DEVELOPING CUSTOMISED FUNCTIONAL TROUSERS FOR RECREATIONAL ACTIVITIES TARGETING CHILDREN OR TEENAGERS

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REZUMAT: Această lucrare este produsul unui proiect de cercetare și este preocupată de dezvoltarea unei game de produse textile pentru copii și adolescenți care practică activități de petrecere a timpului liber, asigurându-le protecția. Produsele care au fost proiectate și fabricate aparțin grupului de îmbrăcăminte de tip pantaloni, cu funcționalitate orientată către client, obținute prin tehnologia folosită pentru confecționarea de țesături tubulare. Materialul folosit a fost selectat pe baza unor teste de laborator care s-au concentrat pe îndeplinirea cerințelor de protecție pentru zonele pe care astfel de produse sunt proiectate să le acopere.

Cuvinte cheie: pantaloni funcționali, activități de agrement, producție, țesături tubulare

ABSTRACT: This paper is the product of a research project and is concerned with the development of a range of textile products for children and teenagers who practice leisure activities, ensuring their protection. The products that were designed and manufactured belong to the trousers-type group of apparel with client-oriented functionality, obtained through the technology used for making tubular fabric textiles. The fabric used was selected based on laboratory tests which focused on meeting the protection requirements for areas that such products are designed to cover.

Key words: functional trousers, leisure activities, manufacturing, tubular fabric

1.INTRODUCTION

In our modern society, the consumer, and especially the young generation, is more active and sophisticated; therefore, there is a growing demand for diversified products whose function is to fulfil the customer’s specific needs and preferences in areas such as recreational activities. The customised textile products for leisure sports have certain structures and are subjected to technological processes which include several important stages, such as: assessing the performance and functionality of the proposed structures of the products; analysing the execution parameters and providing constructive solutions for new textile apparels/products (functional models); and finally, proposing design solutions that also need to provide fun, protection and safety [1].

In this paper we focused on client-oriented functional products that ensure protection during leisure activities. We designed functional trainers for two groups of wearers: children and teenagers.

These products were obtained from knitted fabric.

2. FUNCTIONAL MODELS – TECHNOLOGICAL DESIGN

The technological design of trousers-type products with oriented functionality focused on several aspects [2], [3]:

- Identifying functional and comfort properties that the products must meet;
- Satisfying aesthetic requirements in what concerns visual attractiveness as well as psychological benefits for the wearer, which must be adjusted to the client’s age group – children and teenagers;
- Adopting an appropriate technology for manufacturing the products – the technology used for creating tubular fabric.

We designed and accomplished 2 functional models in 4 versions, for two age groups, children between 5 and 7 and teenagers.

The two functional models were designed and obtained with the help of the manufacturing technology.

For each model were used base and splicing fabric for protecting certain areas that are subjected to strain.

Model 1

The technological presentation of Model 1 is illustrated in Figure 2.1, and Figure 2.2.

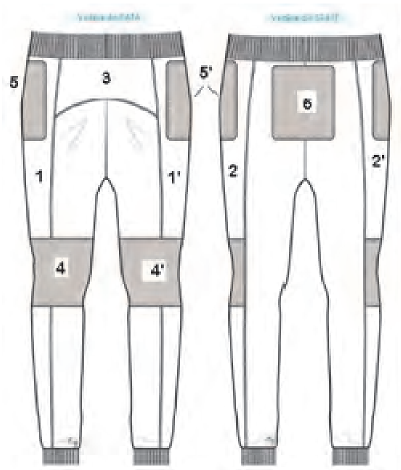

Fig. 2.1. Model 1 – the component parts.

The presented model is symmetrical, compartmental, with the upper part ending in a waistband and the lower part in a cuff. The waistband and the cuff are made of patent jersey 1:1.

The waistband has a width of 5cm, ready-looking and the cuff has a width of 4cm, ready-looking. The product is made of base material 3 – MBV3 (white areas) and has additional areas of reinforcing, placed on the knee area on the sides and at the back.

The front side consists in:

– reference points obtained through longitudinal division (1 and 1’);
– 1 reference point that doubles the front symmetry line (3);
– additional reference points that double the prototype at the knee (4 and 4’), situated on the longitudinal division line at the back;
– additional reference points that double the product on the sides (5 and 5’), applied from front to back, 2cm lower than the waistline.

The back of the model consists of:

– reference points obtained through longitudinal division (2 and 2’);
– an additional reference point which doubles the back on the symmetry line (fixed point 6), placed in a symmetrical manner.

