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(54) Title: PROCESS FOR LASER CUTTING OF FABRICS AND PRODUCTS OBTAINED WITH THE SAID PROCESS

(57) Abstract

Process for laser cutting of fabrics, comprising the following stages: selection of a fabric containing non-meltable natural or artificial fibres; selection of a meltable material; coupling of the said fabric and the said synthetic component along a preset cutting line; directing, along the said cutting line, of a laser beam capable of cutting the fabric and melting the meltable material coupled to it. And goods manufactured by this process.
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FOR THE PURPOSES OF INFORMATION ONLY

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PROCESS FOR LASER CUTTING OF FABRICS AND PRODUCTS OBTAINED 
WITH THE SAID PROCESS

1. Technical Field
The present invention regards the sector of cutting of fabrics, for example fabrics 
for the making of garments, accessories (scarves, ties, bags), and accessories for 
the home.

2. Prior art
In order to cut fabrics made of natural fibres, at present shears, scissors, or some 
form of cutting blades are used which cut the fabric along pre-set lines. Once 
cutting is completed, there remains the problem of the fraying of the outer fibres, 
which tend to come away from the material.
This problem is normally solved by sewing along the border that has been cut. In 
the case of the cutting of woollen fabrics, it has also been found that fraying of the 
fibres is stopped by matting the fabric at least in the area where it is cut, even 
though generally the whole fabric is matted. By adopting this solution, recourse to 
sewing has been avoided, sewing thus ceasing to be a practical problem and 
becoming an aesthetic problem. In fact, sewing involves high production costs and 
long manufacturing times, as well as considerable difficulties in the automation of 
the process from the raw material to the finished garment.

However, matting of the fabric is possible only with fibres made of wool alone, and 
only when it is compatible with the type of product that it is intended to obtain. In 
any case, also this solution entails additional costs, whilst the problem of fraying 
remains unsolved for all the other types of fabric made of natural fibres or of non-
matted wool.

It is also known that cutting of fabrics made of synthetic fibres may be carried out 
using laser techniques in which a laser beam cuts the fabric along pre-set lines 
and prevents its subsequent fraying thanks to the fusion and mutual anchorage of 
the fibres themselves.
Although well known for some time in the sector, laser techniques have never, on 
the other hand, been applied to fabrics containing non-meltable natural or artificial 
fibres because, whilst the heat of the laser is able to cut the fabric, it ruins the
fabric's appearance, frequently blackening the fibres, and in any case does not solve the problem of fraying of the outer fibres, so that in any case the fabric has to be sewn.

3. Summary

A first purpose of the present invention is to overcome the drawbacks of the techniques so far known for cutting fabrics with natural and/or artificial fibres that are not melttable.

A second purpose is to propose a process for cutting fabric containing natural fibres which reduces costs and times for making garments and which enables an increase in automation of this process.

These purposes have been achieved according to the present invention by means of a process for cutting non-melttable natural and artificial fabrics in which a laser beam is directed onto an area of fabric containing non-melttable natural or artificial fibres of the fabric which has previously been coupled to synthetic components that can be melted at the temperatures developed by the laser beam.

The above area may be prepared by superimposing the fabric on a second layer (for example, a hollow punch) made of synthetic material or a material containing synthetic parts. The synthetic layer may also be inserted, glued or not, between two layers of fabric, so as not to be in view and at the same time prevent any fraying of the fabric.

In a further particularly advantageous embodiment, the coupling between the non-melttable natural or artificial fibres and the synthetic components is obtained by cutting a natural-synthetic mixed fabric. Also a mixed fabric can in any case be coupled to a hollow punch as described for particularly important applications (e.g., collars of jackets).

The advantages that are achieved consist in the fact that non-melttable natural or artificial fibres that are cut by the laser beam are embedded in a matrix consisting of the synthetic material melted in the cutting area, which thus prevents fraying at the outer edge.

A second advantage consists in the fact that subsequent sewing for the manufacture, for example, of a garment or of clothing accessories or accessories
for the home, is no longer necessary.
A third advantage consists in the higher degree of automation of the cutting
process that may be obtained using the laser technique.

4. Detailed description of the invention

The process according to the invention basically comprises the following stages:
- selection of a fabric containing non-meltable natural or artificial fibres;
- selection of a meltable material;
- coupling of the said fabric and the said synthetic component along a pre-set
cutting line;
- directing, along the said cutting line, of a laser beam capable of cutting the fibres
and melting the synthetic material coupled to them.

