternatively, a small number (say 1 to 4) of adjacent courses of the additional ground yarn may be alternated with a small number (say 1 to 4) of adjacent courses of the combined ground yarn for a majority number of courses of the fabric in order to provide a consistent performance throughout the majority of the fabric. With such an arrangement the additional combined ground yarn may be utilised to give dimensional stability to the fabric by partial / full setting whilst the ground yarn provides the fabric with a high modulus of elasticity.

[0024] In order to give the fabric of the invention a quick response to recovery from stretch and also a high modulus of elasticity, it is preferred that the elastomeric yarn of the combined ground yarn is either not set or only partially set after knitting of the fabric. For example, it is preferred that the lower the dtex value of the elastomeric yarn used, the lower the amount of setting performed on the elastomeric yarn. Using an elastomeric yarn of a higher dtex value, say 130, enables the yarn to be set to provide similar modulus of elasticity performance of say an unset 78 dtex elastomeric yarn but provide improved handle, drape and dimensional stability.

[0025] In order to provide the fabric with zones of different stretch, elastic recovery or compressive performance, it is envisaged that the elastomeric yarn may be

knitted using different stitch structures or different stitch sizes in selected areas of the fabric. Also it is envisaged that additional, non-elastomeric and/or additional elastomeric yarns may be incorporated into selected areas of the fabric in order to modify the performance of the fabric in those areas.

[0026] For example, it is envisaged that the fabric is largely knit with plain stitches and that in certain areas a stitch selection may be performed, e.g. a mock rib stitch, to reduce the width and length stretch in those areas.

[0027] Similarly, the stitch size in the plain stitch or stitch selection areas may be varied to increase or decrease length and width stretch of the fabric (i.e. the smaller or tighter the stitch the less the lengthwise and widthwise stretch).

[0028] It is also envisaged that additional yarns may be incorporated into the fabric in selected areas to reduce the lengthwise and widthwise stretch of fabric in those areas. The additional yarn may also provide reinforcement of the fabric in those areas. The additional yarn may be incorporated into the fabric by knitting stitches and or by laying-in.

[0029] It is envisaged that the additional yarn may be any non-elastomeric yarn having the desired feel, handle and drape characteristics. The non-elastomeric yarn may be flat or textured. A flat or textured polyamide having a yarn count in the range of 20-160 dtex is preferred for use in the construction of ladies underwear.

[0030] In order to improve the handle, drape and feel of the fabric, it is envisaged that the fabric may be processed in a finishing treatment such as steam relaxation and/or heat treatment and/or application of a softening agent.

[0031] In a specific example wherein the combined ground yarn is a covered yarn, a suitable fabric for underwear is obtained using a covered yarn having a core formed from a 156 dtex 'LINEL' (RTM) elastane (as defined above) covered by a microfibre covering yarn formed from 26 dtex / 28 filament polyamide.

[0032] In a further specific example wherein the combined ground yarn is defined by an elastomeric yarn plated with an accompanying yarn, a fabric suitable for underwear may be produced using bare LYCRA (RTM) 902 elastane plated with an accompanying yarn formed from a 26 dtex / 28 filament microfibre polyamide. In both specific examples, a finishing treatment involves heat treating the fabric in a steam autoclave at a temperature of about 135°C for 1 minute.

[0033] Using a combined ground yarn in the form of a plated elastomeric yarn and an accompanying yarn is advantageous in that it is possible to vary the modulus of elasticity of the fabric by varying the tension applied to the bare elastane whilst knitting on the knitting machine. It is also possible with this technique to generate a higher modulus of elasticity in the fabric by this technique than by increasing the draw of a covered yarn. It is therefore possible when the combined yarn is a plated

yarn, to have a higher weight of elastomeric yarn compared to that forming the core of a covered yarn for producing a fabric having a desired modulus of elasticity.

[0034] The fabric of the present invention is lightweight but can provide a degree of compression normally associated with heavier foundation fabrics. The fabric of the present invention also has a soft feel, good drape and good handle.

