TO‘QUV DASTGOHINING TANDA ROSTLAGICHINI TAXTLASH PARAMETRLARINI LOYIHALASH

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Annotatsiya: Ushbu maqolada to‘quv dastgohining tanda rostlagichining taxtlash parametrlarini takomillashtirish orqali, tanda iplarning uzilishini kamaytirishga va mashinaning ish unumdorligini oshirishishga olib keladigan faktorlar keltirib o‘tilgan. Tanda ipi tarangligining hosil bo‘lishida statik kuchlarni hisoblash va harakatlanuvchi skalo tizimining taxtlash parametrlarini loyihalash uchun bog‘liqlik formulalari keltirilgan.

Tayanch iboralar: dastgoh, tanda, ip, skalo, parametr, rostlagich, taranglik, loyihalash, modellashtirish.

ПРОЕКТИРОВАНИЕ ПАРАМЕТРОВ НАСТРОЙКИ РЕГУЛЯТОРА ОСНОВЫ ТКАЦКОГО СТАНКА

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Аннотация: В данной статье за счет улучшения параметров настройки регулятора основы ткацкого станка упомянуты факторы, которые приводят к уменьшению обрыва нити и повышению производительности машины. Представлены формулы зависимостей для расчета статических сил и расчета параметров установки подвижной системы скалы при формировании натяжения основы.

Ключевые слова: станок, основа, нить, скало, параметр, регулятор, натяжение, проектирование, моделирование

DESIGNING SETTING PARAMETERS OF THE WIP REGULATOR OF STB WEAVING LOOM

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Annotation: In this article, by improving the settings of the warp regulator of the loom, factors are mentioned that lead to a reduction in thread breakage and an increase in machine productivity. Dependency formulas are presented for calculating static forces and calculating the installation parameters of the moving rock system when forming the tension of the base.

Key words: machine, base, thread, rock, parameter, regulator, tension, design, modeling

STB to‘quv dastgohida tanda iplar qo‘zg‘aluvchan skaloning qo‘shimcha ta’siriga uchraydi, bu esa tanda ipi tarangligini nazorat qiladigan moclama vazifasini bajaradi. Skaloning harakati ikkinchi tartibli bir xil bo‘lmagan chiziqli differensial tenglama bilan tavsiflanadi, uning o‘ng tomoni tanda ipi tarangligining siklik o‘zgarishining salbiy ta’sirni ifodalaydi. Salbiy ta’sir ko‘rsatish xomuza hosil qilish, jipslashtirish va boshqa jarayonlar paytida to‘ldirish tizimining umumiy deformatsiyasiga bog‘liqdir[1]. Skaloning o‘z tebranishlari chastotasidan jipslashtirish vaqtidagi chastotasining sezilarli darajada oshib ketishi tufayli, harakatlanuvchi skalo tizimi faqat xomuza hosil qilish jarayoniga ta’sir qiladi[2].

Tebranuvchi skaloning ta’siri natijasida ip tarangligining o‘zgarishi quyidagi formula bilan aniqlanadi.

$\Delta F_{st}\ J(\varphi)=C\ \gamma J(\ t\ )r_r$, Bu yerda: S – elastik taxtlash tizimining qattiqlik koeffitsienti, sN/mm; γJ(t) – dastgoh ish siklining t momentida skaloning burchak siljishi; r_r – skalo markazining burilish radiusi, mm.

Skaloning burchakli siljishi quyidagi shart bilan belgilanadi,

$$\gamma_J(t) = \frac{1}{\omega_o Ist}\int_o^t MF_j(u) exp(-0{,}5P(t-u))\sin 2\pi Ks(t-u)du$$

Bu yerda: ωo –qarshilik kuchlarini hisobga olgan holda skalo tizimining tabiiy tebranish chastotasi, s^{-1}; Ist – skalo tizimining keltirilgan inersiya momenti, $sN\cdot mm\cdot s^2$; MFj – xomuza hosil bo‘lish jarayonida tanda iplarining taranglik kuchi momenti sN·mm; u – yordamchi o‘zgaruvchi; P–Elastik taxtlash tizimining damping xususiyatlariga va skalo osti podshipniklaridagi ishqalanishga bog‘liq bo‘lgan parametr, skalo tizimi birlamchi ta’siridan tebranish paytida o‘tish jarayonining egri chizig‘i bo‘ylab eksperimental ravishda aniqlanadi[3].

