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(54) **A STRETCHABLE FABRIC AND A METHOD,
A WRINKLE-FREE FABRIC AND
GARMENTS THEREOF**

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(57) **ABSTRACT**

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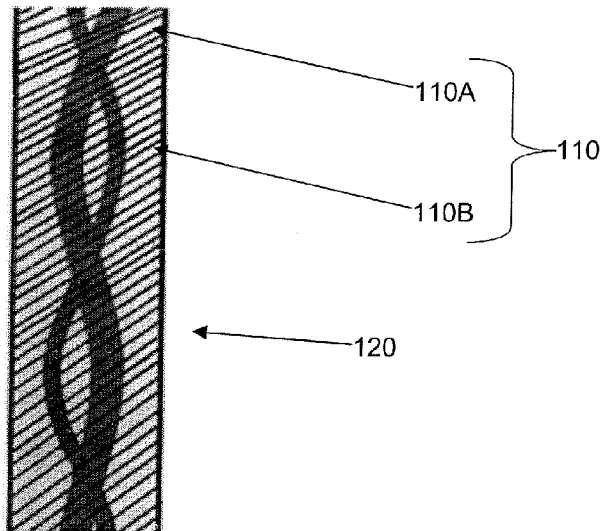
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Described here in various embodiments is a stretchable yarn, a stretchable fabric made of the stretchable yarn, and a wrinkle-free stretchable garments having the stretchable fabric or manufactured from the stretchable fabric. Said stretchable yarn comprises a core yarn and staple fibres wherein the core yarn manufactured by intermingling a filament and an elastomeric yarn and said core yarn is bled with the staple fibers.

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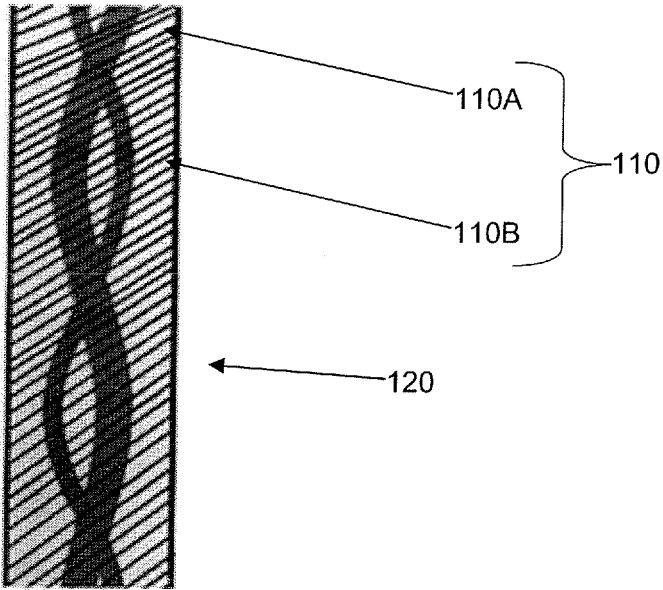


Figure 1

**A STRETCHABLE FABRIC AND A METHOD,
A WRINKLE-FREE FABRIC AND
GARMENTS THEREOF**

FIELD OF THE INVENTION

[0001] The present invention relates to a wrinkle-free fabric. More particularly, the present invention relates to a stretchable wrinkle-free fabric, a stretchable yarn for the said fabric and garments made thereof.

BACKGROUND OF THE INVENTION

[0002] Garments made out of stretch woven fabric have gained lot of popularity due to its comfort property and there is a demand in market place for stretch garments with non-iron properties. The stretch or stretchable fabric is a fabric which stretches and stretch the fabrics either 2-way or 4-way. The stretchable fabric includes an elastomeric yarn in warp and/or weft directions making the fabric stretchable.

