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Investigation of the Sitting Process of Slanted Tooted Transmission

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ABSTRACT: This paper presents an expression that defines the coupling coefficient, which is one of the main parameters that takes into account the continuity and smoothness of the coupling process of the bevel gears and the bevel gear drive.

KEYWORD: bevel, coupling, coverage coefficient, belt, coefficient of elasticity, torque, coupling arc, coupling modulus, coupling line.

I. INTRODUCTION

The coupling coefficient has a special place in the transmissions due to coupling. The coating coefficient takes into account the continuity and smoothness of the coupling in the transmission. Such qualities of the extension are ensured by the fact that one pair of teeth covers the work of another pair of teeth. To do this, each subsequent pair of teeth must also be attached before the previous pair of teeth can be separated. The size of the coating is estimated based on the coverage factor.

II. RELATED WORK

In the study of the coefficient of coverage in gears, we consider the example of involute gears.

As shown in [1], the coverage factor is the angle of inclination of the cross section, pha, which is the angle of rotation of the wheel from the position of the wheel teeth when they collide at point $V^{/}$ and to the position when they collide at point $B^{//}$ (Fig. 1a).

Consequently, the coverage coefficient of a straight gear transmission

$$\varepsilon_\alpha = \frac{\varphi_{\alpha 1}}{\tau_1} = \frac{\varphi_{\alpha 2}}{\tau_2}, \tag{1}$$

this τ_1 - corner step ($\tau_1 = \frac{2\pi}{z_1}$); $\varphi_{\alpha 1}, \varphi_{\alpha 2}$ - the turning angles of the steering and steering gears, respectively ($\varphi_{\alpha 1} = \frac{g_\alpha}{r_{b1}}, \varphi_{\alpha 1} = \frac{g_\alpha}{r_{b2}}$); g_α- the length of the active attachment line ($g_\alpha = g_f + g_a$), m; g_f- the length of the attachment line to the pole, m; g_f- post-pole length, m (Fig. 1b).

III. LITERATURE SURVEY

The lengths of the coupling line before and after the pole are determined as follows

$$g_f = r_{b2}(tg\alpha_{a2} - tg\alpha_\omega), \tag{2}$$

$$g_a = r_{b1}(tg\alpha_{a1} - tg\alpha_\omega), \tag{3}$$

this r_{b1}, r_{b2} - the radii of the initial circles of the leading and driven gears, respectively, m; α_ω -contact angle; α_{a1}, α_{a2} - profile angles of the teeth of the leading and driven gears, respectively.

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IV. METHODOLOGY

If $r_b = 0{,}5mz\cos\alpha$ Substituting (2) and (3) into (1), we obtain the formula for determining the coverage coefficient of a straight gear transmission [1, 2, 3].

$$\varepsilon_\alpha = \frac{z_1 tg\alpha_{a1} + z_2 tg\alpha_{a2} - (z_1 - z_2) tg\alpha_\omega}{2\pi}, \tag{4}$$

this z_1, z_2- leading and unmounted in accordance with the gear wheel teeth.

According to the data given in [4, 5], the coverage coefficient of straight gear transmissions by radii is expressed as follows

$$\varepsilon = \frac{ab}{p_x} = \frac{\sqrt{r_{a1}^2 - r_{b1}^2} + \sqrt{r_{a2}^2 - r_{b2}^2} - a_w \sin\alpha_\omega}{\pi m \cos\alpha_\omega} \tag{5}$$

this *m*- attachment module, mm.