Ks – Salbiy ta’sir qiluvchi kuch chastotasi o‘zgarishi, s^{-1};

t = φ/ (6 na),

bu yerda na – bosh valning aylanishlar soni, min^{-1}.

Bunda γj (t) nolga teng bo‘lgan boshlang‘ich sharoitlarni aniqlash muhim ahamiyatga ega.

STB to‘quv dastgohining friksion tanda rostlagichi ma’lum darajada o‘rnatma parametrlar bilan tavsiflanadi, ularni takomillashtirish tanda iplarning uzilishini kamaytirishga va mashinaning ish unumdorligini oshirishga olib keladi[4].

Tanda rostlagichi tanda ipining kerakli darajadagi tarangligini o‘rnatadi, tanda ipini bo‘shatish orqali u belgilangan darajani ta’minlaydi va to‘quv navoyi faollashtirilganda uni doimiy ravishda ushlab turadi. Ikkala vazifa ham rostlagichning optimal parametrlarini tanlash va saqlash bilan bog‘liqdir[5].

Ma’lumki, tanda ipi tarangligi tanda rostlagichi tomonidan hosil qilingan statik va dinamik kuchlarning yig‘indisidan iboratdir.

Tanda ipi tarangligining hosil bo‘lishida statik modellashtirish. Tanda ipi tarangligining hosil bo‘lishida statik kuchlarni hisoblash va harakatlanuvchi skalo tizimining o‘rnatma parametrlarini loyihalash uchun formulaga muvofiq quyidagi bog‘liqliklardan foydalanish tavsiya etiladi[6]:

$$F = \frac{2Cpr(Lpr - L_0)\sin\theta\frac{R}{r} - G\cos\gamma_{sk\kappa}}{[\cos(\gamma sk - \varphi) - \sin\gamma sk]Mt},$$

bu yerda C_{pr} – prujinaning qattiqlik koeffisiyenti, sN/mm; L_0 – bo‘sh holatdagi prujinaning uzunligi, mm; M_t– tanda iplari soni.

$$\gamma sk = 90^0 - \gamma_o - (\beta_2 - \beta_1),$$

Bu yerda: β_2 – figurali tutqichdagi prujinaning bog‘lash nuqtasini uning aylanish o‘qi bilan bog‘laydigan vertikal va chiziq orasidagi burchak, grad;

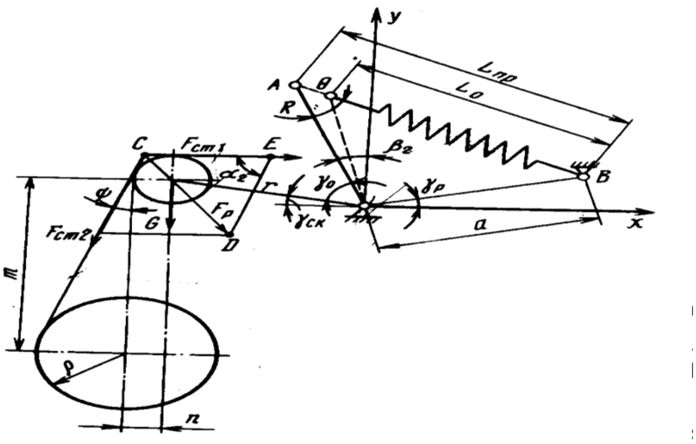
β_1 – figurali tutqichning o‘qi va figurali tutqichdagi prujinali biriktirma nuqtasini uning aylanish o‘qi bilan bog‘laydigan chiziq orasidagi burchak, grad

$$Lpr = \sqrt{R^2 + a + 2Ra\sin(\beta_2 - \gamma_p)};$$

$$\theta = arcos\frac{R^2 + L^2{}_{pr} + a^2}{2LprR};$$

$$\varphi = \arcsin\frac{m(\rho - Rsk - n\sqrt{m^2 + n^2 - (\rho - Rsk)^2}}{m^2 + n^2},$$

Bu yerda R_{sk} – skalo radiusi, mm.



