(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 960 573 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
15.09.2010 Bulletin 2010/37

(21) Application number: **05802307.8**

(22) Date of filing: **11.11.2005**

(51) Int Cl.:
D01G 21/00 *(2006.01)*

(86) International application number:
PCT/IB2005/003474

(87) International publication number:
WO 2007/049094 (03.05.2007 Gazette 2007/18)

(54) PROCESS FOR THE PRODUCTION OF CASHMERE YARNS

VERFAHREN ZUR HERSTELLUNG VON KASCHMIRGARNEN

PROCEDE POUR LA PRODUCTION DE FILS CACHEMIRE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

(30) Priority: **24.10.2005 IT BO20050638**

(43) Date of publication of application:
27.08.2008 Bulletin 2008/35

(73) Proprietor: **MANRICO S.P.A.**
06134 Perugia (IT)

(72) Inventor: **CALZONI, Manrico**
Tenafly - 07670 New Jersey (US)

(74) Representative: **Conti, Marco**
Bugnion S.p.A.
Via Goito, 18
40126 Bologna (IT)

(56) References cited:
WO-A-98/37263 **WO-A-99/14406**
US-A- 4 128 398 **US-A- 5 007 136**

- **B.A. MCGREGOR: "Australian Cashmere - attributes and processing (RIRDC Publication 02/112)" August 2002 (2002-08), RIRDC - RURAL INDUSTRIES RESEARCH & DEVELOPMENT CORPORATION , KINGSTON (AU) , XP002370844 ISSN: 1440-6845 ISBN: 0642 58511 3 pages 22-30 pages 44-51**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 960 573 B1

Description

Technical Field

[0001] The present invention relates to the processing of cashmere fibres to obtain cashmere yarns and cashmere or cashmere - mix textile products, characterised by high quality in terms of fineness (count), mechanical properties and purity.

Background Art

[0002] As is known, cashmere is a fibre obtained from a particular type of goat and, like all animal fibres, has physical properties directly affected by the collection period (by means of combing), the breed and origin of the goats.

[0003] It is also known that amongst natural textile fibres cashmere has different morphological - organoleptic properties (length, fineness, shine, handle) and physical - mechanical properties (hygroscopicity, thermal stability, combustion method, felting, insulation, toughness, resilience) which may be enhanced during processing, depending on the methods used.

[0004] Cashmere processing includes opening, carding, combing, stretching, twisting, spinning, double winding, twining, conditioning and weaving.

[0005] Added to this chiefly mechanical processing are chiefly chemical steps such as dyeing and printing (using various types of dyes) or finishing (such as sanforising, teaseling, calendering, fulling, mercerising, starching, making crease-resistant, waterproofing).

[0006] At present, cashmere yarns are widely used in particular for the production of knitwear textile products.

[0007] For instance, a processing route for cashmere fibers is known from B.A. MCGREGOR: "*Australian Cashmere - attributes and processing* (*RIRDC publication 02/122*)".

[0008] In addition, patent document US5007136 describes a process for the production of yarn from fiber material, patent document WO98/37263 describes a process for treating a fiber to obtaine an aligned sliver, patent document US4128398 deals with worsted and whoolen processes, patent document WO99/14406 deals with the backwashing of partially processed whool.

[0009] However, the known processes for producing cashmere yarns have many limitations regarding the achievement of high levels of yarn fineness or count values, currently not generally higher than 100000 (meters of yarn in one kilogram of yarn) because with cashmere, more than with any other type of fibres, the conditions which first the fibres and then the semifinished products are in during all steps of processing, from selection of the raw material to finishing the fabric, affect and determine the end quality of the yarn and the fabric.

[0010] A consequence of the limits of the known types of processes is that, at present, there are no spinning processes available suitable for the production of cashmere textile products which require very high quality and fineness, for example, bed sheets.

