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"Textile moisture sensor for enuresis alarm system"

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I. Introduction

Bedwetting (Nocturnal Enuresis) is a common problem throughout the world, it has a very high prevalence in the preschool population and the prevalence slowly falls during childhood. Statistic data show that at age 4½, 30% of children still wet the bed, 21% infrequently and 8% of these more frequently. Several therapies exist to solve this problem, one of them is enuresis alarm, which is a primary and an effective nocturnal enuresis treatment method for children.

II. Description of alarm systems

Enuresis alarm is a small device that is attached to a child's pyjamas or is placed under the child and signals, when the bed becomes wet. The drawback of the currently used systems is that (1) the attached systems are rigid and usually have wires attached to them, which may cause discomfort or additional stress; (2) sensors placed under the child are rather small and are made out of plastics, which prevents the skin from breathing and can cause discomfort.

During research existing enuresis alarm systems are overviewed, their drawbacks and advantages are analyzed. The system is improved by making it more convenient for use.

III. Improvement of alarm system sensor

It is important to choose an appropriate size of the sensor – if the sensor is too small, then it may not detect the urination, but if it is too large, it may cause discomfort when it is worn [2]. The sensor must be placed in the area, which is mostly exposed to contact with the first drops of urine. Consequently, a solution that ensures greater comfort and detection efficiency is a direct sensor integration into briefs crotch area and using conductive material, which is incorporated into the fabric structure.

It is possible to integrate conductive contacts or circuits into textile structure, using various non-traditional techniques, such as: printing or laminating of conductive materials, interweaving, knitting, sewing or embroidery with conductive threads [3]. As a result it is possible to obtain a flexible sensor with characteristics of a textile product, which covers the entire area subject to wetting.

The aim of this research is to develop an enuresis alarm system with textile moisture sensor (electrode), which is more suitable for textile garments. Authors propose to design sensor by embroidery using conductive yarn. Conductive yarns are a preferable material for enuresis alarm sensors, since they blend with the textile structure of underwear and bedding sheet, inducing less stress on the treated person.

In order to assess suitability of such threads for the application envisioned, it is necessary to develop a suitable sensor configuration and to test the longevity and stability of the materials used.

Variable factors of the experiment and their variation levels are presented in Table 1.

TABLE I

Factors of the experiment

	Variable factors	Variation levels
1	Yarn type, nr.	N1, N2
2	Sensor configuration, nr.	Comb-like (A), spiral (B)
3	Distance between electrodes, mm	5, 10, 15

As it was found in previous research [4], conductive yarns behavior can be influenced by several factors and various yarns can obtain very different properties. Within the framework of the research several sensor samples with different electrode configurations will be produced. Form configuration with 10 mm distance between traces of embroidered electrodes is shown in Fig.1.

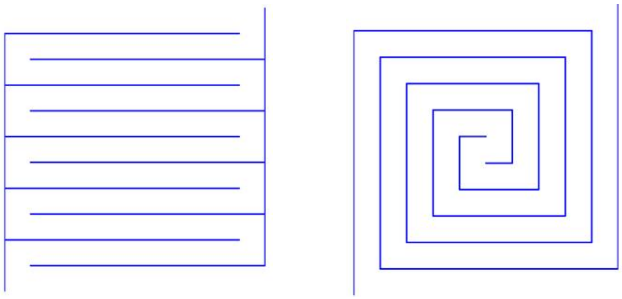

Fig. 1. Form configuration with 10 mm distance between traces of embroidered electrodes

In the result of research the most proper and effective solution of sensor type will be established, what will be used in further research for enuresis alarm system improvement and development.

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