

**O'ZBEKISTON RESPUBLIKASI OLIY VA O'RTA MAXSUS
TA'LIM VAZIRLIGI**

**TOSHKENT TO'QIMACHILIK VA YENGIL SANOAT
INSTITUTI**

NAZARIY VA AMALIY MEXANIKA KAFEDRASI

KURS ISHI

Mavzu: Ko'priqli kran yuritmasi

Bajardi: 16-13 guruh talabasi
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TOSHKENT 2015

Kirish

Yopiq korpus ichiga joylashgan, yetaklanuvchi val burchak tezligini kamaytirib uning aylantiruvchi momentini oshiradigan uzatma reduktor deb ataladi.

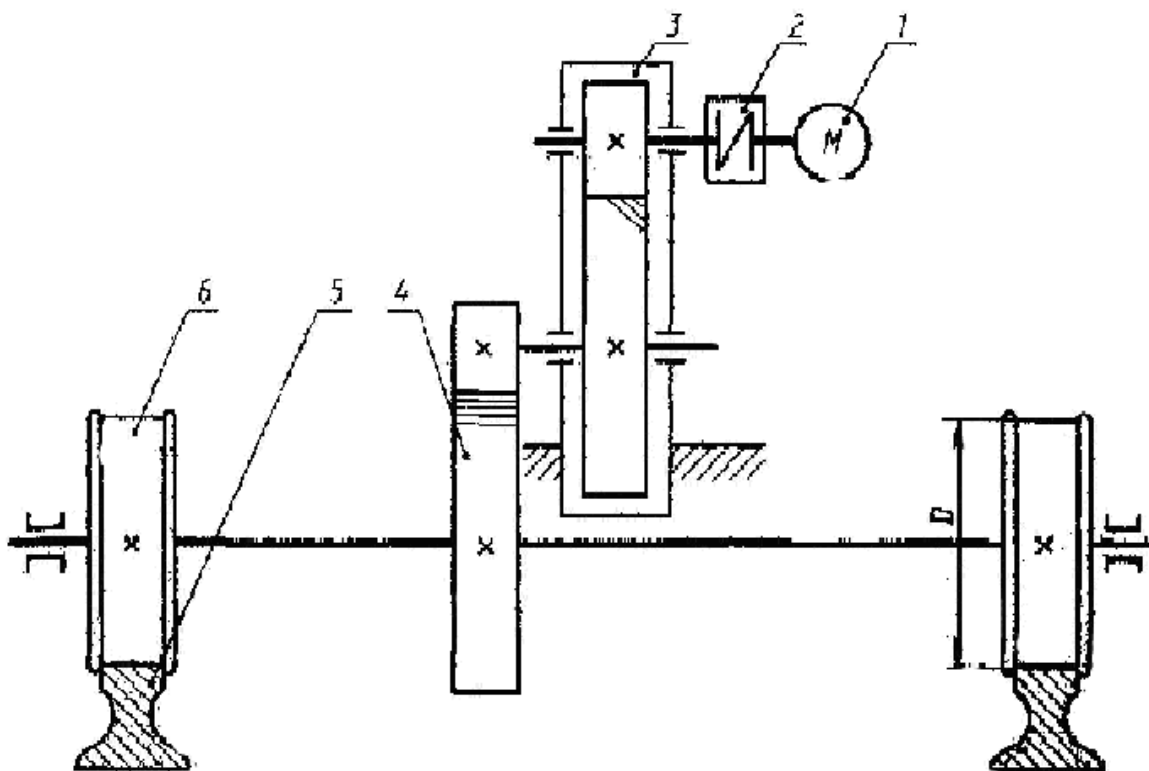
Uzatmani alohida yopiq korpus ichiga joylashtirish yig'ish aniqligini oshiradi hamda uni yaxshi moylanishini, FIK oshishini, yeyilishini kamayishini taminlaydi, chang va namlikdan muxofaza qiladi.