[0011] Another disadvantage is that the relatively low quality of cashmere or cashmere - mix fabrics currently available has traditionally relegated these fabrics to "winter" use, since it does not allow the best use to be made of some cashmere fibre qualities, such as heat regulation, which is a potential characteristic allowing universal use (also called "four seasons") with changes in outside climatic conditions.

Disclosure of the Invention

[0012] The aim of the present invention is, therefore, to overcome these disadvantages by providing a process for the production of cashmere or cashmere - mix yarns and fabrics characterised by high level mechanical properties in terms of both durability when used and quality to the touch (softness, voluminosity).

[0013] According to the invention, this aim is achieved by a process as defined in the appended claims.

Brief Description of the Drawings

[0014] Further advantages and innovative features of the invention are obtained with a process, a yarn and a textile product as defined in the secondary claims, and are more apparent in the detailed description which follows, with reference to the accompanying drawings, in which:

- Figure 1 is a complete block diagram of a process for the production of cashmere yarns and fabrics in accordance with the invention;
- Figure 2 is a block diagram of the step of dyeing the fibres;
- Figure 3 is a block diagram of the step of finishing the fabric.

Detailed description of the preferred embodiments of the invention

[0015] According to the invention, in a process for the production of a cashmere yarn, there is a preliminary step of selecting fibres obtained using suitable recipes.

[0016] In particular, the fibres are selected according to criteria of greatest length, lowest micron category, and greatest quantity of cuticle scales per single fibre, to improve the mechanical properties of the finished yarn.

[0017] In more detail, choosing the raw material involves making a selection to maximise and standardise the properties which can be achieved, including: length, fineness, cleanness, coefficient of variation, mean height and number of scales, cuticle width.

[0018] Using the selection described above it is possible to begin the spinning process from an extremely regular sliver, so that narrowing or thickening can be prevented during spinning.

[0019] Moreover, the rigorousness of the selection allows optimisation and standardisation of both the physical - mechanical and the chemical - physical properties of the fibres, which proved essential in order to produce the textile fibre (pure cashmere or silk blend) used to produce a yarn with a count of up to 200,000, having a high mean number of fibres per section, which thanks to the invention may even be 30 or more.

[0020] Once selected, any impurities are removed from the cashmere fibres through a customary kemp removal process then it is combed to obtain slivers with aligned fibres, also known as "tops".

[0021] Once the tops have been obtained, they can be sent to a dye bath (Figure 3) which advantageously is performed in controlled temperature and pressure conditions, and separately from the dyeing of any other fibres constituting the yarn, for example silk fibres.

[0022] According to the invention, during dyeing the tops are in the form of bobbins, or bumps, protected from the dye bath by a protective layer, or bag with micro-holes in it, permeable to the dye bath, in which the bobbins are immersed to limit the assault on the fibres by the dyeing agents and additives and to prevent loss of the parallelism of the fibres.

[0023] After dyeing, the tops are washed and dried, the drying preferably being simultaneous with a straightening step.

[0024] As illustrated in Figure 3, to standardise the chemical - physical properties in the dyeing process described above, specific products are also used for cleaning such as solvent soaps used to treat the material in advance, and the use of conditioners which precede the step of drying by means of straightener and drier, in order to relax and distribute the fibres again after the dyeing step.

[0025] When dyeing is complete, the dried and washed tops can be spun to obtain a single yarn with cashmere fibre.

[0026] In a preferred embodiment, a single yarn may be produced, of pure cashmere or cashmere mixed with other fibres, for example 70% cashmere fibres and 30% silk fibres.

[0027] In this first spinning step it is important to try to optimise and render uniform the mechanical and chemical - physical properties of the single yarn.

[0028] In particular, for the former it was found that continuous monitoring and adjustment of the environmental conditions is essential for processing the material in ideal temperature and pressure conditions.

[0029] For this purpose, the spinning according to this invention may take place in a climatic chamber, under controlled temperature, humidity and pressure operating conditions.

