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Technology of Production of Technical Belts and the Study of Their Properties

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Abstract*: The article developed a method and technology for the production of seamless woven tapes. Defined technological parameters of the developed conveyor tapes. The laws of change in the mass and thickness of the conveyor tape made from the treated fabric, from the grey fabric and non-woven fabric depending on the time of operation are obtained. solved by the fact that the threading of the warp is carried out in the form of a continuous spiral, then the cords and weft yarns are woven into warp yarns the on the loom. Moreover, the length of a section of fabric with non-rubbed yarn and the ratio of the diameter of the cord to the diameter of the weft yarn is at least 1:2. From the graphs, fig.5 and 6, it follows that the exploitationof the conveyor tape made of non-woven fabric is not more than three months, the conveyor tape made of grey fabric is about two years, and the conveyor tape made of treated fabric is three years.Due to the fact that the degree of adherence of the conveyor material in the tape made of grey fabricis lower by 58 % and in the tape made of treated fabric lower by 71% than in the tape made of non-woven fabric.

The structure of the grey fabric contains only twisted yarns mutuallyintertwined, and the treated fabric is ultimately water-repellent preparations that reduce the adhesion of the conveyer material to the tape. On the contrary, the structure of the non-woven fabric contains fabric, stitched with twisted threads, which increase the adherence of the conveyor material to the tape.

***Index Terms*: weaving, structure of the fabric, woven belts, technology, strength.**

I. INTRODUCTION

Fabrics of new technical structures are in great demand today, so the task of creating new innovative fabrics, including technical belts, the development of design methods and technologies for their manufacture is relevant [1].

Research of the structure of fabric and the development of new structures of technical fabrics were devoted to many works of foreign and domestic scientists [2].

Conveyor belts are one of the most important elements of any production in which conveyors are involved. Conveyor belts are widely used in the food, tobacco, textile, paper, cotton finning and woodworking industries. The condition, in which these products are to function may be sufficiently rigid. [3]

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For example, in the food industry, conveyor belts in certain production areas are exposed to high temperatures and humidity [4].

The conveyor belt used when mowing row cotton, seeds and weed impurities in cotton fins, primary processing of vegetable in agricultural enterprises must be resistant to friction and fire [5]. Deficiency and relatively high cost of the leather do not allow its use for the manufacture of conveyor belts and belts. Conveyor belts used in all industries must represent a closed canvas, that is, seamless. Seamless belts and belts are produced from twisted cotton yarn in several layers (4, 6 and 8) plain weave and impregnated with chemical composition. Producing of seamless belts is possible in two ways [6]. It's known that, woven belt, which is produced on a conventional loom and then the ends of the belt is connected accordingly [7]. This method has a great potential in terms of dimensional changes along the length of the woven belt [8-9].

However, the methods of joining the ends of a woven belt cannot be considered satisfactory as a result of melting, gluing, stitching and sewing, the belt ends tied together [10]. A disadvantage of the known method of fabrication of woven belts is unevenness in thickness and loos of strength and flexibility at the site where the ends of the toe are connected [11]. In the second method, seamless belts are produced directly on the loom in the form of a bag. The production of seamless belts on the machine is done using special technological the belt on the machine is calculated taking into account two or more fabrics at once, the number of warp and weft yarns increases in proportion to the same time [12]. Sometimes seamless belts are folded in half, i.e. in four yarns. Seamless belts provide an increase in the duration of their service, due to the lack of stitching or seam belt ends. Due to the development of endless woven belts, providing a uniform connection, greater strength and flexibility according to the perimeter of the woven belt is relevant [13].

II. DEVELOPMENT OF THE NEW TECHNOLOGY

Our task is solved by the fact that the threading of the warp is carried out in the form of a continuous spiral, then the cords and weft yarns are woven into warp yarns the on the loom [14]. Moreover, the length of a section of fabric with non-rubbed yarn and the ratio of the diameter of the cord to the diameter of the weft yarn is at least 1:2.

After removing the woven belt from the loom machine, instead of cords, weft yarns are pulled (Picking) [15].

The figure 1 shows the threading warp on the loom. The warp yarns 1 passes into the roller 2, reed 3, fate 4, compensators 5 and then returns to the roller.

After that, the same warp yarns 1passes through the adjacent tooth of reed 3 and the fate 4, and so on until the required number of warp threads. Thus, the warp yarns consists of a single thread which is wound with coils arranged in rows in the form of a spiral [16].

For threading the fate are made open to the top, and the reed in the form of a comb.