[0003] The wrinkle-free finish such as fabrics and/or garments are also known as “Easy Care”, “Durable Press”, “Wrinkle-Resistant”, “Wash and Wear”, “No Iron”, “iron free”, “permanent press finish” etc. This permanent press finish function is obtained by forming cross-links between adjacent cellulose polymer chains which gives some elastic and resiliency properties to the cellulosic fibers. Such cross-linking of cellulosic fibers recovers the fabric from deformation stresses and thus wrinkles will not form. However, the wrinkle-free property is obtained at the cost of reduction in the tensile and tear strength of the fabric. Presently, there are three processes for manufacturing the wrinkle-free fabrics are used which includes pre-cure, post-cure and garment dipping. The more preferable process of wrinkle-free for mens wear and womens wear is the garment dipping. In garment dipping process, garments are constructed from non-resinated fabric, then impregnated or the resin is applied by spraying it onto the garment during tumbling process in an enclosed rotational device. A micro-processor is used to meter the exact amount of chemicals and to control the rotation time, desired wet pick-up, spray rate and process time. The garments are then pressed and cured. However, there is significant reduction in the strength of the fabric. The loss is about 40-60% of tensile and tear strength. If a regular stretch fabric with cotton/elastomeric weft, is subjected to garment dipping treatment, the strength and shape retention properties of the garment gets compromised. Shape retention properties of such garments further deteriorate once subjected to repeated home launderings. If the garments made of present regular stretchable fabrics processed for wrinkle-free by the dipping, tensile strength and tear strength of the stretchable fabrics decrease below the acceptable limits defined by various leading brands. Further, though other methods can be used for producing stretchable wrinkle-free fabric, those are also decreasing the strength of the stretchable fabric to a considerable amount which may lead to decrease in the wear life and durability of the stretchable fabric.

[0004] Hence there is a need of a wrinkle-free fabric that can stretch in 2-way or 4-way directions solving at least one of the problems discussed above.

SUMMARY OF THE INVENTION

[0005] In one aspect, provided herein is a woven stretch fabric comprising a plurality of warp yarns and a plurality of

weft yarns wherein either weft yarns or warp yarns, or both, are stretchable yarns, each stretchable yarn includes a core yarn made of filament and elastomeric yarn and said core yarn is blended with staple fibres.

[0006] In some embodiments of the woven stretch fabric, the plurality of warp yarns comprise a core yarn of filament and elastomeric yarns wherein the core yarns are covered by staple fibres.

[0007] In some embodiments of the woven stretch fabric, the weft yarns preferably comprises the stretchable yarns to make fabric stretchable in two directions.

[0008] In some embodiments of the woven stretch fabric, the warp and weft yarns comprise the stretchable yarns to make fabric stretchable in four directions.

[0009] In some embodiments of the woven stretch fabric, the core yarn is obtained by intermingling a filament and an elastomeric yarn by nipping of the filament and the elastomeric yarn with the nip frequency ranging from 80-200 nips per meter.

[0010] In some embodiments of the woven stretch fabric, the filament yarn comprises polyester filaments. Advantageously, the filament denier of the stretchable yarn ranges from 20 D to 300 D.

[0011] In some embodiments of the woven stretch fabric, the stretchable yarn comprises a polyester yarn in an amount of about 15% to about 20% by weight of the total weight of the stretchable yarn.

[0012] In some embodiments of the woven stretch fabric, the elastomeric yarn comprises polyurethane.

[0013] In some embodiments of the woven stretch fabric, the stretchable yarn comprises a polyurethane yarn in an amount of about 2% to about 6% by weight of the total weight of the yarn. Advantageously, the elastomeric denier of the stretchable yarn ranges from 20 D to 140 D.

[0014] In some embodiments of the woven stretch fabric, the staple fibre is in an amount of about 75% to about 80% by weight of the total weight of the stretchable yarn. In some embodiments of the woven stretch fabric, the staple fibre is selected from the group consisting of cotton fibers, regenerated cellulose fibers, manmade fibers, and combinations thereof. In some embodiments of the woven stretch fabric, the warp count of the fabric ranges from 8 s Ne to 100 s Ne and the weft count of the fabric ranges from 8 s Ne to 70 s Ne.