[0030] According to the invention, during spinning of the fibres "ring" processing is used, adapted in the feed system to perform the yarn doubling and simultaneous twining processes.

[0031] This avoids the use of the common double twist twisters on the market, which allow a high level of productivity, but which use high processing speeds, making the yarn cover long distances on the ring and so generating friction and resistance which increase the risks of the yarns breaking and/or having much more "nap" due to loss of fibre parallelism.

[0032] With the selected processing it is also possible to avoid the use of common doubling machines, which have feed systems with yarn extensions and processing corners creating resistance and friction that in turn creates a risk of breaks and loss of parallelism.

[0033] Advantageously, the processing used according to the invention, through a repetition of the various spinning production steps, for example on the combing machine, guarantee standardisation and greater uniformity of the twisted yarn, even at the expense of processing speed and productivity.

[0034] When spinning is complete; the next step of quality control or "yarn clearing" is carried out on the already twisted yarn with the result of having fewer processing actions (involving higher quality and fewer rejects).

[0035] After the spinning step a step of weaving the yarns is performed which, according to the invention, takes place in a climatic chamber, under controlled temperature, humidity and pressure conditions, to improve the workability of the yarns and the end quality of the textile product.

[0036] After weaving, the fabric obtained is further treated to improve the properties which the user can perceive, that is to say, the quality to the touch.

[0037] This processing (Figure 2) is the finishing step in which, according to the invention, a process involving double decatising was set up.

[0038] For this purpose, the weaving step is followed by a first step of stabilising through intermittent decatising (KD)

performed in a kier under controlled temperature and pressure conditions, to prepare the fabric for the subsequent finishing step, consisting of washing and ennobling.

[0039] Finally, after finishing the fabric is subjected to a second intermittent decatising step.

[0040] According to the invention during the finishing step it is also possible to use a decatising wrapper able to allow fabric fixing, preserve the physical - mechanical properties and enhance the aesthetic characteristics such as the elegance, practicality, exclusivity and the "*handle*" (softness and voluminosity to the touch, that is to say, when felt between the area of the palm next to the thumb and the fingers on the hand), as well as improving functional properties such as lightness and heat regulating capacity unique to cashmere.

[0041] Below is a table (Table 1) containing some properties characteristic of the yarn and the fabric obtained using the process disclosed, starting with a predetermined selected material and in predetermined environmental conditions.

[0042] As may be inferred from Table 1, the yarn and the fabric obtained in this way have excellent mechanical properties, which make them suitable for the production of superior products such as sheets, pillowcases and other items. However, it shall be understood that a process and a product according to the present invention may also have different applications and be modified without thereby departing from the scope of the inventive concept.

TABLE 1

MATERIAL	LENGTH	WIDTH
Cashmere tops	> 48.0	< 15.00 µm

Environmental Conditions	Range
Humidity	65 – 75
Temperature	20 – 25
Pressure	Constant

YARN	Strength Gr.	% Stretching	Mean No. fibres per section
Count 200,000 70WS 30SE	> 135 Gr.	> 6.10	> 25

FABRIC	TESTS ON ALPHATENS 400 DYNAMOMETER TENSILE STRENGTH				ISO 13934
ITEM 1					
COLOUR WHITE					
COUNT 2/200					
TEST LENGTH	500 MM	T. SECONDS TO BREAK 20" +/- 2"			
TEST WIDTH	50 MM	WASHED IN WASHING MACHINE, 200 L WATER WITH MEGASOFT JET 0.5 G/L ADJUSTED WITH ACETIC ACID FOR Ph 6.5/7 T. 40°C +/- 2 DEGREES			
TEST DIRECTION	**WARP**				
1daN = 1.02 kg					
No. OF WASHES	**TIME**		**STRENGTH daN**	**% STRETCHING**	**T. SEC. TO BREAK**
5 CYCLES	30' PER CYCLE		22.39	15.59	23.65
ITEM 1					
COLOUR WHITE					
COUNT 2/200					
TEST LENGTH	500 MM	T. SECONDS TO BREAK 20" +/- 2"			
TEST WIDTH	50 MM	WASHED IN WASHING MACHINE, 150 L WATER WITH BIOFOLL 0.5 G/L ADJUSTED WITH ACETIC ACID FOR Ph 6.5/7 T. 40°C +/- 2 DEGREES			
TEST DIRECTION	**WEFT**				
1daN = 1.02 kg					
No. OF WASHES	**TIME**		**STRENGTH daN**	**% STRETCHING**	**T. SEC. TO BREAK**
5 CYCLES	30' PER CYCLE		23.23	19.31	29.26
WASHING CYCLES AS INDICATED IN ACCOMPANYING DIAGRAM IN FIG. 2					