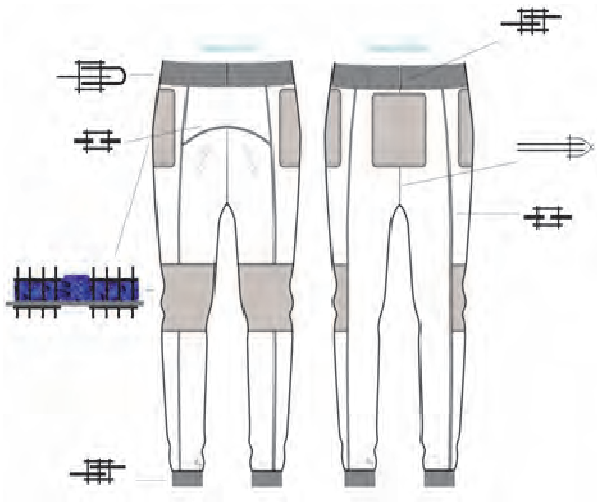

Fig. 2.2. Model 1 – technological map

Model 2

The technological presentation of Model 2 is illustrated in Figure 2.3, and Figure 2.4.

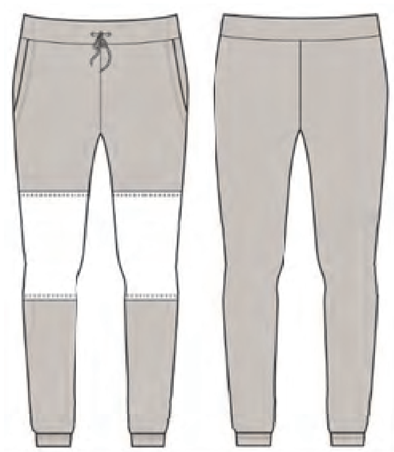

Fig. 2.3. Model 2 – the component parts.

The model is presented as being symmetric, with seams on the sides, transversely compartmentalized, with lateral pockets; the upper part ends in a waistband and the lower part in a cuff. The product is made of base material 1– MBV1 (gray areas) and comprises additional reinforcing areas placed on the knee line.

The front of the prototype includes 2 reference points: the main big one and an additional reinforcing point that can be found on the knee area.

The back of the prototype has only one reference point.

The waistband and the lower end of the prototype are made of the same material with big reference points.

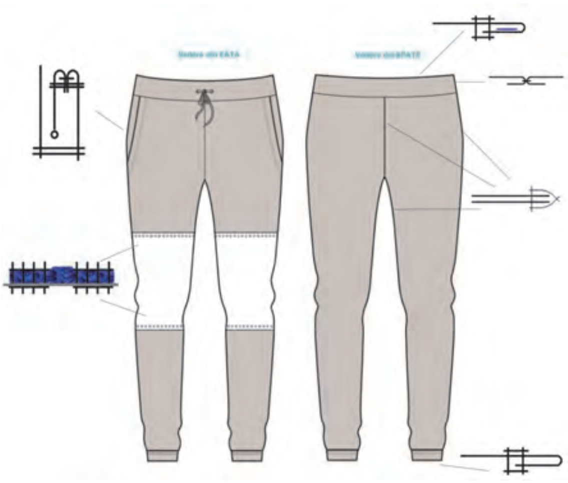

Fig. 2.4. Model 2 – technological map

The reinforced zones are the most critical ones where personal protection is needed during different sport activities (such as cycling, horse riding, mountain hiking) or the reduction of shocks/impact at the basin level (pelvic area) and at knee level when falling, together with protection against abrasion or friction.

Prototype patterns were projected in geometrical layer. By adding some new sizes (which include information about the client, the wideness of the waistband, wideness of the cuff and material elasticity), the reference points of the model/pattern are automatically generated. The MTM module allows the manufacturing of the base patterns for a certain range of sizes or for one particular size only.

The functional models manufactured according to the technical documentation are as follows:

- Prototype 1 - teenagers (Figure 2.5)
- Prototype 2 - children of 5-7 years of age (Figure 2.6).

Fig. 2.5. Prototype 1 – for teenagers

Fig. 2.6. Prototype 2 – for children of 5–7 years

In order to improve wrist compression for people who carry out jobs/activities that entail leaning their arms against rigid surfaces for a long time or repetitive movement of the fist (operating a computer mouse), experts applied a three-dimensional knitted textile support with a high degree of recovery from compression in areas such as the palm and the wrist, in order to protect the median and ulnar nerve [4]. The three-dimensional knitted textile support (sandwich-type) made of polyamide yarns was also selected for manufacturing apparels worn by people exposed to accidents when practising sports and leisure activities (models 1 and 2).

