Optimization and Basis of Quality Indicators in Laser Decorative Work on Clothing

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ABSTRACT

The laser technology of applying an image to the material has been studied, the most optimal modes of laser engraving have been selected, and products decorated with a laser have been made. It is shown that at present, decorating clothes with a laser is the most economical and unique technology for its decoration.

Keywords: laser engraving, engraving

Currently, decorating clothes with a laser is the most economical and unique technology for its decoration. Laser technology is based on the removal of a layer from the surface of the material and partial evaporation of microparticles, which as a result leads to the formation of a relief image or pattern using a laser beam.

The idea of drawing on textiles using laser technology is far from new, but it began to be implemented in garments only recently. Before applying an image to textiles, it is necessary, firstly, to think over and create a design for the future drawing, and secondly, to determine the technology of drawing on the material. Among the common methods of applying an image to textiles are silk-screen printing, thermal transfer printing, sublimation and embroidery. Currently, decorating clothes with a laser is the most economical and unique technology for its decoration. A laser beam is a powerful stream of co-directional photons with high energy [1]. Laser technology is a method of applying images by removing material from the surface of an object. In other words, engraving creates a certain relief on the material. The depth of cutting the relief can be set. Laser engraving allows you to change the color of the material, which is also reflected in the formation of the pattern.

The main tool for engraving is a solid-state laser (or as it is also called, a laser engraver), it directly "burns out" the particles of the surface layer of the material, while not affecting all other parts of the product at all [1]. The uniqueness of laser engraving lies in the fact that the applied image is part of the product itself, so engraving allows you to create indelible inscriptions and drawings on the product, and at the same time not cause harm to the product. Laser equipment has a high resolution, and therefore engraving can be done with very small symbols. It is necessary to note the high speed of applying images, which is achieved by the manufacturability of the process itself. In addition, laser engraving is devoid of any intermediate steps that other methods of applying images have, for example, making clichés.

There are two types of laser exposure: "line burn" - linear (contour) burning, and "fill burn" - cavity burning. Contour burning is quite thin and clear, and is used to apply complex drawings. Abdominal burning, on the other

hand, is characterized by an effect on the deeper layers of the tissue, and at the same time only a small pattern is applied. The visual embodiment of the picture is regulated by the power and expansion of laser radiation [3].

The consumer strives for sophistication, originality, exclusivity and his requirements for quality are growing from year to year, this increases competition in the market and stimulates manufacturers to search for new technologies, equipment, which reduces costs and gives maximum productivity, both in mass and single production. To meet the needs of customers, manufacturers use various types of decoration of material and finished products, such as appliqués, artistic cutting of fabrics, perforation in the form of lace from various synthetic and natural materials. Openwork textiles are loved by a very large number of people, and there is hardly a person who would not like the light patterns of lace and guipure products. In the textile industry, the most famous lace fabrics are made of threads on special knitting machines. But more recently, a new technique for making openwork translucent fabrics with a beautiful pattern by the method of perforation has appeared. Perforation is the decoration of fabrics with a through small pattern made using a laser beam. The prototype of perforation was invented in the 70s of the last century and was called guilloche.

With the help of a special electric tool with a thin needle, similar to a soldering iron or a device for burning on wood, the craftsmen performed lace trim on the fabric. To do this, a drawing developed in advance and applied to paper was located on glass, and a canvas was fixed on top. A lamp illuminating from below made it possible to see the pattern through the fabric. With precise point movements, the master burned holes in the material. This type of fabric finishing has become so popular that it has become an art [1]

In the designed products, contour burning is used, since a complex pattern is used to decorate the elements of the selected models, which is created in a vector program. The elements of the main drawing are arranged together so that the composition as a whole looks harmonious and is combined with the main idea of the drawing itself.

Below are the experimental data of the most optimal modes of laser engraving on the surface of various types of materials: artificial leather - radiation power 35 W, processing speed 650 mm / s, frequency 0.1; crepe satin - radiation power 25 W, processing speed 600 mm / s, frequency 0.1; jeans - radiation power 30 W, processing speed 600 mm / s, frequency 0.1; gabardine - radiation power 30 W, processing speed 600 mm / s, frequency 0.1; suede - radiation power 27 W, processing speed 700 mm / s, frequency 0.17; atlas-stretch - radiation power 30 W, processing speed 700 mm / s, frequency 0.1; knitwear - radiation power 30 W, processing speed 700 mm / s, frequency 0.1; synthetic knitwear - radiation power 30 W, processing speed 700 mm / s, frequency 0.1; velvet - radiation power 35 W, processing speed 600 mm / s, frequency 0.1.

Decorating clothes with the help of laser technology allows you to create really unusual, in many ways complex and certainly absolutely unique models. Currently, the Department of Fashion and Technology has developed models using laser processing of the main fabric - youth sets made of suede, faux fur products with perforation elements, evening dresses made of knitwear.

Laser CO2 tubes have a multilayer structure: an outer protective layer of glass that protects the tube with a beam and a built-in glass coil for supplying water for cooling, and an inner double-layer tube inside which a laser beam is formed, and between the walls of which water is pumped, cooling the surface of the inner tube.

Laser processing is an effective way to decorate the surface of various materials. With its help, decorative finishing of garments and cut details, engraving of monochrome images of any format on the surface of textile material is carried out. A distinctive feature of laser engraving is the high quality of the applied images. All laser equipment that is engraved is controlled by powerful computers and has a high resolution, which allows you to get clear, beautiful images on the surface of materials [4]. The glued parts can later be connected, and the

lines are sealed with thermal tape. The flexibility of the process and the strength of the result were confirmed by a large number of samples carried out on raw materials of various thicknesses and qualities. The use of this system is protected by an international industrial patent. The membrane gluing system allows you to implement innovative methods for fur and leather products that will be waterproof, breathable and tear-proof. Thus, analyzing the above, we can conclude that perforation is a relevant and promising option from an economic point of view for decorating modern fabrics and materials. And the use of membranes greatly improves the consumer properties of fur products.

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