[0015] In some embodiments of the woven stretch fabric, the woven stretch fabric is a wrinkle resistant fabric further comprising an impregnated resin or a sprayed on resin.

[0016] In another aspect, provided herein is a method for manufacturing a woven stretch fabric or garment thereof, comprising the steps of providing a plurality of warp yarns, providing a plurality of weft yarns comprising stretchable yarns, each stretchable yarn having a core yarn comprising a filament and an elastomeric yarn wherein the core yarns are covered by staple fibres, and, weaving the warp yarns and weft yarns to form a stretchable fabric.

[0017] In one embodiment of the method, the method include a step of treating the stretchable fabric with liquid ammonia.

[0018] In one another embodiment of the method, the method include a step of optionally dipping the ammonia treated stretchable fabric or garment thereof in a resin to obtain a wrinkle-free fabric or garment thereof.

[0019] In one another aspect, the present invention provides a wrinkle free stretch garment manufactured from a

woven stretch fabric provided by at least one of the aforementioned aspects of the present invention.

[0020] In one more another aspect, a stretchable yarn for manufacturing stretchable fabric, comprising a core yarn and staple fibres wherein the core yarn manufactured by intermingling a filament and an elastomeric yarn, said core yarn blended with the staple fibres on ring spinning machine for covering the core yarn with staple fibers.

BRIEF DESCRIPTION OF DRAWINGS

[0021] FIG. 1 shows a stretchable yarn described herein.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Other objects, features, and advantages of this invention will appear from the specification, claims, and accompanying drawings which form a part hereof. In carrying out the objects of this invention, it is to be understood that its essential features are susceptible to change in design and structural arrangement, with only one practical, and preferred embodiment being illustrated in the accompanying drawings, as required.

[0023] The terms “a”, “an”, and “the” as used in the claims herein are used in conformance with long-standing claim drafting practice and not in a limiting way. Unless specifically set forth herein, the terms “a”, “an”, and “the” are not limited to one of such elements, but instead mean “at least one”.

[0024] The present invention in various embodiments provides a stretchable yarn, a stretchable fabric made of the stretchable yarn, and a wrinkle-free stretchable garments having the stretchable fabric or manufactured from the stretchable fabric.

[0025] FIG. 1 shows the stretchable yarn (100) according to a preferred embodiment of the present invention. The stretchable yarn (100) comprises a core yarn (110) and staple fibers (120).

[0026] According to the present invention, the core yarn (110) is manufactured by intermingling a filament yarn (110A) and an elastomeric yarn (110B) through nipping of elastomeric and filament yarns with the nip frequency ranging from 80-200 nips per meter. Then, the stretchable yarn (100) is ring spun by a core spinning yarn technology wherein staple fibers (120) are wrapped or cover the core yarn (110). Various methods and systems are known in the textile field can be used for core spinning of the stretchable yarn according to present invention. In the present invention a conventional core spinning attachment with ring spinning systems is used to manufacture the stretchable yarn according to the present invention.

[0027] According to the present invention, the filament denier of the stretchable yarn (100) ranges 20 D to 300 D. The filament yarn (110A) comprises polyester filaments. Preferably, the stretchable yarn comprises a polyester yarn in an amount of about 15% to about 20% by weight of the total weight of the stretchable yarn.

[0028] According to the present invention, the elastomeric denier of the stretchable yarn ranges from 20 D to 300 D. The elastomeric yarn (110B) comprises polyurethane. Preferably, the stretchable yarn comprises a polyurethane yarn in an amount of about 2% to about 6% by weight of the total weight of the yarn.

[0029] According to the present invention, the staple fibre (120) in an amount of about 75% to about 80% by weight of the total weight of the stretchable yarn. The staple fibres (120) may be selected from a group including cotton, fibers, regenerated cellulose fibers, manmade fibers, natural fibers and combination thereof.