Claims

1. A process for the production of a yarn consisting completely or partly of cashmere fibres, **characterised by** the following steps:

    - selection of a quantity of fibres selected according to the criteria of length, micron category and quantity of cuticle scales per single fibre, whereby the fibre width is lower than 15 micron;
    - treatment for removal of kemp from the selected fibres;
    - combing the treated fibres to obtain tops with aligned fibres;
    - dyeing the tops in a dye bath, in which the tops are protected from the dye bath by a protective layer or bag permeable to the dye bath;
    - washing the dyed tops;
    - drying and simultaneously straightening in a stentering machine the washed tops;
    - combing the tops;
    - spinning the dried and washed tops with continuous control and regulation of the temperature and humidity conditions, to obtain a single cashmere yarn.

2. The process according to claim 1, wherein the spinning step comprises spinning of fibres of material other than cashmere to obtain a single cashmere - mix yarn.

3. The process according to claim 2, wherein the step of dyeing the cashmere fibres is carried out separately from the dyeing of the fibres of other material.

4. The process according to any of the foregoing claims, further comprising one or more steps of twining a number of single yarns, to obtain a twisted cashmere or cashmere - mix yarn.

5. The process for obtaining a textile product starting with at least a percentage of yarns produced according to process claim 4, comprising a step of weaving the twisted yarns, which takes place in a climatic chamber, under continuous control and regulation of temperature, humidity and pressure operating conditions, to improve the workability of the yarns.

6. The process according to claim 5, wherein the weaving step is followed by a first step of stabilising through intermittent decatising, a step of finishing by washing and ennobling, and a second step of stabilising through intermittent decatising.

7. The process according to claim 6, wherein at least one of the stabilising steps is carried out in controlled temperature and pressure conditions.

8. The process according to any of the claims 6, 7, wherein at least one of the stabilising steps is carried out while protecting the textile product with a layer, or wrapper, made from a fabric whose yarn has a higher count.

9. The process according to any of the claims from 6 to 8, wherein the finishing step is carried out by means of calendering at a controlled temperature.

10. The process according to any of claims 1 to 4 with a mix of 70% cashmere fibres and 30% silk fibres.

11. The process according to one or more of the claims from 5 to 9 for the production of sheets, pillowcases and other items.

Patentansprüche

1. Verfahren zur Herstellung eines vollständig oder teilweise aus Kaschmirfasern bestehenden Garns, **dadurch gekennzeichnet, dass** es folgende Schritte beinhaltet:

    - Auswahl einer Menge von Fasern, die nach den Kriterien Länge, Größenkategorie in Mikrometern und Anzahl der Cuticula-Schuppen je einzelner Faser ausgewählt werden, wobei die Faserbreite unter 15 Mikrometern beträgt;

- Behandlung zum Entfernen der Grannenhaare von den ausgewählten Fasern;
- Kämmen der behandelten Fasern, um Kammzüge ("tops") mit gleichgerichteten Fasern zu erhalten;
- Färben der Kammzüge in einem Färbebad, in dem die Kammzüge durch eine für das Färbebad durchlässige Schutzschicht oder Hülle vor dem Färbebad geschützt werden;
- Waschen der gefärbten Kammzüge;
- Trocknen und gleichzeitiges Glätten der gewaschenen Kammzüge in einer Spannmaschine;
- Kämmen der Kammzüge;
- Spinnen der getrockneten und gewaschenen Kammzüge mit kontinuierlicher Kontrolle und Regulierung der Temperatur- und Feuchtigkeitsbedingungen, um ein einzelnes Kaschmirgarn zu erhalten.

