

# PATENT SPECIFICATION

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(72) Inventors HELMUT LANGANKE  
DR. ROMAN HOFFMEISTER and  
HERBERT FRITZ



## (54) TEXTILE FABRIC MADE FROM SYNTHETIC YARN

(71) We, METALLGESELLSCHAFT AKTIENGESELLSCHAFT, a body corporate organized under the laws of the German Federal Republic, of Reiterweg 14, 6000 Frankfurt am Main, German Federal Republic, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a textile fabric which comprises a synthetic multifilament yarn and is suitable for use in articles of clothing.

Modern fabrics for use in making articles of clothing often consist entirely or in part of synthetic yarn, polyamides, polyesters or polypropylene being mainly used as the material from which the synthetic yarn is made. For many fields of application, synthetic yarn used in articles of clothing is textured and, as it is textured, is stretched to have an elongation at break of only 30% or less. In previously proposed textile fabrics made from polyamide yarn, the latter has an elongation at break of 25 to 35%. For this reason it was believed that it was not possible to use a yarn having a higher elongation at break in the manufacture of a textile fabric which can be comfortably worn.

Surprisingly it has now been found that synthetic yarn having an elongation at break of at least 45% can be used in textile fabrics to be used in articles of clothing.

Accordingly, the present invention provides a textile fabric suitable for use in making of articles of clothing, wherein the fabric is made directly from a non-textured, unfinished synthetic multifilament yarn consisting of a polyamide, polyester or polypropylene, which yarn has been spun from a melt and wound up at a speed of 3000 to 6000 metres per minute, and wherein the yarn has a denier of 1.5 to 20 dtex per filament in the yarn and an elongation at break of at least 45%.

The yarn is usually wound on a bobbin when it has been spun and can be incorporated in the desired textile fabric directly by being knitted or woven without need for further stretching of the yarn. The resulting textile fabric has a somewhat higher extensibility than hitherto available synthetic fabrics and may be used, e.g., in articles of men's or ladies' clothing, particularly in ladies' outerwear or underwear. It can be worn substantially as comfortably as the fabrics available hitherto, and slight changes in the physical properties of the yarn are more than offset by the considerable reduction in the cost of manufacturing the yarn. Above all, the present textile fabric has a pleasant textile handle.

The yarn used in the textile fabric may be made by previously proposed processes. Suitable spinning processes have been described, e.g., in German Specification (DT-AS) No. 2,207,849 in German Specification (DT-OS) No. 2,347,801, and in U.S. Patent Specification Nos. 3,880,371 and 3,837,156. In these processes, monofilaments are extruded through a spinneret, cooled by an air blast, bundled by filament guides, coated with an antistatic agent, and pulled off and wound up by a high-speed winder. The winding speed at which the filaments are pulled off and stretched at the same time is in the range of 3000 to 6000 metres per minute.

The spinning process may be performed with or without godets, spinning without godets being preferred because the equipment is less costly. The monofilaments of the yarn product have a denier of 1.5 to 20 dtex, preferably 2 to 8 dtex, and the yarn denier is usually in the range from 10 to 500 dtex.

If the present textile fabric consists of polyamide yarn, the latter is preferably made to have an elongation at break of 45 to 100%, more preferably 60 to 80%. The elongation at break is determined in

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accordance with DIN 53815 and is equal to the quotient

$$\frac{\Delta l}{l_0} \times 100\%$$

5 wherein  $l_0$  is the length of the non-elongated yarn and  $\Delta l = l_{\max} - l_0$ ,  $l_{\max}$  being the length of the yarn under the ultimate load before breaking.

10 When the textile fabric is made from polyester yarn, the latter is preferably made to have an elongation at break of 50 to 150%, more preferably 80 to 100%. It was previously believed that the elongation of polypropylene yarn incorporated in textile fabric must not exceed about 30 to 40%. It

15 has now been found that the elongation at break may be in the range of 100 to 220% if a textile material for specific articles of clothing is to be made.  
20 The present textile fabric made from synthetic yarn having a relatively high elongation at break has a force-elongation behaviour in the range which is required for a good textile performance. The fabric can be made without difficulty, e.g., on warp

25 knitting machines, circular knitting machines or raschel knitting machines. From the bobbin on which the as-spun yarn has been wound, the yarn is supplied to these machines directly without an  
30 intermediate operation, such as folding or rewinding. It will be readily apparent that this enables considerable savings in cost to be effected. The invention will now be illustrated by the following Examples.  
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#### Example 1

Granules of polyamide-6 having a relative viscosity of 2.7 (measured at 25°C., using a solution of 1 gram of granules dissolved in 100 cm<sup>3</sup>. concentrated sulphuric acid), are melted at 270°C. and extruded through a spinneret having 13 orifices 0.2 mm. in diameter. The resulting filaments travel through a cooling duct and are coated with a commercial antistatic agent and then combined in a yarn and wound up at a speed of 3500 metres per minutes and without contacting interposed godets. The antistatic agent consists of an oil-water emulsion and increases the filament weight by 0.8%.