The perimeter of the warp 1corresponds to the length of the woven belt with regard to training, due to, compensators 5.

Figure 2 shows the pattern of fabrication of a section of fabric with cords on a loom. For the formation of fate tissue, being moved in a vertical plane, they form from the thread of the cord is inserted and the reed makes surf of the cord to the edge of the fabric. After which the cycle repeats and the accumulation of tissue A.

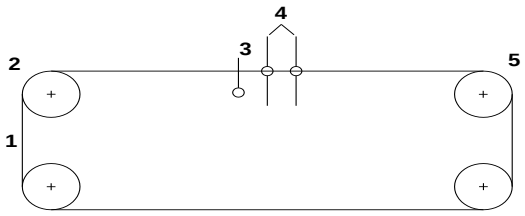


Figure1.Threading warp on the loom

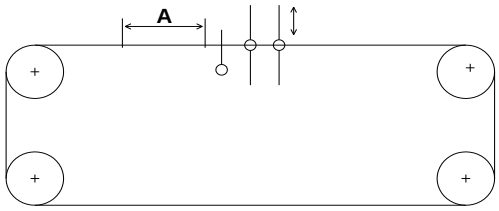


Figure 2. The pattern of fabrication of a section of fabric with cords on a loom

After producing a section of fabric A with cords, weft yarn are woven into the fabric (fig.3), thereby forming a section B of fabric with weft yarn.

At the same time, a section of fabric A with cords moves from the reed to fate. Then the weaving process becomes impossible, due to the limited size of the throat and the impossibility of filling the weft yarn in the shed. Therefore, a region “S” is formed on the fabric, i.e. forming on the fabric with the main fabric without weft yarn.

In this position, we produce the cutting of the main fabric from the tooth of the reed and the fate and the fabric roller.

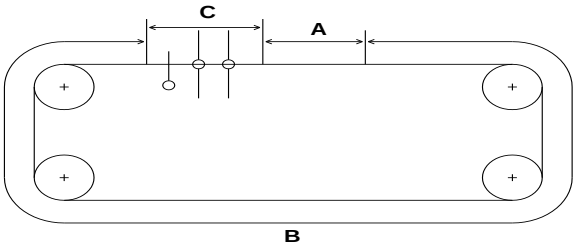


Figure 3. Weft yarn are woven into the fabric

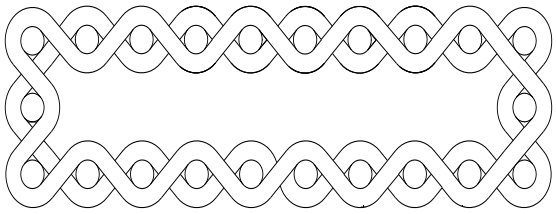


Figure 4. Section of a woven belt

Figure 4 shows a section of a woven belt with section A of fabric with added cords, section B with warp yarns and section S with warp yarns. Section A and Shave single lengths, i.e. proportional. The process of filling section S is carried out in the following sequence. In the section “S” with instead of running cords lay weft yarns. Conveyor belt was produced in the production of “Belting textiles”, according to the method described above. Table 1.shows the setting parameters of the developed belt.

III. Experiment and discussion of results

Table 1. Setting parameters of the developed conveyor belt

№	Parameters	Unit of measure	Indicator
1.	Linear density: on warp on weft	tex tex	25x10 25x10
2.	Fabric thread density: on warp on weft	10 yarns/dm	95 55
3.	Width of unbleached fabric	cm	80
4.	Breaking load: on warp on weft	kgF	286 181
5.	Breaking elongation: on warp on weft	%	39 11
6.	Fabric threading: on warp on weft	%	12 5
7.	Fabric thickness	mm	1,9
8.	Surface density	g/m^2	660
9.	Number twisting warp weft	twisting/m	110 110
10.	Pattern		Plain
11.	Read width	cm	85

Currently used at baking enterprises conveyor belts, which are made mainly of non-woven fabrics, satisfy the consumer with their quality characteristics. The main deficiency is the low service life of the conveyor, due to the influence of the temperature-humidity made of production and the stretching of the belt during the operation of explain we have carried out experimental studies of the effect of durability and humidity among conveyor belts made from processed fabric, from unable ached fabric and from non-woven fabric installed on dough-rolling machines.

The experiment was carried out for 36 months, where the control of the experiment results were carried out every 3 months, while the temperature of the workshop was 20^0 C, and the humidity of workshop 65% [13].