2. Verfahren nach Anspruch 1, worin der Schritt des Spinnens das Verspinnen von Fasern eines anderen Materials als Kaschmir beinhaltet, um eine einzelnes Kaschmir-Mischgarn zu erhalten.

3. Verfahren nach Anspruch 2, worin der Schritt des Färbens der Kaschmirfasern getrennt von dem Färben der Fasern des anderen Materials durchgeführt wird.

4. Verfahren nach einem der vorhergehenden Ansprüche, das ferner einen oder mehrere Schritte des Verzwirnens mehrerer einzelner Garne beinhaltet, um ein gezwirntes Kaschmirgarn oder Kaschmir-Mischgarn zu erhalten.

5. Verfahren zum Erhalten eines Textilerzeugnisses ausgehend von zumindest einem Prozentanteil von Garnen, die nach dem Verfahrensanspruch 4 hergestellt wurden, beinhaltend einen Schritt des Webens der gezwirnten Garne, der in einem klimatisierten Raum erfolgt, in dem die Betriebsbedingungen Temperatur, Feuchtigkeit und Druck kontinuierlich kontrolliert und reguliert werden, um die Verarbeitbarkeit der Garne zu verbessern.

6. Verfahren nach Anspruch 5, worin auf den Schritt des Webens ein erster Schritt der Stabilisierung durch intermittierendes Dekatieren, ein Schritt des Appretierens durch Waschen und Veredelung, sowie ein zweiter Schritt der Stabilisierung durch intermittierendes Dekatieren folgt.

7. Verfahren nach Anspruch 6, worin zumindest einer der Stabiüsierungsschritte unter kontrollierten Temperatur- und Druckbedingungen ausgeführt wird.

8. Verfahren nach einem der Ansprüche 6, 7, worin zumindest einer der Stabilisierungsschritte durchgeführt wird, während das Textilprodukt durch eine Schutzschicht oder Umhüllung aus einem Stoff geschützt ist, dessen Garn eine höhere Feinheit (Garnnummer) aufweist.

9. Verfahren nach einem der Ansprüche von 6 bis 8, worin der Schritt des Appretierens durch Kalandriereinrichtungen bei kontrollierter Temperatur durchgeführt wird.

10. Verfahren nach einem der Ansprüche 1 bis 4 mit einem Gemisch aus 70% Kaschmirfasern und 30% Seidefasern.

11. Verfahren nach einem oder mehreren der Ansprüche von 5 bis 9 für die Herstellung von Bettlaken, Kissenbezügen und anderen Artikeln.

Revendications

1. Un procédé pour la production d'un fil composé entièrement ou en partie de fibres de cachemire, **caractérisé par** les phases suivantes :

- sélection d'une quantité de fibres sélectionnées selon les critères de longueur, micronage et quantité d'écailles de la cuticule par fibre simple, la largeur des fibres étant inférieure à 15 microns ;
- traitement pour enlever les jarres des fibres sélectionnées ;
- peignage des fibres traitées pour obtenir des rubans peignés de fibres alignées ;
- teinture des rubans peignés dans un bain de teinture, où les rubans peignés sont protégés du bain de teinture par une couche ou poche de protection perméable au bain de teinture ;
- lavage des rubans peignés teints ;
- séchage et lissage simultané dans une rame élargisseuse des rubans peignés lavés ;
- peignage des rubans peignés ;

- filage des rubans peignés séchés et lavés avec contrôle continu et réglage des conditions de température et d'humidité, afin d'obtenir un fil simple de cachemire.

