685.31

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В роботі наведені результати досліджень процесу взаємодії текстильних ниток з напрямними поверхнями великої кривини у випадку наявності радіального охоплення з урахуванням жорсткості на згин, деформації в зоні контакту, нелінійної залежності коефіцієнту тертя від вхідного натягу та радіусу кривини поверхні в нормальній площині. Отримані результати використовувалися для удосконалення технологічних процесів швейної та текстильної промисловості.

*Ключові слова: текстильна нитка, направляюча поверхня, кривина, тертя, радіальне охоплення.*

V.YU. SCHERBAN, N.I. MURZA, A.N. KIRICHENKO, G.V. MELNIK, M.I. SHOLUDKO
Kyiv National University of Technologies and Design

**INTERACTION OF TEXTILE FILAMENTS WITH DIRECTING
THE BIG CURVATURE IN THE CASE OF PRESENCE OF RADIAL SCOPE**

In the process of processing filaments co-operate with the sending surfaces of large curvature. The arising up here loadings in the area of contact can result in the precipice of filament. Research of this process will allow to minimize the value of pull and develop the rational constructions of sending large curvature. An important value has a decision of this task for the improvement of technological processes of textile and sewing industry from position of increase of the productivity of technological equipment and quality of the produced products. Thus, a theme of this article is important, which has an important value for the improvement of the system of serve of filament on a technological equipment. Installations and research methods. At processing on the technological equipment of filament co-operate with the sending surfaces of large curvature. Absence of researches of process of co-operation of filament with the sending surfaces of large curvature taking into account inflexibility on a bend, to deformation in the area of contact, to nonlinear dependence from an entrance pull and radius of curvature of surface does not allow the coefficient of friction to set dependence of initial pull of filament on the radius of curvature of sending surface of large curvature, entrance pull, corner of scope, type of raw material taking into account correlation of radius of filament and internal radius and to optimize the geometrical sizes of sending. The lead through of such researches will allow to minimize a pull in the process of work of technological equipment and promote the productivity. Theoretical basis at the decision of scientific and technical problem are labours in industries of technology of textile and knitting productions, textile materials, mechanics of filament, theory of resiliency, mathematical design. Practical value. Optimization of pull of textile filament before the working area of technological equipment from position of his minimization allows to decrease the precipices of filaments, time of stop of technological equipment and to promote quality of the produced products.

Keywords: textile filament, sending surface, curvature, friction, radial scope.

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[1–3, 5, 6].

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[1, 4, 6].

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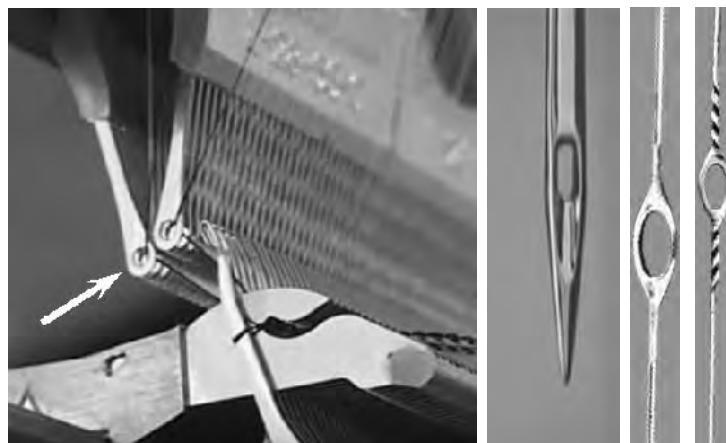
(. 1 -) [1, 3, 5, 6, 8–14].
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$$\varphi = \varphi_P + \varphi_1 + \varphi_2 - \varphi_1 - \varphi_2, \qquad \varphi_P -$$

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φ_P ; $\varphi_1, \varphi_2 -$

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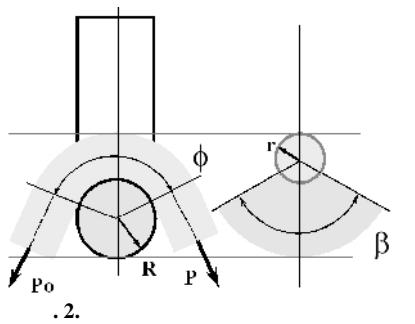
P_0 P_A P P_B.

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$$P_A = P_0\left[1 - \frac{\left(\frac{E\pi}{64}\sum_{i=1}^{w}d_i^4 \frac{1}{j}\right)^{(1+u_1 K^{u_2})}}{2P_0[R+r(1-\delta_0)]^2}\right], \; P_B = P\left[1 - \frac{\left(\frac{E\pi}{64}\sum_{i=1}^{w}d_i^4 \frac{1}{j}\right)^{(1+u_1 K^{u_2})}}{2P[R+r(1-\delta)]^2}\right] \quad (1)$$

$(\frac{E\pi}{64}\sum_{i=1}^{w}d_i^4)^{j(K)}$ –   ; E –

; d_i –   (   ),

; w –   ,   ; $j(K) = 1 + u_1 K^{u_2}$, –   ,

K ; $\delta, \delta_0 -$

; u_1, u_2 –   .

, A B.

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$ds = (R+r)d\varphi$ ($s -$)   [1–3, 8=14]

$$\frac{dP}{ds} = F \;, \quad N = b_1 E_1 \delta, \quad \frac{P}{[R+r(1-\delta)]} = N, \qquad (2)$$

$P -$; F –   ,   ; $N -$

; $s -$; $b_1 -$

; $E_1 -$ [1, 3] .