Table2. The results of experimental studies of the effect of life time on the mass and thickness of the belt

№	Belt sample names	Belt thickness, mm		Weight conveyor belt (Length 3m), gr	
		refueling technological	after operation	refueling technological	after operation
1.	Belt	1,9	2,2	1990	2200
2.	Processed belt	1,9	2,18	1990	2180
3.	Non-woven belt	1,9	4,0	1990	4000

Based on the processing of experimental studies, mathematical models have been obtained that describe the patterns of change in the mass of belts depending on the time of operation:

For conveyor belt made from treated fabric.

$$Y_R=1{,}93*x^{0{,}035}$$

For conveyor belt made of harsh fabric

$$Y_R=1{,}93*x^{0{,}065}$$

For conveyor belt made fromnon-woven yarn

$$Y_R=1{,}93*x^{0{,}19}$$

Familiarly obtained mathematical models describing the patterns of change in the thickness of the belt, depending on the time of operation:

For conveyor belt made from treated fabric.

$$Y_R=2*x^{0{,}06}$$

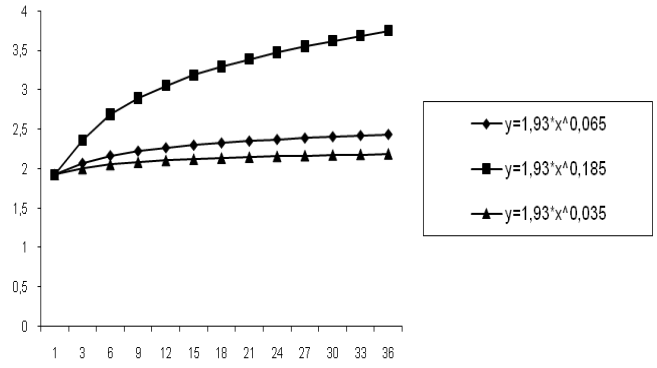
For conveyor belt made of harsh fabric

$$Y_R=2*x^{0{,}09}$$

For conveyor belt made from non-woven fabric

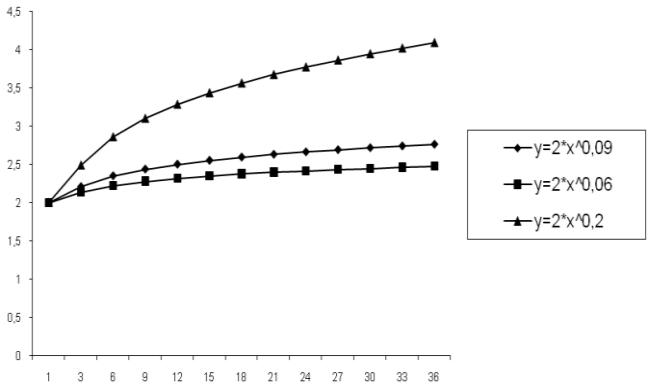
$$Y_R=2*x^{0{,}2}$$

Figure 5 shows the patterns of change in the mass of (v.kg) of conveyor belt made from treated fabric. From harsh fabric and non-woven fabric depending on the time of operation, and fig.6 shows the patterns of change in the thickness of the conveyor belt made from treated fabric, from grey fabric and non-woven fabric depending on the time of operation.



A Row 1-the belt made of grey fabric;
Row 2-belt made of a non-woven fabric;
Row 3-belt made of the treated fabric.

Figure 5. Patterns of change in the mass of the conveyor belt depending on the time of operation



Row 1-the belt made of grey fabric;
Row 2-belt made of treated fabric;
Row 3-non-woven fabric

Figure 6. Patterns of change in the thickness of the conveyor belt, depending on the time of operation

From the graphs, fig.5 and 6, it follows that the exploitation of the conveyor belt made of non-woven fabric is not more than three months, the conveyor belt made of grey fabric is about two years, and the conveyor belt made of treated fabric is three years. Due to the fact that the degree of adherence of the conveyor material in the belt made of grey fabric is lower by 58 % and in the belt made of treated fabric lower by 71% than in the belt made of non-woven fabric.

IV. CONCLUSION

The structure of grey fabric contains only mutually interlaced twisted yarns, and the treated fabric is processed with water-repellent substance, which reduces the adhesion of the transported material to the belt. On the contrary, the structure of non-woven fabric contains fibres, stitched with twisted threads, which increase the adhesion of the transported material to the belt.

In summary, it should be noted that a method and prodeuction technology of seamless woven belts has been developed. Technological parameters of the developed conveyor belt are developed. Regularities were obtained in the mass (kg) and the thickness (mm) of conveyor belt made from treated fabric, grey fabric and non-woven fabric, depending on the operation time.

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