[0030] The present invention also provides a stretchable yarn for manufacturing a wrinkle-free stretch garment, said yarn comprising a core ply yarn of filament and elastomeric yarn covered by cotton fibres or staple fibres has instant absorbency to allow resin to penetrate into the very interior of the fibres and form crosslinks for making the wrinkle-free stretch fabric.

[0031] Accordingly, a woven stretch fabric ready to make wrinkle-free fabric or garment is manufactured by weaving the stretchable yarns (100). The said woven stretch fabric comprises a plurality of warp yarns and a plurality of weft yarns interlaced to form a woven fabric, wherein either weft yarns, so warp yarns or both comprises the stretchable yarns (100). In the present invention, a known woven technology is used for weaving the stretchable yarns with warp yarns. The fabric made from the stretchable yarns (100) has increased absorbency that allows resin to penetrate into the interior of the fibres of yarns and forming of crosslinks for making the wrinkle-free fabric stretchable at least in two or four directions.

[0032] Preferably, all weft yarns comprises stretchable yarns and the warp yarns comprises ring spun yarns for making a wrinkle-free garment with stretchability in two directions. The warp yarns can be single ply or multiply-ring spun staple fibres. Alternatively, the woven stretch fabric ready to make a wrinkle-free fabric or garment, comprises stretchable yarns in both weft and warp direction for making a wrinkle-free garment having stretchability in four directions.

[0033] According a preferable embodiment of the present invention, the woven stretch fabric has a weight preferably ranging between 80-450 gsm. The warp count of the stretchable fabric ranges from 8 s Ne to 100 s Ne and the weft count of the fabric ranges from 8 s Ne to 70 s Ne.

[0034] The present invention also provides a method for manufacturing a woven stretch fabric ready to make a wrinkle-free fabric or garment comprising steps of providing a plurality of warp yarns, providing a plurality of weft yarns comprising stretchable yarns, and weaving the warp yarns and weft yarns to form a fabric. According to the present invention, each stretchable yarn having a core ply yarn of filament and elastomeric yarn covered by cotton fibers or staple fibres for increasing absorbency to allow resin to penetrate into the very interior of the fibres and form crosslinks for making the wrinkle-free fabric stretchable in two directions.

[0035] According to the present invention, the warp yarns may also comprise stretchable yarns, each stretchable yarn having a core ply yarn of filament and elastomeric yarn covered by cotton fibers or staple fibres for increasing absorbency to allow resin to penetrate into the very interior of the fibres and form crosslinks for making the wrinkle-free fabric stretchable in four directions.

[0036] According to the present invention, the method comprises further step of treating the fabric with liquid-ammonia at ultra-low temperatures for causing deconvolution of cellulosic fibre, smoothing of the surface, swelling of the fibre to a circular cross section, improved absorbency,

strength and lustre and touch of the woven stretch fabric ready to make a wrinkle-free fabric or garment.

[0037] According to the preferable embodiment of the present invention, a garment is manufactured from the liquid-ammonia treated woven stretch fabric and treated with the resins by a garment dipping method to obtain a woven wrinkle-free stretch garment. The woven stretch wrinkle-free garment obtained from the woven stretch fabric of the present invention by dipping method has a tensile strength and tear strength above the acceptable limits, as strength of the fabric of the present invention drops by only 20-30% in garment dipping thereby maintaining customer strength requirement.

[0038] According to the present invention, a pre-cure method is applied to the woven stretch fabric of the present invention to obtain a woven wrinkle-free stretch fabric by treating with resins. Alternatively, a post-cure method is applied where in resin is applied on fabric and then the garments are manufactured from the resin applied fabric, pressed and cured to make wrinkle-free garments.

[0039] According to the present invention, the warp and weft yarns are grieger yarns or dyed yarns to obtain grieger or dyed woven stretch fabric ready to make a wrinkle-free fabric or garment.

ment made out of the coreply stretch fabric has better shape retention, better crease recovery angle, controlled growth and better strength properties compared to garment made out of regular fabric.