Reduktor tugallangan mexanizm bo'lib, mashinalar yuritmalarining tartibiga kiradi. U dvigatel va mashina ishchi organlariga turli xil muftalar, ochiq uzatmalar yoki boshqa ajraluvchi qurilmalar yordamida ulanadi.

Reduktor korpusida vallarga qo'zg'almas qilib biriktirilgan tishli g'ildiraklar joylashtirilgan. Vallar esakorpusdagi maxsus urindiqlarda joylashtirilgan podshipniklarga tayanadi. Reduktorlarda asosan dumalash podshipniklari qo'llaniladi. Podshipnik o'rindiqlari podshipnik qopqoqlari bilan berkitiladi.

Sanoatda keng qo'llaniladigan silindrsimon g'ildirakli reduktorlar bir pog'onali, ikki pog'onali va uch pog'onali qilib yasaladi. Ularning asosiy parametrlari, masalan, uzatish nisbati, o'qlararo masofasi, reduktor ostidan vallar o'qigacha bo'lgan masofa standart qiymatga ega bo'ladi. Reduktorlarning belgisiga (markasiga) asosan ularni konstruksiyasi va asosiy parametrlaridan biri aks etgan bo'ladi.

Техник топшириқ №2
Кўприкли кран юритмаси



1-двигатель; 2-муфта; 3-цилиндрсимон ёпик узатма; 4-очик цилиндрсимон узатма; 5-рельс; 6-ғилдирак

| Берилган қийматлари | Вариантлар | | | | | | | | | |
|---|------------|------|-------------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Кўприк ҳаракатига қаршилик куч F , кН | 1,5 | 2,0 | 2,5 | 3,0 | 2,0 | 3,0 | 1,5 | 2,5 | 2,5 | 3,5 |
| Кўприк тезлиги V , м/с | 1,00 | 1,35 | 1,65 | 1,00 | 2,00 | 1,35 | 1,65 | 2,00 | 1,00 | 1,65 |
| Ғилдирак диаметри D , мм | 200 | 300 | 400 | 300 | 500 | 400 | 600 | 700 | 400 | 500 |

Berilgan
 $F=2,5$ кН
 $V=1.65$ м/с
 $D=400$ мм

$$P_U = F \cdot V = 2,5 \cdot 1.65 = 4.2 \text{ kvt}$$

$$n_u = \frac{60V}{\pi D} = \frac{60 \cdot 1.65}{3.14 \cdot 0.4} = 78.8 \text{ ayl / min}$$

Yuritmani kinematik hisobi

1. Yuritmani umumiy Foydali Ish Koeffisientini hisoblash

$$\eta_{um} = \eta_{\tau} \cdot \eta_{nod} \cdot \eta_{ped} = 0,97 \cdot 0,98 \cdot 0,99^3 = 0,913$$

2. El. dvigatelni tanlash uchun talab etiladigan quvvatni hisoblash

$$P_{tal} = \frac{P_{chiq}}{\eta_{um}} = \frac{4,2}{0,913} = 4,61 \text{ kvt} \quad P_{dv} > P_{tal} \quad P_{dv} = 5,5 \text{ kvt}$$

3. El. dvigatelni markalarni tanlash

| | | | |
|--------------|-------------|-------------|-------------|
| $n_c = 3000$ | 1500 | 1000 | 750 |
| 4A90L2 | 4A100S4 | 112MA6 | 4A112M8 |
| $S = 4,3\%$ | $S = 4,4\%$ | $S = 4,7\%$ | $S = 5,8\%$ |

4.

$$n_{dv} = 3000(1 - S) = 3000(1 - 0,043) = 2880 \text{ ayl / min}$$

$$n_{dv} = 1500(1 - S) = 1500(1 - 0,044) = 1445 \text{ ayl / min}$$

$$n_{dv} = 1000(1 - S) = 1000(1 - 0,047) = 965 \text{ ayl / min}$$

$$n_{dv} = 750(1 - S) = 750(1 - 0,058) = 720 \text{ ayl / min}$$

5. Yuritmani umumiy uzatish sonini hisoblash

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{2880}{78,8} = 36,5$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{1445}{78,8} = 18,3$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{965}{78,8} = 12,3$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{720}{78,8} = 9,1$$