The yarn has a denier of 44/13 dtex, a strength of 4.7 g. per dtex and an elongation at break of 68%. The denier varies by about 0.8%. This yarn is supplied to a conventional direct warping machine for making 16 warp beam sections, each of which comprises 670 filaments. The warp beam sections are supplied to a warp knitting machine having 32 needles per inch. Two guide bars are used for the desired interlooping, and 5360 warp threads are supplied for each guide

bar. The following interlooped pattern is selected:

First guide bar: 2—3, 1—0, second guide bar: 1—0, 1—2.

The knitted fabric is dyed on the beam 65 under the conditions which are usual for polyamide yarn and is then heat-set in the tenter frame. The resulting knitted fabric is used to make ladies' undershirts.

#### Example 2

70 Granules of polyester having a relative viscosity of 1.62 (measured at 20°C. using a 1% solution of polyester granules in metacresol) are melted at 284°C. and extruded through a spinneret having 34 orifices 0.2 mm in diameter. The resulting filaments travel through a cooling zone and are coated with a commercial antistatic agent, combined in a yarn and wound at a speed of 3500 metres per minute without contacting interposed godets. the antistatic coating increases the filament weight by 0.4%. 75 80

The yarn has a denier of 170/34 dtex, a strength of 2.4 g. per dtex and an elongation at break of 120%. The denier varies by about 0.7%. This yarn is supplied from 20 warp beam sections having 420 filaments each to a conventional raschel knitting machine having 40 needles per 2 inches. Four guide bars are used for the desired interlooping and 2100 warp threads are supplied to each guide bar. The following interlooped pattern is selected: First guide bar for fringes, second and third guide bars for filling and fourth guide bar for tricot. The resulting textile fabric is used to make ladies' outerwear. 85 90 95

#### Example 3

100 Granules of polypropylene having a melt index MFI of 14 per 10 minutes at 230°C./2.16 kg. are melted at 280°C. and extruded through a spinneret having 34 orifices 0.3 mm. in diameter. The resulting filaments travel through a cooling duct and are coated with a commercial antistatic agent and then combined in a yarn and wound up at a speed of 3500 metres per minute without contacting interposed godets. The antistatic coating increases the filament weight by 0.8%. 105 110

The yarn has a denier of 76/25 dtex, a strength of 2.8 g. per dtex, a denier variation of less than 1% and an elongation at break of 160%. This yarn is processed in a warp knitting machine having 28 needles per inch and supplied with 12 warp beam sections having 600 threads each. Two guide bars are used to obtain the desired interlooping and 3600 warp threads are supplied for each guide bar. The following interlooped pattern is selected; First guide bar: 1—0—1, 1—2—1; second guide bar: 2—3—2, 1—0—1. 115 120

## WHAT WE CLAIM IS:—

1. A textile fabric suitable for use in making articles of clothing, wherein the fabric is made directly from a non-textured, untwisted, synthetic multifilament yarn consisting of a polyamide, polyester or polypropylene, which yarn has been spun from a melt and wound up at a speed of 3000 to 6000 metres per minutes, and wherein the yarn has a denier of 1.5 to 20 dtex per filament in the yarn and an elongation at break of at least 45%.
2. A textile fabric as claimed in Claim 1, wherein the yarn consists of a polyamide and has an elongation at break of 45 to 100%.
3. A textile fabric as claimed in claim 1 or 2 wherein the yarn consists of a polyamide and has an elongation at break of 60 to 80%.
4. A textile fabric as claimed in claim 1 wherein the yarn consists of a polyester and has an elongation at break of 50 to 150%.
5. A textile fabric as claimed in claim 1 or 4, wherein the yarn consists of polyester and has an elongation at break of 80 to 100%.
6. A textile fabric as claimed in claim 1 wherein the yarn consists of polypropylene and has an elongation at break of 100 to 220%.
7. A textile fabric as claimed in any preceding claim, wherein the yarn has a denier of 2 to 8 dtex per filament.
8. A textile fabric as claimed in any preceding claim, wherein the fabric has been made by knitting or weaving.
9. A textile fabric in accordance with claim 1, substantially as hereinbefore described in any one of the foregoing Examples.
10. An article of clothing made from the textile fabric claimed in any preceding claim.

TREGAR, THIEMANN & BLEACH,  
Chartered Patent Agents,  
Enterprise House,  
Isambard Brunel Road,  
Portsmouth PO1 2AN,  
and  
49/51, Bedford Row,  
London WC1V 6RL.