[0041] The following Examples and/or Comparative Examples are provided in order to highlight characteristics of one or more embodiments, but it will be understood that the Examples and Comparative Examples are not to be construed as limiting the scope of the embodiments, nor are the Comparative Examples to be construed as being outside the scope of the embodiments. Further, it will be understood that the embodiments are not limited to the particular details described in the Examples and Comparative

EXAMPLES

Example 1

[0042] Stretch fabric made by conventional method and the woven stretch fabric were tested at initial stages, then treated with resins to obtain wrinkle-free fabric and tested again. The test method used for testing were Home Laundry Washing Cycle method (AATCC-135) and Evaluating Stretch & Growth Test Method (ASTM-D-3107). The test results are shown in Table 1 as given below:

TABLE 1

Fabric type	Warp x Weft	Content	Initial		After 10 Home laundry wash		After 20 Home laundry wash	
			Stretch	Growth	Stretch	Growth	Stretch	Growth
Conventional stretch fabric	40s Ne x 40s Ne Elastomeric Yarn	96% Cotton/4% Elastane	22.00%	4.00%	22.80%	6.00%	22.00%	6.00%
	40s Ne x 2/80s Ne + 40s Ne Elastomeric yarn	98% Cotton/2% Elastane	20.40%	3.00%	20.80%	5.60%	21.00%	6.40%
Woven stretch fabric of the present invention	2/80s Ne x 40s Ne coreply yarn	77% Cotton/18% Polyester/4% Elastane	20.00%	2.20%	20.00%	2.40%	18.60%	3.30%
	2/80s Ne x 40s Ne coreply yarn	77% Cotton/18% Polyester/4% Elastane	22.00%	2.00%	22.00%	2.60%	22.00%	2.80%

[0040] The present invention solves the problem by providing a woven stretch fabric ready to make a wrinkle-free fabric or garment. The woven stretch fabric of the present invention has excellent absorbency to allow resin to penetrate into the very interior of the fibres and form crosslinks. The garments manufactured from the woven stretch fabric are durable, stretchable and wrinkle-free. Further, the gar-

Example 2

[0043] Stretch fabric made by conventional method and the woven stretch fabric were tested at initial stages, then treated with resins to obtain wrinkle-free fabric and tested again. The test method used for testing tear strength (ASTM-D 1424) & tensile strength (ASTM-D 5034). The test results are shown in Table 2 as given below:

TABLE 2

Fabric type	Warp x Weft	Content	Tear		Tensile	
			Warp	Weft	Warp	Weft
Conventional stretch fabric	40s Ne x 40s Ne Elastomeric Yarn	96% Cotton/4% Elastane	3.1	3.1	71.9	44.4
	40s Ne x 2/80s Ne + 40s Ne Elastomeric yarn	98% Cotton/2% Elastane	3.6	2.8	63.1	38.2

TABLE 2-continued

Fabric type	Warp × Weft	Content	Tear		Tensile	
			Warp	Weft	Warp	Weft
Woven stretch fabric of the present invention	2/80s Ne × 40s Ne coreply yarn	77% Cotton/18% Polyester/4% Elastane	4	3.7	88.2	55.2
	2/80s Ne × 40s Ne coreply yarn	77% Cotton/18% Polyester/4% Elastane	4.5	3.9	97	54.3

[0044] It is found from the above example that the fabric made of present regular stretchable fabrics processed for wrinkle-free by the dipping, % growth of the stretchable fabrics decrease below the acceptable limits after repeated home laundry washes, whereas the woven stretch fabric made by the present invention for wrinkle-free by the dipping, tensile strength and tear strength of the stretchable fabrics found above the acceptable limits after repeated home laundry washes, hence resulting into better shape retention properties.