6. Umumiy uzatish sonini aniq pog'onalarga taqsimlash

$$U_{um} = U_T \cdot U_{red} \quad U_{red} = 4$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{36.5}{4} = 9.1$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{18.3}{4} = 4.5$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{12.3}{4} = 3.1$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{9.1}{4} = 2.27$$

7. Har bir val uchun quvvat (P), aylanishlar soni (n), burovchi moment (T), burchak tezligi (ω) hisoblanadi

I val:

$$P_1 = P_{tal} = 4,6 \text{ kvt}$$

$$n_1 = n_{dv} = 965 \text{ min}^{-1}$$

$$T_1 = 9550 \cdot \frac{P_1}{n_1} = 9550 \cdot \frac{4,6}{965} = 45.5 \text{ Nm}$$

$$\omega_1 = \frac{\pi \cdot n_1}{30} = \frac{3.14 \cdot 965}{30} = 101 \text{ s}^{-1}$$

II val:

$$P_2 = P_1 \cdot \eta_T \cdot \eta_n = 4,6 \cdot 0.97 = 4.46 \text{ kvt}$$

$$n_2 = \frac{n_1}{U_R} = \frac{965}{4} = 241.25 \text{ min}^{-1}$$

$$T_2 = T_1 \cdot U_R \cdot \eta_T \cdot \eta_n = 45.5 \cdot 4 \cdot 0.97 = 176.5 \text{ Nm}$$

$$\omega_2 = \frac{\omega_1}{U_R} = \frac{101}{4} = 25.25 \text{ s}^{-1}$$

III val:

$$P_3 = P_2 \cdot \eta_p \cdot \eta_{nod} = 4,46 \cdot 0,96 = 4,28 \text{ kvt}$$

$$n_3 = \frac{n_2}{U_{II}} = \frac{241,25}{3,1} = 77,8 \text{ min}^{-1}$$

$$T_3 = T_2 \cdot U_{II} \cdot \eta_n = 176,5 \cdot 3,1 \cdot 0,96 = 525,3 \text{ Nm}$$

$$\omega_3 = \frac{\omega_2}{U_{II}} = \frac{2,25}{3,1} = 8,14 \text{ s}^{-1}$$

$$T_1 < T_2 < T_3$$

$$\omega_1 > \omega_2 > \omega_3$$

$$n_1 > n_2 > n_3$$

$$P_1 > P_2 > P_3$$

Bir pog'onali qiya tishli silindrsimon yopiq uzatmaning hisobi

Berilgan:

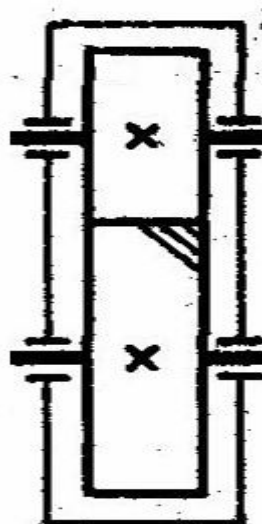
$$T_2 = 176.5 \text{ Nm}$$

$$T_3 = 525.3 \text{ Nm}$$

$$n_2 = 241.25 \text{ min}^{-1}$$

$$n_3 = 77.8 \text{ min}^{-1}$$

$$U = 4$$



1. Ruxsat etilgan kuchlanishlarni aniqlash

1.1 Ruxsat etilgan kontakt kuchlanishni aniqlash

$$[\delta_H] = K_{HL} \cdot [\delta_{HO}]$$

bu yerda:

K_{HL} -uzatmani ishlash muddatini hisobga oluvchi koeffitsient bo'lib, uning qiymatini 1 ga teng deb olamiz