2-rasm. Skalo harakatlanish tizimini hisoblash sxemasi

F_p ni aniqlash uchun quyidagi tenglamadan foydalanamiz

$$F_p = \sqrt{F^2{}_{cm1} + F^2{}_{cm2} + 2F_{cm1}F_{cm2}\cos\alpha_2},$$

Bu yerda $\alpha_2 = 90^0 - \psi$.

Agar dastgohda skalo aylanadigan podshipniklardan yordamida harakatlansa, u holda tenglama quyidagi shaklni oladi

$$F_p = \sqrt{2F_{cm}^2 - 2F_{cm}^2 \cos\left(90^0 - \psi\right)} = F_{cm}\sqrt{2\left(1 - \sin\psi\right)}.$$

prujinaning o‘zgargan uzunligi *L’’r* va *F’* asos shoxlarining natijaviy tarangligi o‘rtasidagi bog‘liqlik empirik tenglama shaklida taqdim etilishi mumkin[7].

$L'_{pr} = 389 + 0{,}0044F^2_r - 0{,}15F_r$.

Rostlagichning harakatlanuvchi qismining ishlash modeli. Agarda tanda ipining haqiqiy uzunligi $\Delta\ell_2$, tanda rostlagichi tomonidan yechilayotgan belgilangan tanda ipi uzunligi $\Delta\ell_1$ ga teng bo‘lsa, dastgohda mato ishlab chiqarish jarayoni barqaror bo‘ladi. $\Delta\ell_1$ va $\Delta\ell_2$ ni aniqlash uchun quyidagi formulalardan foydalanish tavsiya etiladi[4].

$\Delta\ell_1 = (1 + 0{,}01a_t) / R_a$,

bu yerda: a_t – tanda ipi kirishishi, %; R_a – to‘qimaning arqoq bo‘yicha zichligi, ip/1 mm.

$$\Delta\ell_2 = \alpha \cdot \rho \cdot \pi / 180,$$

bu yerda: α – Navoydan tanda ipini yechilish vaqtidagi burilish burchagi, grad;

ρ – To‘quv navoiga ipning o‘ralish burchagi, mm.

Yechilayotgan tanda ipining uzunligini aniqlash uchun to‘quv navoyiga ipni o‘rash ρ radiusining berilgan qiymati uchun α aylanish burchagini aniqlash kerak[8].

Navoyning burilish burchagi richag-kulisali mexanizmining o‘rnatilishiga va skalo prujinalarini uzunligiga bog‘liq.

$\alpha = f\,(b_1, b_2, b_3, L'_r)$,

bu yerda b_1, b_2, b_3 –mos ravishda 3,4,8 mexanizmning richaglari uzunligi, mm;

L_{pr} – tanda rostlagichining 2 prujina uzunligi, mm.

Ushbu bog‘liqlik ma’lum to‘qimalarni ishlab chiqarish va keyinchalik regressiya tahlili usuli yordamida eksperimental ma’lumotlarni qayta ishlash jarayonida faol tajriba natijasida olinishi mumkin[9]. Eksperimental tadqiqotlar natijasida olingan munosabatlarga misol:

$$\alpha = 3{,}35 + 0{,}003b_1 - 0{,}0023b_2 + 0{,}0013b_3 - 0{,}007L_{\text{'r.}}$$

Gazlama hosil qilish jarayonining texnologik rejimini loyihalash bo‘yicha yuqoridagi nazariy ishlanmalar asosida dastur algoritmi tuzildi va to‘quv texnologik jarayonining SAPR tizimi ishlab chiqildi[10].

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