2. Le procédé selon la revendication 1, **caractérisé en ce que** la phase de filage comprend le filage de fibres d'un matériau autre que le cachemire afin d'obtenir un fil simple mélangé cachemire.

3. Le procédé selon la revendication 2, **caractérisé en ce que** la phase de teinture des fibres de cachemire est effectuée séparément par rapport à la teinture des fibres de l'autre matériau.

4. Le procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend en outre une ou plusieurs phases de retordage de plusieurs fils simples, afin d'obtenir un fil retors de cachemire ou mélangé cachemire.

5. Le procédé pour obtenir un produit textile à partir d'au moins un pourcentage de fils réalisés selon la revendication 4 du procédé, **caractérisé en ce qu'**il comprend une phase de tissage des fils retors, qui a lieu dans une chambre climatique, avec contrôle continu et réglage des conditions opérationnelles de température, d'humidité et de pression, afin d'améliorer l'aptitude des fils à être travaillés.

6. Le procédé selon la revendication 5, **caractérisé en ce que** la phase de tissage est suivie d'une première phase de stabilisation par décatissage discontinu, d'une phase d'apprêtage par lavage et ennoblissement, et d'une deuxième phase de stabilisation par décatissage discontinu.

7. Le procédé selon la revendication 6, **caractérisé en ce qu'**au moins une des phases de stabilisation est effectuée dans des conditions contrôlées de température et de pression.

8. Le procédé selon l'une quelconque des revendications 6, 7, **caractérisé en ce qu'**au moins une des phases de stabilisation est effectuée en protégeant le produit textile avec une couche, ou enveloppe, réalisée à partir d'un tissu dont la contexture est plus élevée.

9. Le procédé selon l'une quelconque des revendications de 6 à 8, **caractérisé en ce que** la phase d'apprêtage est effectuée par calandrage à une température contrôlée.

10. Le procédé selon l'une quelconque des revendications de 1 à 4, avec un mélange composé de 70 % de fibres de cachemire et 30 % de fibres de soie.

11. Le procédé selon une ou plusieurs des revendications de 5 à 9, pour la fabrication de draps, taies d'oreiller et autres articles.