,   [1, 3, 4],   ,

[1, 3, 7].

F f

$$F = f \cdot N^n, \; f = \frac{a}{b\varphi^{n_1}}, \; f = \frac{4\sin(\frac{\beta}{2})}{\beta + \sin(\beta)}\frac{a}{b\varphi^{n_1}}. \tag{3}$$

$n, a, b, n_1 -$,
        ; $f -$; $\beta -$

[5, 6]; $f -$. n

$2/3 \le n \le 1$ [1, 3]. $n_1 = 0$,   (3) $f = a/b$.

        (2)

$$\frac{P}{[R + r(1-\delta)]} = b_1 E_1 \delta. \tag{4}$$

        (4)   (2),   (3),

$$\frac{d}{ds}\{[R + r(1-\delta)]b_1 E_1 \delta\} = \frac{a}{b\varphi^{n_1}}\frac{4\sin\frac{\beta}{2}}{\beta + \sin(\beta)}(b_1 E_1)^n (\delta)^n. $$

                                    ,

$$(\delta)^{1-n} = (\delta_0)^{1-n} + \frac{(1-n)a(b_1 E_1)^{n-1}}{b(1-n_1)}\frac{4\sin\frac{\beta}{2}}{\beta + \sin(\beta)}\varphi^{1-n_1}. \tag{5}$$

                              $n \to 1$, $n_1 = 0$ $f = \frac{a}{b}$

$$\delta = \delta_0 e^{f\frac{4\sin(\frac{\beta}{2})}{\beta+\sin(\beta)}\varphi}. \tag{6}$$

        (6)   (2),   (3),
    $n = 1$

$$P_B = P_A\left[1 + \frac{(R+r)}{[R + r(1-\delta_0)]}(e^{f\frac{4\sin(\frac{\beta}{2})}{\beta+\sin(\beta)}\varphi} - 1)\right]. \tag{7}$$

        (7)   (1),

$$P = P_0\left[1 + \frac{(R+r)}{[R+r(1-\delta_0)]}\left(e^{f\frac{4\sin(\frac{\beta}{2})}{\beta+\sin(\beta)}\varphi} - 1\right)\right] + \left[\frac{\left(\frac{E\pi}{64}\sum_{i=1}^{w}d_i^4\right)^{(1+u_1 K^{u_2})}}{2[R+r(1-\delta)]^2}\right] - \left[\frac{\left(\frac{E\pi}{64}\sum_{i=1}^{w}d_i^4\right)^{(1+u_1 K^{u_2})}}{2[R+r(1-\delta_0)]^2}\right] \times$$

$$\times\left[1 + \frac{(R+r)}{[R+r(1-\delta_0)]}\left(e^{f\frac{4\sin(\frac{\beta}{2})}{\beta+\sin(\beta)}\varphi} - 1\right)\right]. \tag{8}$$

 $\varphi = \varphi_P + \varphi_1 + \varphi_2 - \varphi_1 - \varphi_2$,   [1–3]

$$\varphi_1 = \arccos\left[1 - \delta_0\left(\frac{2r}{R}\right)^2\right], \quad \varphi_2 = \arccos\left[1 - \delta\left(\frac{2r}{R}\right)^2\right],$$

$$(9)$$

$$\varphi_1 = \arccos\left[1 - \frac{B}{2P_0(R+r)^2}\right], \quad \varphi_2 = \arccos\left[1 - \frac{B}{2P(R+r)^2}\right].$$

(8)   (2), (9).

$$f(P) = 0 \qquad P.$$

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174   (1   ), $B = 1{,}3$ · ^{2}, $P_0 = 10$, $r = 0{,}24$, $R = 0{,}5...10$, $\varphi_p = 3{,}14$,
$n = 0{,}82$, =;   93,5 (2   ), $B = 1{,}2$ · ^{2}, $P_0 = 10$, $r = 0{,}2$, $R = 0{,}5...10$
, $\varphi_p = 3{,}14$, $n = 0{,}85$, = ;   100 (3   ), $B = 2{,}5$ · ^{2}, $P_0 = 10$, $r = 0{,}21$,
$R = 0{,}5...10$, $\varphi_p = 3{,}14$, $n = 0{,}78$, = .

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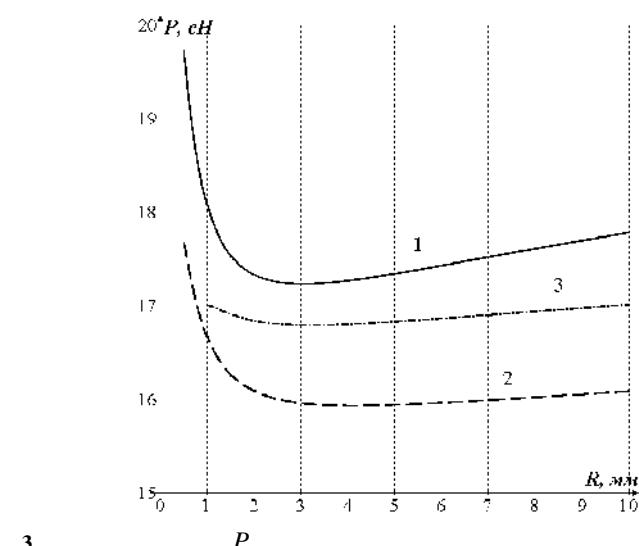
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