A special extreme material

Inga Lyashenko

Abstract

The paper deals with elaboration of textile technology and manufacture of textile material such as extreme material used for fashion design of textile products such as women's dresses and men's shirts. This textile material is intended for the expansion of the range of products and contributes to the creation of visual effect of slender body. The goal of the paper is to create Moiré Effect by dynamic textile articles put on a human body. The fashion material is manufactured by knitting or weaving interlacing, preferably a complex threads row after row, (by elastic or non-elastic plaiting) and a plating Polyamide film or raised (embossed) pattern is used. The interlacing includes at least two types of complex threads: the first type of the thread includes Polyamide thread (colorless) – basic thread; the second type – high-twisted Polyamide thread (one color) together with metallized thread – weft thread; and the plating Polyamide film (colorless). In this case, the number of elementary fibers in the second type thread in respect of the first type of the thread (basic thread) and plating Polyamide film are characterized by the following ratio: 2 : 1 : 1. Elasticity of the material is attained by alternation of introduced elastomer reinforced threads and basic threads.

Introduction

The paper deals with elaboration of textile technology and manufacture of textile material such as extreme material used for fashion design of textile products such as women's dresses and men's shirts. This textile material is intended for the expansion of the range of products and contributes to the creation of visual effect of slender body.

Keywords:
fashion material,
plating complex threads
high-twisted Polyamide thread,
Moiré Effect

Basic problems

The purpose of improvement of technique and technology of manufacture of textile products is to reduce costs in terms of raw materials and labor – on the one hand, and to develop new (fashion) products that are convenient to wear and that emphasize a human figure etc., on the other hand.

A smooth enveloping of silhouette by the product depends on the cut and properties of material which are based primarily on the structure of textile material (determined by the dimensions, shape and positional relationship of its components).

However, based on the design parameters of structural elements of the fabrics and subsequent sewing operations, one does not always succeed in creating the effect of a slender figure. In order to solve this problem, as one of the options, various pattern applications are used.

Prior art

There are existing applications [1 - 4] that are used independently or that have a sign function (for instance, as a part in a military, special or another kind of clothes). The method of performing application on textile (knitted or woven) matrix includes preliminary backup of the textile basis of polymer composition in the case of warming and under pressure. Using high-frequency currents, application of polyvinylchloride composition is applied under pressure. Backup of polymer composition is performed by high-frequency currents at the temperature of heating of stamp up to 125° - 155° C at the pressure 500 – 600 kPa directly with textile matrix. Natural (cotton) or natural mixed with synthetic fibers threads of various interlacings are used as textile matrix. 0.2 – 0.5 mm thick application of polymer thermoplastic composition (as a polyether, polyamide or polyurethane film) is applied under the pressure of plain electrode-stamp from 2000 to 2700 kPa to the place of contact with the polymer composition inside the fabric matrix.

These developments of application provide for the following: improvement of quality of application thanks to the increase of controlled penetration and fixation of thermoplastic composition in the structure of textile material; the increase of the range of applications, thanks to the expansion of the range of modes in the technology of applying application.

However, multi-layerness is characteristic of these methods of applications; low durability of joining of application with textile matrix in the process of use of the product.

In addition to that, these applications have stable contours that are constant in motion of humans. In this case, there is formed a static visual effect of a slender body, but there arises the necessity to change (to reduce in width or length) the contours of application thanks to dynamically changing pattern of application as a human moves around. As a result of that, the effect of a slender body will be preserved in motion of a human.

Aim of the study

The purpose of the paper is to create Moiré Effect by dynamic textile articles put on a human body and contributes to the creation of visual effect of slender body.

Method

The set goal is achieved thanks to the fact that the fashion material is manufactured by knitting or weaving interlacing, preferably a complex threads row after row (by elastic or non-elastic plaiting), and a plating Polyamide film is used (form the application).

The interlacing includes at least two types of complex threads: the first type of the thread includes Polyamide thread (colorless) – basic thread; the second type – high-twisted Polyamide thread (one color) together with metallized thread – weft thread; and the plating Polyamide film (colorless). In this case, the number of elementary fibers in the second type thread in respect of the first type of the thread (basic thread) and plating Polyamide film are characterized by the proportion: 2 : 1 : 1.

The elasticity of the material is attained by alternation of introduced elastomer reinforced threads and basic threads.

The essence of the invention is explained by the Figure 1 with the woven elastic interlacing, where: E_1, E_2 – Elastan threads; 1, 2, 3, 4 – basic threads, Polyamide threads; 5 – weft complex thread, high-twisted Polyamide thread (black color); 6 – weft complex thread, high-twisted Polyamide thread (white color); 7 - plating Polyamide film.

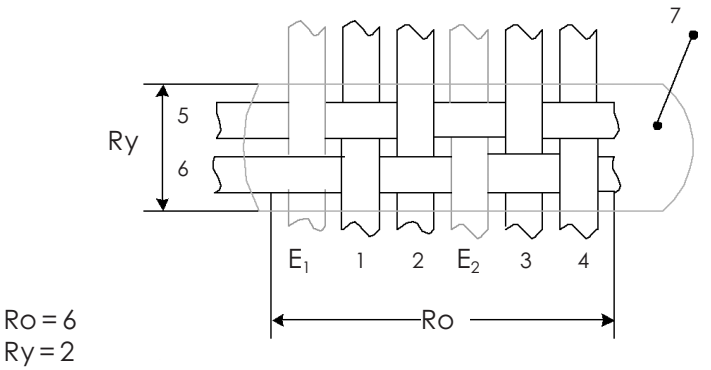

Figure 1. Calico weave

where E_1, E_2 – Elastan threads; 1, 2, 3, 4 – basic threads, Polyamide threads; 5, 6 – weft threads, Polyamide threads; 7 – plating Polyamide film.