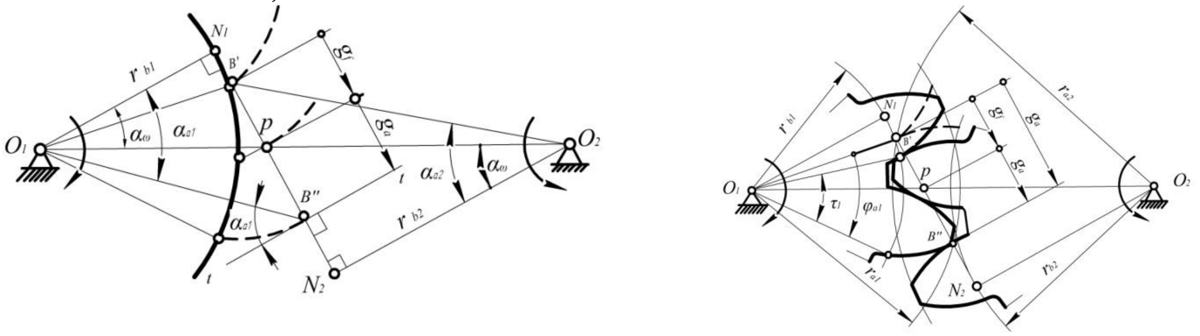

Figure 1. Evolventa profile gear coupling

If $\varepsilon_\alpha < 1$ is calculated according to formulas (4) and (5), the process of tooth adhesion is not continuous: one pair of teeth has time to separate from the tooth before the other pair of teeth have yet to be attached. Therefore, the minimum allowable value of ε_α is 1.05. This value ensures that the sharing process is uninterrupted with a 5% backup.

In a bevel gear, the sticking time of a pair of teeth (bevel $\beta \neq 0$) is longer than in a bevel gear (bevel angle $\beta = 0$). Therefore, the coverage factor of the bevel gear eg is greater than the coverage factor ε_γ of the right gear transmission and is calculated according to the following formula:

$$\varepsilon_\gamma = \varepsilon_\alpha + \varepsilon_\beta. \tag{6}$$

In this sum, ea is determined by the addition of (4) or (5), and the second addition is determined by the following relation.

$$\varepsilon_\beta = \frac{B}{p_x}, \tag{7}$$

this *B* – thickness of the gear wheel ($B = \psi m$, ψ – thickness coefficient of the gear, determined by the condition of tooth strength and abrasion resistance, m-coupling modulus, m.), m; px – tooth axial pitch ($p_x = \dfrac{\pi m}{\sin\beta}$), м.

V. EXPERIMENTAL RESULTS

We do this by substituting *B* and p_x into the expression ε_β

$$\varepsilon_\beta = \psi \sin\frac{\beta}{\pi}. \tag{8}$$

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It is clear from equations (6) and (8) that the ε_γ coverage coefficient of the bevel gear ($\beta\neq0$) is greater than the coverage coefficient ea of the straight gear transmission ($\beta=0$). This is the advantage of bevel gear transmission.

Figure 2 shows the distribution of the coupling arc of straight and bevel gears. According to this scheme, the coverage coefficient is defined in [6] as follows. That is, the propagation of the coupling arc of a straight gear measured along the initial circumference is expressed as follows when considered as a straight line.

$$a'b' = r_b \varphi_\alpha \,. \tag{9}$$

The coverage coefficient of such a gear is as follows

$$\varepsilon = \frac{a'b'}{p_x}, \tag{10}$$

this $a'b'$ - the length of the propagation of the coupling arc, m.

According to the diagram shown in Figure 2, it takes longer because of the time it takes for the teeth to engage in the bevel gears $\varphi' > \varphi$. The propagation of the coupling arc measured along the initial circumference of the bevel gear is expressed as follows when considered as a straight line

$$a'b'' = r_b \varphi'_\alpha \,. \tag{11}$$

Based on the above, we express the coefficient of coverage of bevel gears as follows

$$\varepsilon_k = \frac{a'b''}{p_x} = \frac{a'b'}{p_x} + \frac{b'b''}{p_x} = \varepsilon + \frac{Btg\beta}{p_x} \,. \tag{12}$$

In our study, the principle of coupling the gear belt with the gear pulley in the gear belt transmissions was considered as a special case of the coupling laws of the gears. However, since one of the two joints in the gear belt drive is a flexible element, it is important to take into account the elastic deformation when determining the coverage coefficient[6, 7]. According to the scheme shown in Figure 3, the teeth of the gear belt are deformed under the influence of rotational force and move from state $b'b''$ to state $b_1'b_1''$.

