



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.03.2015 Bulletin 2015/12

(51) Int Cl.:
D04B 21/20 (2006.01) D02G 3/44 (2006.01)

(21) Application number: **14386019.5**

(22) Date of filing: **30.07.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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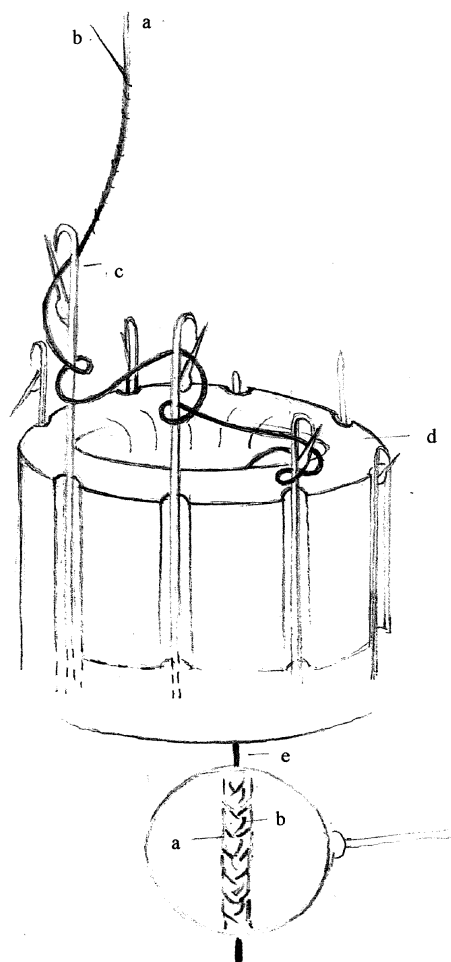
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(30) Priority: **31.07.2013 GR 2013100451**

(54) **Antimicrobial fabric incorporating copper**

(57) The antimicrobial fabric incorporating copper is manufactured with yarns of natural or synthetic origin, which incorporate copper wire, already existing in the market, not requiring extra elaboration, produced on a chain stitch cord knitting machine or a twisting machine. The thread thickness and density of the produced fabric in terms of picks or courses per 10 cm, determine the weight, the quality and designate the end use. The advantage of this fabric, where no chemical method or mechanical depositing of copper oxide particles is used, is the retaining of antimicrobial properties regardless of repeated washing, cleaning or ironing processes during its use, as well as low production cost.

SCHEME 1



Description

[0001] The invention refers to fabric containing copper. The fabric is manufactured with the known methods of weaving or knitting on weaving looms or knitting machines respectively. The threads used for fabric manufacture contain copper wire.

[0002] The antimicrobial fabrics marketed for various uses are manufactured in ways using chemical or mechanical methods. Chemical method is the coating of the fabric surface using binding nanotechnology to achieve antimicrobial properties. This method has the disadvantage of weakening up to disappearing the antimicrobial properties when subjected to repeated cleaning processes, wet washing or dry cleaning.

[0003] Mechanical method is the embodiment of copper oxide particles in the fibre mass. The copper oxide nano-particles are mixed with the lot of fibres to produce the yarn. The mechanical elaboration of the fibre lot embraces the copper oxide particles during the carding and spinning process. This method is also subjected to the disadvantage of weaker initial antimicrobial properties which eventually deteriorate after reiterated cleaning methods as the copper oxide particles are removed with repeated wet washing.

[0004] Other methods used to produce threads for the production of antimicrobial fabrics utilize compound yarns that contain metal plated threads as core yarn, (EP 1 008 682 A1), positioned as an inlay, thus restricting the antimicrobial action.

[0005] Threads using silver wire as core and any other yarn as cover, (US 2012/0060963 A1), or vice versa, are effective in antimicrobial properties but costly to produce.

[0006] Methods presented by various inventors over the years propose either the use of biocomponent multifilaments (KR2001111994), or artificial filaments of inorganic material (KR2004078826), or elaborate twisting requiring "S" and "Z" twist (JP2012153994), or mixed spinning fine copper yarns for knitting (KR2000067042). The present invention differs as it incorporates solid copper wire, already available in the market, which is embedded in the thread in two ways. One way is by knitting the copper wire with the yarn into a chain stitch cord and not as an inlay, the other way is by twisting the yarn with the copper wire, both methods being industrially easy and establish a low cost production as the copper wire used does not need any extra preparation being available in the market for various uses.

[0007] These ways of copper wire incorporation ensure the permanent antimicrobial properties of the thread, making the removal of the copper wire from the fabric impossible when subjected to repeated washing and cleaning processes and also provide an excellent and soft texture. This method results in exposing the copper wire surface to microbes, thus providing antimicrobial action.