In a preferred embodiment of the composites, the applied plating Polyamide film (colorless) is characterized by the thickness of 0.95 ± 0.02 mm (of which application is formed); the second type – Polyamide thread (one color) twisted together with metallized thread. Polyamide thread metallized with Ag, Au, Pt, Zn, Cu etc. or AgTi, AgNi and other alloys, the thickness of metallized coating being 50 ~ 2000 Å.

The method of applying a plating Polyamide film on the woven matrix with the aim to create Moiré Effect consists in the following:

- material is laid with its face surface against the press-type machine (i.e. UZP-2500A, equipped with a device to heating the electrode-stamp, which has an operating frequency 27.12 ± 0.2 MHz [5]); the electrode-stamp with flat surface is replaced by raised surface;
- a thin colorless Polyamide film (application) is laid on material;
- the set is pressed by a heated up to 130° C raised electrode-stamp of pressure at least 2600 kPa, and the pitch of raised stamp is 0.4 ± 0.02 mm and it covers two Polyamide weft threads at the same time (Figure 1);
- a high-frequency current is passed through the set for 3.0 seconds, and film is heated to the flow temperature and welded under pressure to the fabric material.

The above-mentioned sequence of operations, strictly sustained technological modes allow to obtain application with a preset Moiré Effect, i.e. as a human moving around, occur changes in color spectrum or pattern on the surface of the product, depending on the textile interlacing, which allows to obtain the effect of a slender body.

Results and discussion

Interlacing of threads is seen as the system of regular structures with various reflective powers. The coefficient of reflective power of the Polyamide thread is just 4 – 5 % [6]. In order to increase the coefficient of reflective power of fabric, a metallized thread has been used, for instance, one with silver coating. The average coefficient of silver reflecting power is 95%. Thus, Polyamide and metallized threads have been intertwined, so that the pitch angle of a lap to the surface of the generating thread was ≈ 45°.

Plating Polyamide film (colorless) functioned as a convex collecting lens.

Images on the surface of a product are formed as Moiré Effect and interference reflected waves of light from regular structures – Polyamide and Elastan threads (diffraction grating). Graphically, the refraction of light beams in a convex collecting lens may be represented in the following way (see Figure 2):

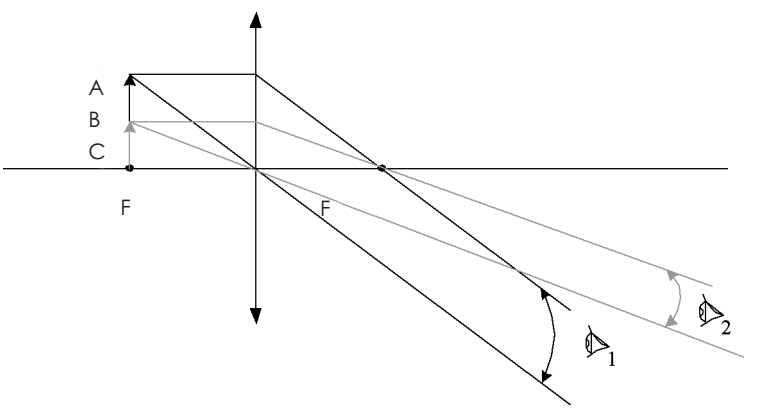

Figure 2. Refraction of light beams in the convex collecting lens

A light beam is reflected from regular structures 5 (A – B) and 6 (B – C) (Figure 1) located in the focus of convex lens F (Figure 2). Following the refraction, beams pass through the focus of the lens, image in infinity is

obtained as beams from each point of the thread after refraction in the lens operate parallelly. Thus, the clear picture of color spectrum or image is visible within the aperture (α 1 or α 2) 9° ~ 12°.

The adhesive ability of Plating Polyamide film has been evaluated through the parameter of strength of coupling between the layers: application – textile matrix (see Table 1).

Bonding strength between Plating Polyamide film and textile matrix, N/mm	parameter of quality of laying of application
	41.3

Table 1. Parameter of quality of laying application

The parameter of quality as regards laying of application is within the norm as set forth by the standard.

Conclusions

1. Fashion material with Moiré Effect is developed by weaving interlacing, preferably a complex threads row after row, (by elastic or non-elastic plaiting); the interlacing includes at least two types of complex threads: the first type of the thread includes Polyamide thread (colorless) – basic thread; the second type – high-twisted Polyamide thread (one color) together with metallized thread - weft thread; and the plating Polyamide film (colorless). In this case, the number of elementary fibers in the second type thread in respect of the first type of the thread (basic thread) and plating Polyamide film are characterized by the ratio: 2 : 1 : 1.

2. The application is pressed to the textile material by heated up to 130° C raised electrode-stamp with the pressure of at least 2600 kPa, and the pitch of raised stamp is 0.4 ± 0.02 mm and it covers two Polyamide weft threads at the same time, a high-frequency current is passed for 3.0 seconds, and film is heated to the flow temperature and is welded under pressure to the fabric material, which, compared with the existing methods of obtaining of application, enables to increase the bonding strength of welded application, and thus increase the operation time by preserving the required appearance. Multilayerness of the set is reduced at the same time, as a result of which preparation for further applying of the application is made simpler.

3. Total intensity of reflected light with the presence of metallized Silver threads is approximately 6 times more, thus the Moiré Effect is increased.

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About the author

Dr.sc.ing. Inga Lyashenko
Senior Researcher, Biomaterial Research and Development Laboratory
inga.lasenko@inbox.lv
Institute of Biomaterials and Biomechanics,
Riga Technical University
Azenes st. 14/24
Riga, LV 1048
Latvia
Phone: +371 7089211; +371 29436384 Fax: +371 7613071