$[\delta_{HO}]$ -ruxsat etilgan kontakt kuchlanishning oquvchanlik chegarasi

$$[\delta_{HO}] = 2 \cdot HB_{o'r} + 70 = 2 \cdot 200 + 70 = 470 \text{ MPa}$$

$$[\delta_n] = 0.45([\delta_{n1}] + [\delta_{n2}]);$$

$$\text{Shesternya uchun: } [\delta_{n1}] \frac{(2 \cdot HB_1 + 70) K_{HL}}{[SH]} = \frac{(2 \cdot 230 + 70) \cdot 1}{1.1} \approx 482 \text{ MPa}$$

$$\text{G'ildirak uchun: } [\delta_{n2}] \frac{(2 \cdot HB_2 + 70) K_{HL}}{[SH]} = \frac{(2 \cdot 200 + 70) \cdot 1}{1.1} \approx 428 \text{ MPa}$$

$$[\delta_n] = 0.45(482 + 428) = 410 \text{ MPa}$$

2. Uzatmaning o'qlararo masofasini aniqlash

$$a_{\omega} = K \cdot (U + 1) \cdot \sqrt[3]{\frac{T_3 \cdot K_{H\beta}}{[\delta_H]^2 \cdot U^2 \cdot \psi_a}}$$

bu yerda:

K_a -hisobiy koeffitsient bo'lib, to'g'ri tishli uzatma uchun $K_a = 49.5$ ga teng, qiya tishli uzatma uchun esa $K_a = 43$ gat eng.

U-uzatmaning uzatish soni

$[\delta_H]$ -ruxsat etilgan kontakt kuchlanishning MPa hisobida

T_3 -sekin aylanuvchi g'ildirak valining burovchi momenti

K_{HB} -yuklanishni tish yuzasiga notekis taqsimlanishni hisobga oluvchi koeffisienti tish yuzasining notekisligi HBga, tish eni koeffisienti ψ_a va uzatma g'ildiraklarining tayanchi nuqtasiga joylashishiga nisbatan olinadi.

ψ_a -tish eni koeffisienti bo'lib, uzatma g'ildiraklarini tayanchga nisbatan joylashishiga qarab tanlanadi.

$$a_\omega = K \cdot (U + 1) \cdot \sqrt[3]{\frac{T_3 \cdot K_{HB}}{[\delta_H]^2 \cdot U^2 \cdot \psi_a}} = 43 \cdot 5 \cdot \sqrt[3]{\frac{176.5 \cdot 10^3 \cdot 1}{410^2 \cdot 4^2 \cdot 0.4}} = 118.25 \text{ mm}$$

Standart bo'yicha $a_\omega = 125 \text{ mm}$ ga teng.

3. Tishli g'ildiraklarning dastlabki o'lchamlari

3.1 G'ildirak bo'luvchi aylana diametrini hisoblash.

$$d_2 = \frac{2 \cdot a_\omega \cdot U}{U + 1} = \frac{2 \cdot 125 \cdot 4}{5} = 200 \text{ mm}$$

3.2 G'ildirak eni

$$b_2 = \psi_a \cdot a_\omega = 0.4 \cdot 125 = 50 \text{ mm} \quad b_1 = 50 + 5 = 55 \text{ mm}$$

4. Uzatma modulini aniqlash

$$m_n = (0.01 \div 0.02) a_\omega = 1.25 \div 2.5 \text{ mm}$$

$$m_n = 2 \text{ mm}$$

Standart bo'yicha $m = 1.25 \text{ mm}$ deb qabul qilamiz.

bu yerda:

K_m -hisobiy koeffisient bo'lib, to'g'ri tishli uzatma uchun 6,8ga teng, qiya tishli uzatma uchun 5,8 ga teng bo'ladi.