3. EVALUATING THE PERFORMANCE OF TEXTILE PRODUCTS USED IN CREATING FUNCTIONAL MODELS

The fabrics used in our study to obtain the functional textile products for those who are exposed to accidents were: 3 base knit materials (interlock, one-sided, and plated jersey) the first two structures comprise cotton and elastomeric yarns, whereas the third structure is made of polyamide and elastomeric yarns; 7 filling fabrics with a layered composition accomplished through various technologies. Corresponding laboratory tests were conducted using the LRX Plus (Lloyd Instruments Ltd -AMETEK-England) equipment which assesses materials when stretched/compressed; the machine had the following functional properties: the loading force is measured with the help of a force transducer (load cell), XLC-500-Al, which allows the measurement of forces up to 5,000N, with a precision of 0.5% according to

ASTM E4 and DIN 1221; the speed with which the force is applied can be in the range of 0.01-1,016 mm/min, with a precision of 0.2%; the axial motion (deformation) is measured with the help of the numeric axis of the testing machine, with a precision of 0.001 mm. All the tests were scheduled to take place under identical circumstances (same force, same bradawl movement speed, same loading cycle, and same method of embedding the material). Data acquisition and processing were carried out with the help of integrated software, NEXIGEN Data Analysis, embedded in the LRX Plus testing machine. Taking into account the destination of the products, the experiments were conducted in three ways: individually, on each base and filling material; on two-layer combinations (base + filling fabrics); on three-layer combinations (base + filling + base fabrics)[2].

The loads were established according to the following cycle: a pre-stressing force of 2 N was applied, followed by five stressing loads, in order to reach a force of 5 N. Graphs resembling the one presented in Figure 2.6 were drawn for each test by using the NEXIGEN software. Furthermore, we can estimate the mechanic qualities of the studied materials (Figure 2.7) by interpreting the force-motion graphs that include the highest and lowest values of the force when the five stressing loads are applied and the span of time during which these values are reached. As for the ability to resist external mechanical actions and to dampen shocks, respectively, the best results were obtained in the case of the three-layered variant corresponding to the following knitting structures: plated jersey + three-dimensional knitted textile support + plated jersey. Using this best variant, a functional trousers model was designed and obtained with the help of the manufacturing technology. The models presented can be manufactured for various age groups: children between 5 and 7 years old and teenagers.

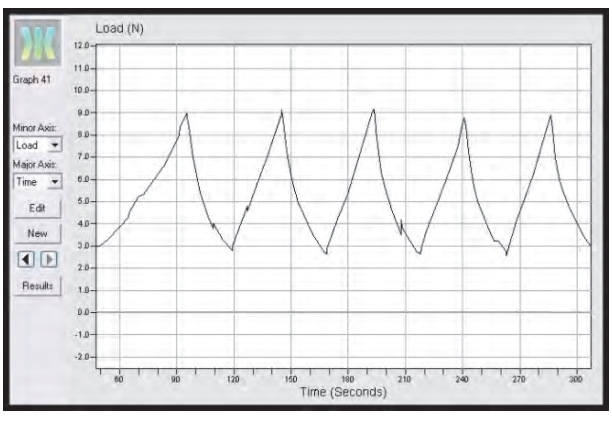

Fig. 2.6 Example of experimental results obtained

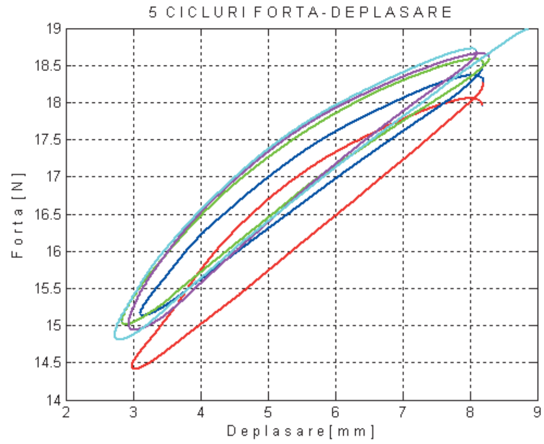

Fig. 2.7. Force-motion testing loads (5 cycles) for the filling fabric, namely the three-dimensional knitted textile support (sandwich-type) made of polyamide yarns

4. CONCLUSIONS

The development of new textile apparels (functional models) is the result of applying new design concepts that entail, from the very start, specific planning and execution methods based on the use of high-performing textile products. Thus, it can be ensured a balance between function, shape and structure.

Our study aimed at developing new textile products which are functional, comfortable, flexible, reproducible and competitive in what concerns the quality-price ratio. The products were designed to provide protection, safety and to preserve the health of active young people. The technical-scientific activity was focused not only on the application of new/innovative techniques and solutions so as to design and implement such products, but it also included experimental and result validation activities.

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