[0035] The fabric of the present invention therefore provides an elasticated fabric which can be used to make underwear garments for providing shape and/or support for the body of the wearer whilst avoiding the problems associated with heavy foundation garments. This therefore enables garments made from the fabric of the present invention having a shaping and/or supporting function to be fashionable and feminine.

Claims

1. A weft knitted elasticated fabric produced from a combined ground yarn which is formed into knitted loops on selected courses and which comprises an elastomeric yarn combined with an accompanying non-elastomeric yarn, the elastomeric yarn having a yarn count in the range of 70 to 160 dtex and the accompanying yarn having a yarn count in the range of 5 to 80 dtex.
2. A fabric according to Claim 1 wherein said combined ground yarn is formed into knitted loops on adjacent courses for a majority of courses of said fabric.
3. A fabric according to Claim 1 wherein an additional combined ground yarn is formed into knitted loops on pre-selected courses interposed between said selected courses of said combined ground yarn.
4. A fabric according to Claim 3 wherein said additional combined ground yarn comprises an elastomeric yarn having a yarn count in the range of 40 to 130 dtex and an accompanying yarn having a yarn count in the range of 5 to 80 dtex and wherein the dtex value of said elastomeric yarn of said combined ground yarn is different to the dtex value of said elastomeric yarn of said additional combined ground yarn.
5. A fabric according to Claim 3 or 4 wherein a predetermined number of courses of said combined ground yarn alternate with a predetermined number of courses of said additional combined ground yarn for a majority of courses of the fabric.
6. A fabric according to any preceding claim having a weight in the range of 150 gm to 250 gm/m².
7. A fabric according to Claim 6 having a modulus of elasticity in the range of 120g to 500g.
8. A fabric according to any preceding claim wherein said elastomeric yarn of said combined ground yarn and/or said additional combined ground yarn comprises an elastane.
9. A fabric according to any preceding claim wherein said accompanying yarn is a flat or textured polymeric yarn.
10. A fabric according to Claim 9 wherein the polymeric yarn is a multifilament or microfibre yarn.
11. A fabric according to any of Claims 1 to 8 wherein the covering yarn is a natural fibre yarn such as cotton.
12. A fabric according to any preceding claim wherein said combined ground yarn and/or additional combined ground yarn comprise a covered yarn wherein the elastomeric yarn defines the core of the covered yarn and the additional yarn defines the covering yarn wrapped around said core.
13. A fabric according to Claim 12 wherein the covering yarn is twisted about the core so as to have a number of twists per metre in the range of 800 to 1200.
14. A fabric according to Claim 12 or 13 wherein said elastomeric core of the combined ground yarn and/or additional combined ground yarn is a drawn yarn.
15. A fabric according to any of Claims 1 to 11 wherein said combined ground yarn and/or said additional combined ground yarn is defined by said elastomeric yarn plated with said accompanying yarn.
16. A fabric according to any preceding claim including, in selected areas of the fabric, an additional non-elastomeric yarn to reduce stretch of the fabric in said selected areas.
17. A fabric according to any preceding claim wherein in predetermined areas of the fabric, the stitch size is larger or smaller to increase or decrease respectively fabric stretch in said areas.
18. A fabric according to any preceding claim wherein in predefined areas of the fabric, the stitch structure differs to decrease, in the coursewise and/or walewise direction, fabric stretch.
19. A fabric according to any preceding claim wherein in selected areas of the fabric a predefined pattern is provided, the pattern being created by a pattern

stitch structure and/or patterning yarns in said selected areas.

- 20.** A garment constructed, at least in part, from fabric according to any preceding claim.

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- 21.** A garment according to Claim 20 wherein the elastomeric yarn of the combined ground yarn is not fully set.

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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 4077

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Place of search MUNICH		Date of completion of the search 20 September 2003	Examiner Dreyer, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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