FIG.1

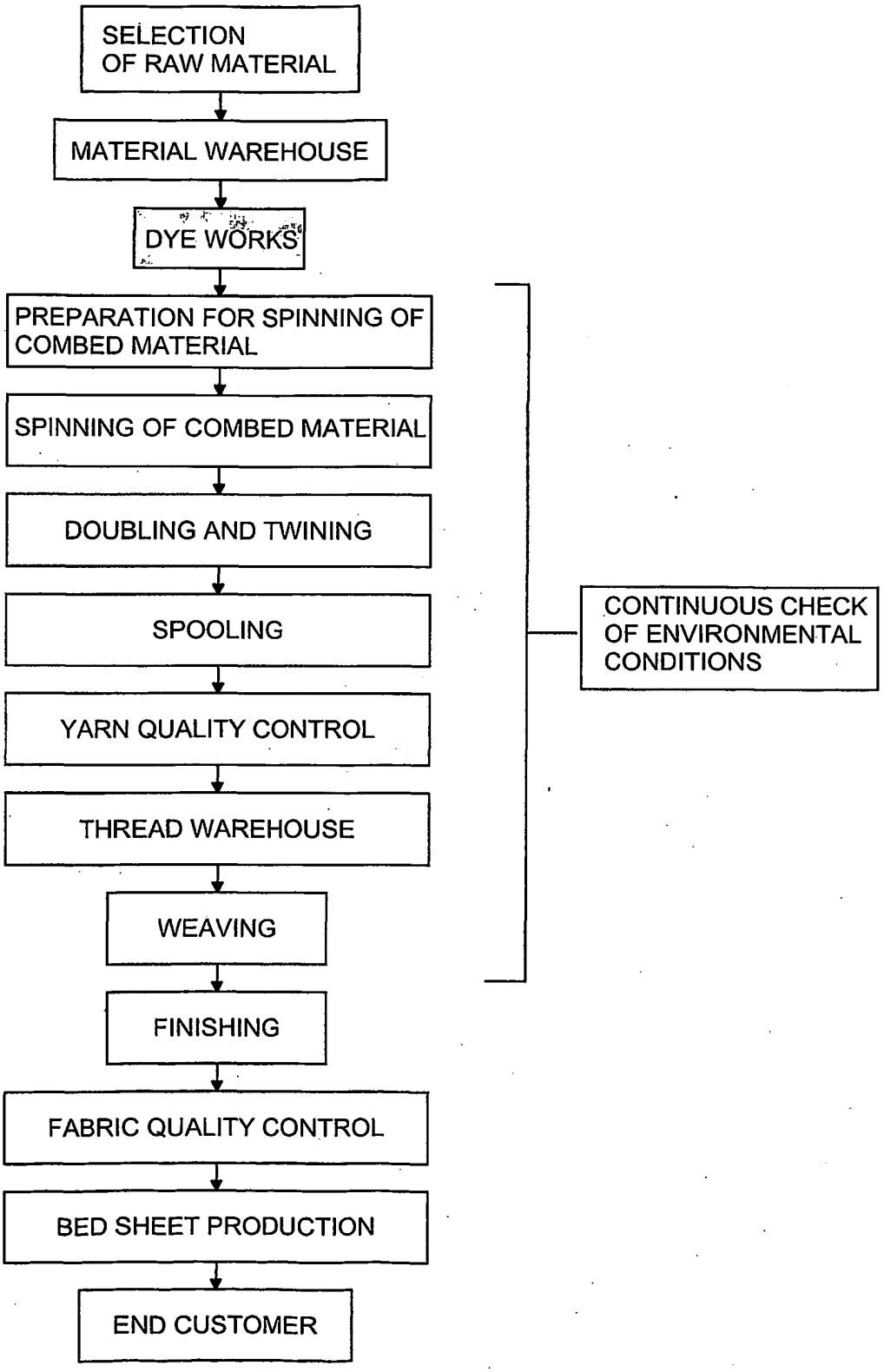

SELECTION OF RAW MATERIAL
MATERIAL WAREHOUSE
DYE WORKS
PREPARATION FOR SPINNING OF COMBED MATERIAL
SPINNING OF COMBED MATERIAL
DOUBLING AND TWINING
SPOOLING
YARN QUALITY CONTROL
THREAD WAREHOUSE
WEAVING
FINISHING
FABRIC QUALITY CONTROL
BED SHEET PRODUCTION
END CUSTOMER
CONTINUOUS CHECK OF ENVIRONMENTAL CONDITIONS