VI. CONCLUSION

It is known that gear belt extensions serve for power transmission. Therefore, a deformation force is generated in the belt teeth during operation, and we express it as follows

$$P = c\delta \,, \tag{13}$$

this c-coefficient of elasticity of the band, Nm / rad; δ-belt teeth deformation value of, m.

Given Equation (13), we determine the torque transmitted by the gear belt transmission as follows.

$$M = Pr_b \,. \tag{14}$$

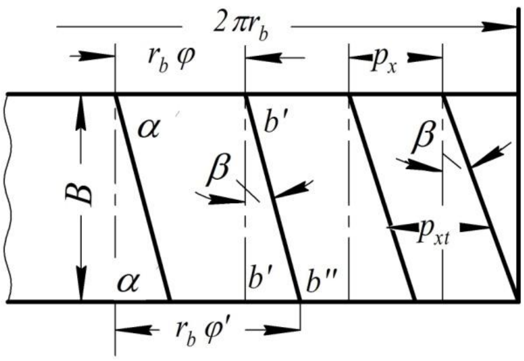

Figure 2. Propagation of the coupling arc of straight and oblique gears

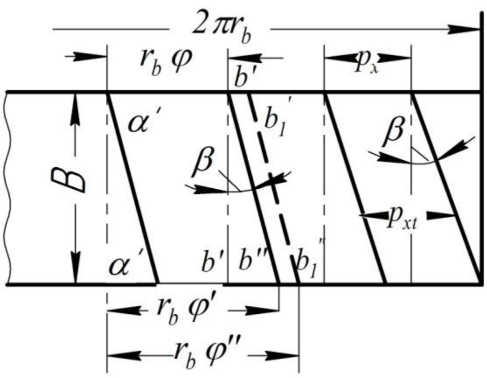

Figure 3. Scheme for determining the coverage coefficient of bevel gear

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Using equations (13) and (14), we determine the deformation value of the belt tooth

$$\delta = \frac{M}{p_x c r_b}. \quad (15)$$

According to the results of theoretical research, the coefficient of coupling of the proposed bevel gear is given by equations (12) and (15) as follows

$$\varepsilon_y = \varepsilon + \left(B + \frac{M}{c r_b} \right) \frac{tg\beta}{p_x}. \quad (16)$$

It can be seen from Equation (16) that the value of the coverage coefficient also increases as the width of the gear belt, the value of the torque and the angle of inclination of the teeth increase. It is practiced in gear extensions $\varepsilon_y > 10$ [8].

REFERENCES

[1] Frolov K.V., Popov S.A., Musatov B.K. Mechanism and machine theory. - T .: Teacher, 1990. - 496 p.
[2] Mashnev M.M., Kraskovskiy E. A., Lebedev P.A. Theory of mechanisms and machines and details of machines. - M .: Mashinostroenie, 1980. - 512 p.
[3] Levitskaya O.N., Levitskiy N.I. Course theory of mechanisms and machines. - M .: Vysshaya shkola, 1978. - 269 p.
[4] Usmonho'jaev H.H. Mechanism and machine theory. - T .: Teacher, 1970. - 576 p.
[5] Korenyakov A.S. Theory of mechanisms and machines. - M .: Vysshaya shkola, 1976. - 444 p.
[6] V.Turdaliyev, A.Qosimov, M.Mansurov, D.Shodmonov, S.Komilov. Dynamic Analysis of the Transfer Mechanism of the Soil Processing Unit // International Journal of Advanced Research in Science, Engineering and Technology Vol. 7, Issue 9 , September 2020.
[7] J.Mukhamedov, A.Qosimov, M.Mansurov, D.Shotmonov, N.Asqarov. Development of Structures and Structural Analysis of Gear-Lever Belt [1] Transmission // International Journal of Advanced Research in Science, Engineering and Technology Vol. 7, Issue 10, Octobe 2020.
[8] Konvisarov D.V. Theoretical bases of design of mechanisms. - M .: Mashgiz, 1950. - 320 p.