[0008] Copper, as mentioned in numerous scientific studies, has antimicrobial action. The microbes die within

one or two minutes when in contact with copper. Scientific researches, published in international medical magazines and forums for copper, strongly support the antimicrobial properties. It has been proven that by covering with copper the most frequently touched surfaces in hospitals and intensive care units, such as tables, side boards, stands, door handles, toilet seats, can minimise the cases of hospital infections, in comparison to patients threatened in other hospitals. A decrease in pestilential diseases affecting students has been observed also, when antimicrobial fabric was used as cutrains in schools.

[0009] With the present invention the thread production for antimicrobial fabric is achieved in two ways. One way is to use a circular knitting machine for chain stitch cord production, whose dial diameter and number of needles used determine the cord thickness, where the copper wire is interlocked with the yarn. The other way is to use a twisting machine where the spindles twist the yarn with the copper wire. The resulting thread, with the copper wire exposed on the thread surface, is then used to produce a woven or knitted fabric or article.

[0010] The methods for the thread production can be explained with the aid of the attached schematic drawings where:

SCHEME 1 illustrates the way to produce the chain stitch knitted cord where the machine interlocks the copper wire (b) with the yarn (a) in the needle dial (d) with needles (c). The thickness of thread (e) will determine the weight and strength.

SCHEME 2 illustrates the way to produce the twisted thread where the machine twists the copper wire (b') with yarn (a') with the rotating spindle (d') inside ring (c') and the winding of the produced thread (e') on a bobbin.

[0011] The choice of the material, of natural or synthetic origin, as well as the thickness determines the thread quality. The fabrics produced with these threads can be used for protection against microbes. The uses vary from seat covers for car and transport industry, to bed sheets for hospitals, medical clothing, masks or gloves, socks and many other. The level of twist, the thread thickness, the synthesis and density of the weave or knit determine the end use of the fabric. The purity of the copper wire as well as the thickness is essential as it affects flexibility, drape, endurance, comfort, appearance, utilization and effectiveness.

Claims

1. Antimicrobial fabric containing bare copper wire which is **characterised by** being manufactured with yarns incorporating copper wire, either in form of chain stitch knitted cord or twisted thread.

2. The antimicrobial fabric, according to claim 1, which is manufactured with yarns incorporating copper wire, retains permanent antimicrobial properties of the knitted or woven fabric as they are not affected or removed, regardless of repeated washing, cleaning or ironing processes during its use.