FIG.2

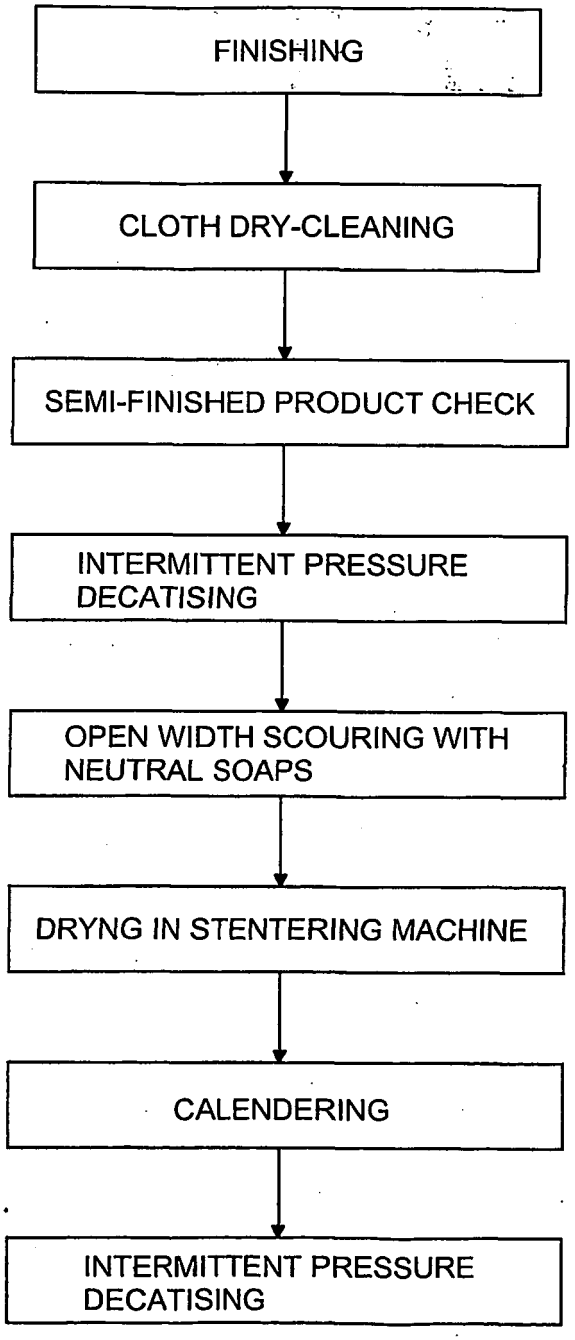
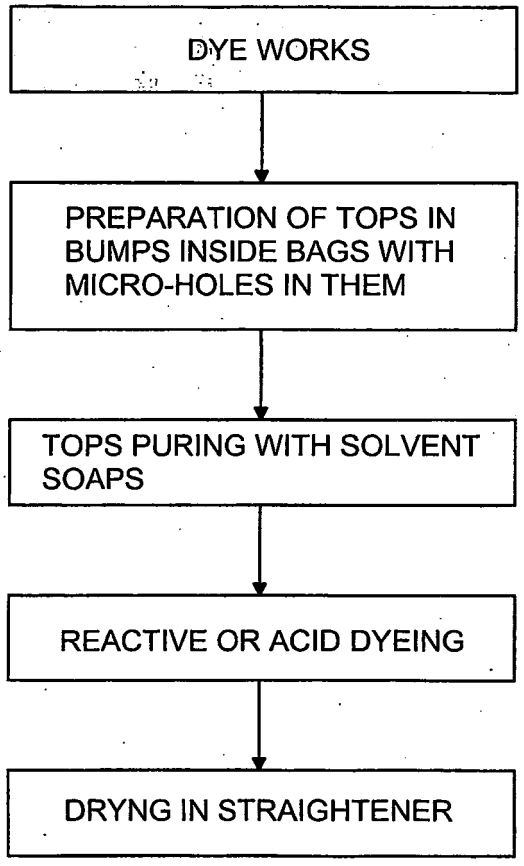

FINISHING
CLOTH DRY-CLEANING
SEMI-FINISHED PRODUCT CHECK
INTERMITTENT PRESSURE DECATISING
OPEN WIDTH SCOURING WITH NEUTRAL SOAPS
DRYNG IN STENTERING MACHINE
CALENDERING
INTERMITTENT PRESSURE DECATISING

FIG.3


DYE WORKS
PREPARATION OF TOPS IN BUMPS INSIDE BAGS WITH MICRO-HOLES IN THEM
TOPS PURING WITH SOLVENT SOAPS
REACTIVE OR ACID DYEING
DRYNG IN STRAIGHTENER

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5007136 A **[0008]**
- WO 9837263 A **[0008]**
- US 4128398 A **[0008]**
- WO 9914406 A **[0008]**