According to a first embodiment of the process, the said coupling is obtained by
superimposition of the fabric containing non-meltable natural or artificial fibres to a
layer containing a part made of meltable material, for example, a synthetic hollow
punch. The layers of fabric and meltable material may moreover be alternated, for
example, by inserting a hollow punch between two layers of fabric, one set on the
right side, and the other set on the reverse side.

In a second embodiment of the process, the said coupling is made by selecting a
mixed fabric containing non-meltable natural or artificial fibres and meltable fibres,
usually synthetic fibres. Also in this case, coupling may be carried out with a layer
(hollow punch) of meltable material.

According to the process, the said selection of a fabric comprising non-meltable
natural or artificial fibres is made from among the group of fabrics comprising
natural fibres of animal origin, such as wool, cashmere, alpaca, mohair, angora,
vicuna, camel, silk and others; of vegetal origin, such as cotton, linen, hemp, jute,
ramie, pineapple, coconut, and others; and artificial fibres, such as viscose, Cupro
(registered trade-mark), acetate, Tencell (registered trade-mark), Lyocell
(registered trade-mark), and others.

The said selection of a meltable material is made, for example, from among the
following meltable synthetic materials: nylon, polyester, acrylic, Lycra (registered
trade-mark), Elastan (registered trade-mark), and other meltable materials/fibres.
The power of the laser depends on the specific fibres to be cut and on the synthetic material used, and, for example, the laser may be an oxygen laser with a jet at a pressure of 15 bar and frequency of 170 MHz, such as the apparatus known on the market as “Minny”.

In two preferred examples of embodiments, the process was carried out by cutting a mixed fabric having the following characteristics:
Example 1: 60% wool; 36% polyester; 4% Lycra;
Example 2: 22% wool; 76% polyester; 2% Lycra.

The invention moreover comprises garments and products made of fabric containing natural fibres, obtained by cutting the fabric according to the process described herein.

The invention has been described according to a preferred embodiment, but it is understood that equivalent modifications may be made without departing from the scope of the protection granted.
CLAIMS

1. Process for laser cutting of fabrics, characterized in that it comprises the following stages: selection of a fabric containing non-meltable natural or artificial fibres; selection of a meltable material; coupling of the said fabric and the said synthetic component along a pre-set cutting line; directing, along the said cutting line, of a laser beam capable of cutting the fabric and melting the meltable material coupled to it.

2. Process according to Claim 1, characterized in that the said coupling is obtained by superimposing at least one layer of the fabric containing non-meltable natural or artificial fibres on at least one layer comprising parts made of a meltable material, for example a hollow punch made of meltable synthetic material.

3. Process according to Claim 2, characterized in that two of the said layers of fabric are superimposed on an intermediate layer of meltable material.

4. Process according to Claim 1, characterized in that the said coupling is made by selecting a mixed fabric containing non-meltable natural or artificial fibres and meltable fibres.

5. Process according to Claim 4, characterized in that the said mixed fabric is coupled to a layer of meltable material.

6. Process according to Claim 1, characterized in that the said selection of fabric containing non-meltable natural or artificial fibres is made within the group of fabrics comprising the following natural fibres of animal origin: wool, cashmere, alpaca, mohair, angora, vicuna, camel, and silk; of vegetal origin: cotton, linen, hemp, jute, ramie, pineapple, and coconut; and artificial fibres: viscose, Cupro, acetate, Tencell, and Lyocell; and the said selection of meltable material is made from among the following meltable materials: nylon, polyester, acrylic, Lycra, and Elastan.

7. Process according to Claim 4, characterized in that the said mixed fabric is chosen from among fabrics having the following characteristics:
   a) 60% wool; 36% polyester; 4% Lycra;
   b) 22% wool; 76% polyester; 2% Lycra.

8. Textile product characterized in that it comprises at least one part of fabric
containing non-meltable natural or artificial fibres which is cut using the process according one of the Claims from 1 to 7.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 D06H/22 B23K26/18

According to international Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 D06H B23K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

Date of the actual completion of the international search

18 May 1999

Date of mailing of the international search report

27/05/1999

Name and mailing address of the ISA

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Aran, D

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