[0045] While a particular embodiment of the present invention has been shown and described in detail herein, it will be obvious to those skilled in the art that changes and modifications of the present invention, in its various aspects, may be made without departing from the invention in its broader aspects, some of which changes and modifications being matters of routine engineering or design, and others being apparent after study. As such, the scope of the invention should not be limited by the particular embodiment and specific construction described herein, but should be defined in the appended claims and equivalents thereof. Accordingly, the aim of the appended claims is to cover all such changes and modifications as fall within the scope of the invention:

We claim:

1. A woven stretch fabric comprising a plurality of warp yarns and a plurality of weft yarns wherein either weft yarns or warp yarns, or both, are stretchable yarns, each stretchable yarn includes a core yarn made of filament and elastomeric yarn and said core yarn is blended with staple fibres.

2. The woven stretch fabric as claimed in claim 1, wherein the weft yarns preferably comprise the stretchable yarns to make fabric stretchable in two direction.

3. The woven stretch fabric as claimed in claim 1, wherein the warp and weft yarns comprises the stretchable yarns to make fabric stretchable in four directions.

4. The woven stretch fabric as claimed in claim 1, wherein the warp count of the fabric ranges from 8 s Ne to 100 s Ne and the weft count of the fabric ranges from 8 s Ne to 70 s Ne.

5. The woven stretch fabric as claimed in claim 1, wherein the woven stretch fabric is a wrinkle resistant fabric further comprising an impregnated resin or a sprayed on resin.

6. The woven stretch fabric as claimed in claim 1, wherein the core yarn is obtained by intermingling a filament and an elastomeric yarn by nipping of the filament and the elastomeric yarn with the nip frequency ranging from 80-200 nips per meter.

7. The woven stretch fabric as claimed in claim 6, wherein the filament denier of the stretchable yarn ranges 20 D to 300 D.

8. The woven stretch fabric as claimed in claim 6, wherein the filament yarn comprises polyester filaments.

9. The woven stretch fabric as claimed in claim 1, wherein the stretchable yarn comprises a polyester yarn in an amount of about 15% to about 20% by weight of the total weight of the yarn.

10. The woven stretch fabric as claimed in claim 6, wherein the elastomeric denier of the stretchable yarn ranges from 20 D to 300 D.

11. The woven stretch fabric as claimed in claim 6, wherein the elastomeric yarn comprises polyurethane.

12. The woven stretch fabric as claimed in claim 1, wherein the stretchable yarn comprises a polyurethane yarn in an amount of about 2% to about 6% by weight of the total weight of the yarn.

13. The woven stretch fabric of claim 1, comprising the staple fibre in an amount of about 75% to about 80% by weight of the total weight of the stretchable yarn.

14. The woven stretch fabric of claim 1, wherein the staple fibres are selected from the group consisting of cotton fibers, regenerated cellulose fibers, manmade fibers, and combinations thereof.

15. A method for manufacturing a woven stretch fabric or garment thereof, comprising the steps of

- providing a plurality of warp yarns;
- providing a plurality of weft yarns comprising stretchable yarns, each stretchable yarn having a core yarn of a filament and an elastomeric yarn wherein the core yarn is covered by staple fibres; and
- weaving the warp yarns and weft yarns to form a stretchable fabric.

16. The method as claimed in claim 15, further comprising step of treating the stretchable fabric with liquid ammonia.

17. The method as claimed in claim 16 further comprising step of optionally dipping the fabric or garment thereof in a resin to obtain a wrinkle-free fabric or garment thereof.

18. The method as claimed in claim 15, wherein the warp yarns comprises stretchable yarns.

19. A wrinkle-free garment manufactured by treating a woven stretch fabric as claimed in claim 1 with resin using a pre-cure or a post-cure method.

20. A stretchable yarn for manufacturing stretchable fabric, comprising a core yarn and staple fibres wherein the core yarn manufactured by intermingling a filament and an elastomeric yarn, said core yarn is blended with the staple fibers on ring spinning machine for covering the core yarn with staple fibers.

21. A wrinkle-free garment manufactured by manufacturing a woven stretch fabric or garment thereof by a method as claimed in claim 15, and treating the woven stretch fabric or garment thereof with resin using a pre-cure or a post-cure method.

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