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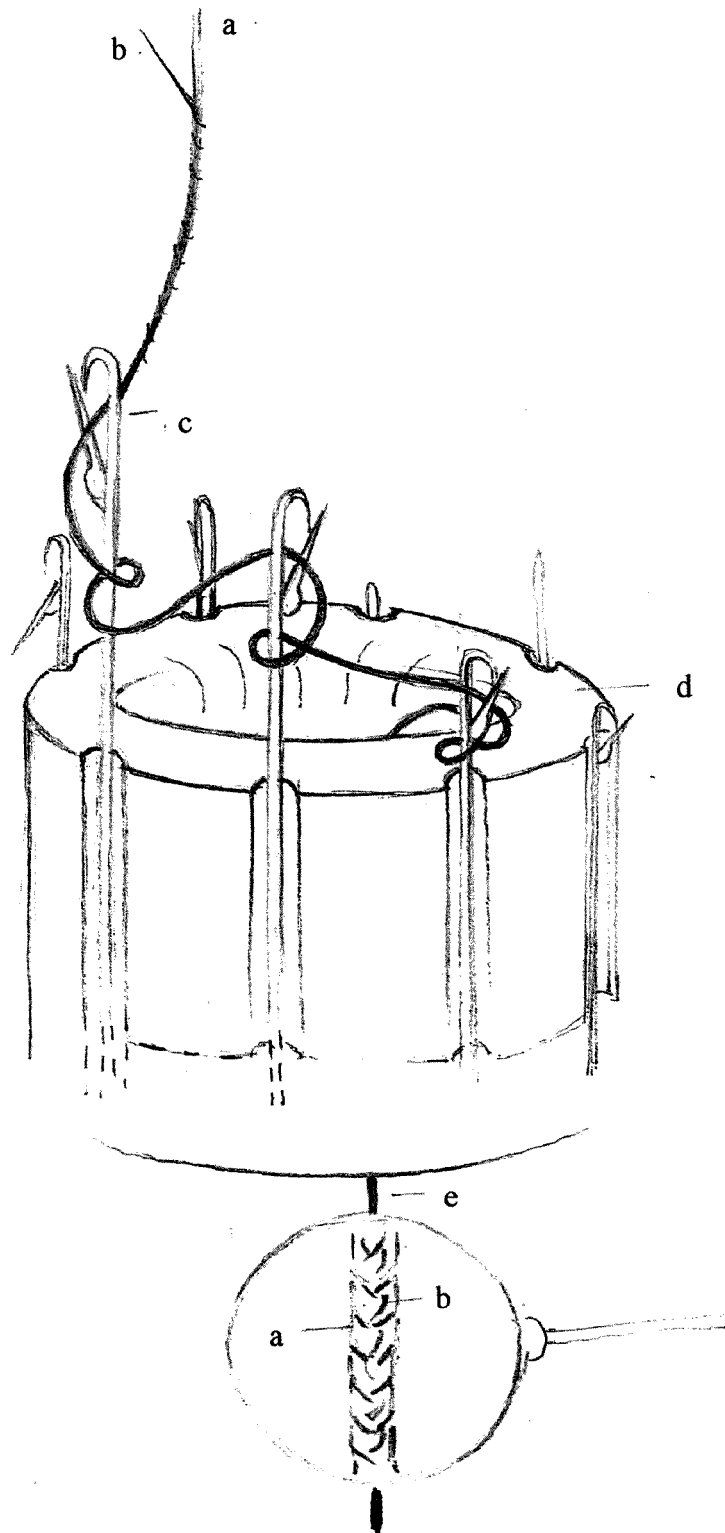
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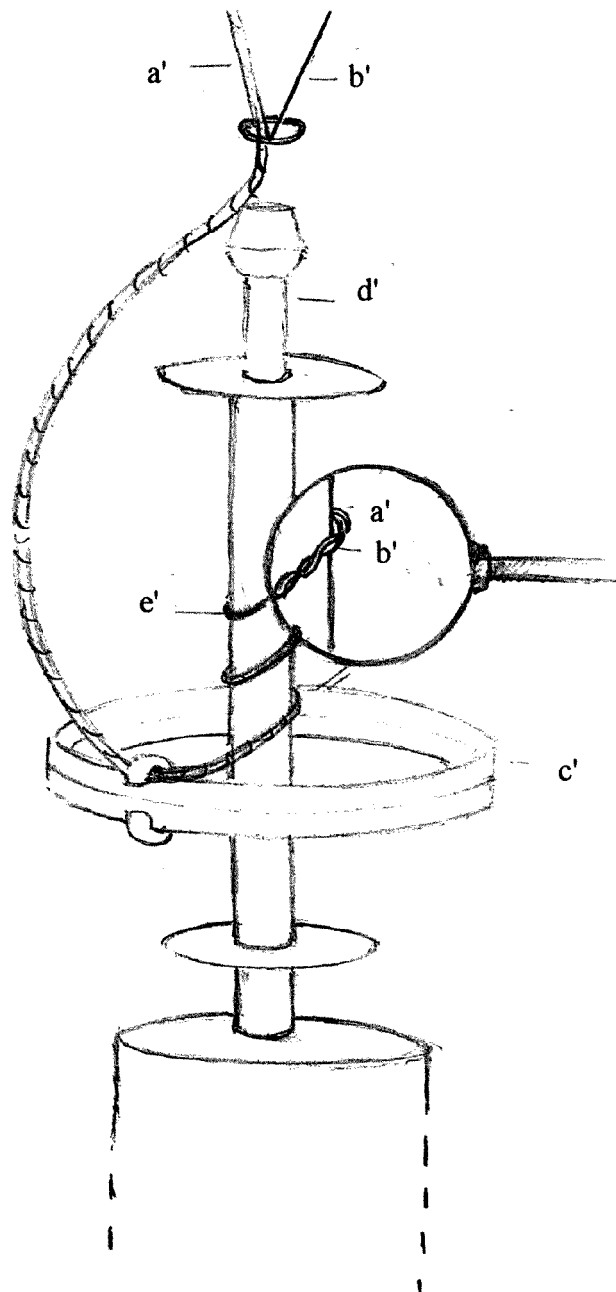
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SCHEME 1



SCHEME 2





EUROPEAN SEARCH REPORT

 Application Number
EP 14 38 6019

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X	WO 2008/098386 A1 (TEXTILMA AG [CH]; SPEICH FRANCISCO [CH]) 21 August 2008 (2008-08-21) * page 5, line 18 - page 6, line 10; figure 1 *	1,2	TECHNICAL FIELDS SEARCHED (IPC) D02G D04B D04D
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 February 2015	Examiner Pollet, Didier
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			

EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 38 6019

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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