Employing laser-cutting technique to enrich the aesthetics for jeans clothes

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Abstract:

The garment industry is one of the most important pillars of Egyptian basic industries, where it has been making significant progress recently. So all garment manufacturers and their sponsors compete to provide the necessary factors for the success of this industry, country has given great attention to this industry by expanding the establishment of many factories. Hence the need to link scientific research with society because it can contribute to the service of society by helping small businesses through offering new proposals, Experimentation in the field of clothing decoration is one of the most important necessities that achieve the objectives of this field. The experiment comes in two directions: the first with innovative aspects, and the second with technical aspects It is not rich for either side to build a product.

Recently, laser beams have been introduced in many fields for high accuracy and high speed Therefore; it spread in industries that rely on the use of cutting, engraving and engraving techniques in the implementation of their products on different materials such as paper, glass, metal, acrylic and wood.

Clothing jeans are popular in the recent period due to consumer demand for them in summer and winter and with the rapid development of fabrics of clothes jeans have become not only limited to cotton fiber but could be mixed with polyester and other which adds to the jeans fabrics other characteristics and affect the quality of the final product.

The current research deals with how to use laser-cutting technology as an advanced technique for decoration of clothing made of jeans.

Research hypotheses:

1-There is a statistical relationship between the quality of laser cutting and the ratio of mixing fibers in jeans fabrics.

2- There is a relationship with a statistical function between the quality of laser cutting and the distance of spacing between units.

3-There is a relationship with a statistical function between structural design and decorative design using laser cutting on jeans.

Research goals:

1 - Study the possibilities of plastic cutting method of laser decorative design.

2- Presenting design proposals for the decoration of jeans with laser cutting technology.

3 - Determination of quality standards of laser cutting for the design of the decorative jeans.

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Research importance:

1 - Attempt to draw attention to modern laser techniques in the decoration of clothes.
2 - Linking scientific research and society through the use of areas of study in small projects.
3 - the possibility of competition in the application of technology in the garment industry.

Search terms:

Jeans: It is a type of clothing, usually made from denim. The origin of the word Jeans came from the Italian cities of Genoa and French Neem, and took from the French word Gênes which means Genoa city that used jeans in its military fashion, in order to use a fabric that can be worn wet or dry During the 17th century, jeans were the basic clothing of the working class in northern Italy.

Laser: It is the abbreviation of the first letters of the sentence Light Amplification by Stimulated Emission of Radiation. It means amplification of light by emitting the catalyst radiation. It is electromagnetic radiation. Photons are equal in frequency and wavelength symmetry. Interference between their wavelengths interferes with a high-energy photovoltaic pulse. And with a very small diffusion angle, which can not be achieved using techniques other than stimulating radiation. Due to its high energy and very small diffusion angle, lasers are used in several areas, such as measuring very small or very large distances with finite accuracy. It is also used in the production of heat for the industrial shearing operations of all raw materials. This technology has been adapted to be used for cutting and unloading cloth used in the garment industry.

Research Methodology: The research follows the analytical descriptive approach with the applied study.

The **theoretical framework** includes the characteristics of the jeans fabrics, the definition of laser engraving technology and the types of radiation and the programs used in it, in addition to the advantages and aesthetics of laser engraving technology.

Types of laser techniques: The laser has different techniques as follows

Laser cutting

Is the complete removal and separation of the material from the top surface to the bottom surface along a particular path. Laser cutting can be done on a single-layer material or multi-layer material used .

Laser Engraving

Laser engraving is a process whereby the material is removed from the top surface down to a specific depth.

Laser Marking

Laser drawing is changing the surface color without removing any material.

We can be combined The cutting, engraving, and drawing processes described above without having to move or re-install the cloth.

The application framework is divided into two axes:

(A) Producing jeans with decorative designs using laser cutting technology.
(B) Discuss the results.

(A) The stages of producing jeans with decorative designs using laser cutting technique:

1- Prepare the decorative design using Photoshop.
2- Distribution of decorative design to fit the structural design.
The decorative design has been prepared and distributed according to the structural design area of the jeans products as in the proposed designs.
3- processing the decorative design using corel drow program.
4- Cutting (discharge) laser decorative design on the products of jeans.

Suggested designs For jeans clothing with a decorative design using laser cutting

The laser beam cuts the cloth according to the design

The product is open on the laser cutting machine

Processing of decorative design on the computer

In order to obtain the required quality for laser engraving, a survey was carried out for the following items:

A - Determination of the ratio of mixing fibers in jeans fabrics that achieve the required quality:

The genes materials were used according to the following mixing ratios:
1- 100% cotton.
2- 82% cotton - 9% viscose - 9% polyester.
3- 80% Cotton - 20% Polyester.
4- 60% cotton - 30% polyester - 8% viscose - 2% spandex.

B - Defining the distance between the units that achieve the required quality:

A comparison was made between the different spacing ratios for the same decorative design to judge the laser cutting quality as follows:
1: 2 mm - 2: 3 mm - 4: 5 mm - 5: 6 mm

(B) Discussion of the results:

1- Validation of the first hypothesis:

After the design of the proposed design of the jeans was designed using a laser cutting technique. A questionnaire form was prepared by a form for each design for judging the proposed designs, consisting of the following axes: The foundations, elements of the design and the aesthetic side. The degree obtained by the six designs ranged from 89.68% for the second design and 98 84% for the third design. Which indicates the achievement of the foundations and elements of design and distinguish the aesthetic side due to the existence of a relationship of statistical function between the structural and decorative design using laser-cutting technology on jeans clothes. Thus proving the validity of the first hypothesis.

2. Validation of the second hypothesis:

To obtain the laser material suitable for laser cutting, a questionnaire was conducted to judge the quality of the laser cutting according to the ratio of the mixing of its constituent fibers. The grade obtained by the fabric samples ranged from 96.85% for the sample to 60% cotton, 30% polyester, 8% viscose - 2% spandex), which is the highest percentage of 75.76% for the sample (100% cotton) and is the lowest percentage due to the impact of raw material 100% cotton high temperature of the laser beam. which affected the color of the cloth to the combustion, The quality of the laser cutting and the ratio of mixing the fiber and thus prove the validity of the second hypothesis.

3 - Validation of the third hypothesis:

To obtain the quality required for laser engraving on jeans clothes, a questionnaire was conducted to determine the best distance between the units in the same decorative design. The grade obtained by the fabric samples ranged from 82.35% for the sample with a distance of 5: 6 mm. 20.62% of the sample has a distance of 1: 2 mm, which is the lowest percentage due to the lack of distance between the units. which led to the cutting of cloth in some places in the distances between the units. Which indicating a statistically significant relationship between the quality of the laser shear and the distance between the units and thus the validity of the third hypothesis

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