5. Uzatma tishlarining qiyalik burchagi va umumiy tishlar soni

5.1 Qiyalik burchagining eng kichik qiymatini aniqlash

$$\beta_{\min} = \arcsin\left(\frac{4m}{b_2}\right) = 0.97$$

5.2 Uzatma umumiy tishlar soni

$$z_y = \frac{2 \cdot a_\omega \cdot \cos \beta_{\min}}{m} = \frac{2 \cdot 125 \cdot 0.97}{2} = 121$$

6. Yetaklovchi va yetaklanuvchi tishli g'ildirak tishlar soni

$$z_1 = z_y / (U + 1) = 121 / 4 + 1 = 24$$

$$z_2 = z_y - z_1 = 121 - 24 = 97$$

$$\cos \beta = \frac{(z_1 + z_2)m_n}{2aw} = \frac{(24 + 97) \cdot 2}{2 \cdot 125} = 0.983$$

$$\beta = 11^\circ 50'$$

7. Uzatmaning geometrik o'lchamlari

a) Tish bo'luvchi aylana diametri

$$d_1 = \frac{m \cdot z_1}{\cos \beta} = \frac{2 \cdot 24}{0.97} = 49.5 \text{ mm}$$

$$d_2 = \frac{m \cdot z_2}{\cos \beta} = \frac{2 \cdot 97}{0.97} = 200 \text{ mm}$$

b) Tish ostidan o'tgan aylana diametri

$$d_{f_1} = d_1 - 2.5m = 49.5 - 2.5 \cdot 2 = 44.5 \text{ mm}$$

$$d_{f_2} = d_2 - 2.5m = 195 \text{ mm}$$

c) Tish ustidan o'tgan aylana diametri

$$d_{a_1} = d_1 + 2m = 49.5 + 2 \cdot 2 = 53.5 \text{ mm}$$

$$d_{a_2} = d_2 + 2m = 200 + 2 \cdot 2 = 204 \text{ mm}$$

8. O'qlararo masofani tekshirish

$$a_\omega = \frac{(d_1 + d_2)}{2} = \frac{49.5 + 200}{2} = 125 \text{ mm}$$

$$a_\omega = 125 \text{ mm}$$

$$\psi_{bd} = \frac{b_1}{d_1} = \frac{55}{49.5} = 1.1$$

$$v = \frac{\omega_1 d_1}{2} = \frac{101 \cdot 49.5}{2000} = 2.5 \text{ m/s}$$

9. Ilashishda hosil bo'ladigan kuchlar

9.1 Aylanma kuch

$$F_t = \frac{2 \cdot T_2}{d_2} = \frac{2 \cdot 176.5 \cdot 10^3}{200} = 1765 \text{ N}$$

9.2 Radial kuch

$$\alpha = 20^\circ$$

$$F_r = F_t \cdot \frac{\text{tg} 20^\circ}{\cos \beta} = 1765 \cdot \frac{0.36}{0.97} = 662 \text{ N}$$

9.3 Bo'ylama kuch

$$F_a = F_t \cdot \text{tg} \beta = 1765 \cdot \text{tg} 11^\circ 50' = 375 \text{ N}$$

10. Kontakt kuchlanishni hisoblash

$$K = 376$$

$$\delta_H = K \cdot \sqrt{\frac{F_t(U+1)}{d_2 \cdot b_2}} \cdot K_{H\beta} \cdot K_{H\alpha} \cdot K_{Hv} = 376 \cdot \sqrt{\frac{1765 \cdot 5 \cdot 1 \cdot 1,1 \cdot 1,05}{50 \cdot 200}} = 378 \text{MPa}$$

Chiqqan qiymat quydagi oralig'da bo'lishi kerak

$$\delta_H = (0,9 - 1,05)[\delta_H] = 369,4 - 430,8 \text{MPa}$$

$$z_{v1} = \frac{z_1}{\cos \beta} = \frac{24}{0,983^3} \approx 25$$

$$z_{v2} = \frac{z_{21}}{\cos \beta} = \frac{97}{0,983^3} \approx 102$$

$$Y_{F1} = 4,01 \quad \text{va} \quad Y_{F2} = 3,06$$

$$\text{Shesternya uchun } \delta_{F \text{ lim } b}^{\circ} = 1,8 \cdot 230 = 415 \text{MPa}$$

$$\text{G'ildirak uchun } \delta_{F \text{ lim}}^{\circ} = 1,8 \cdot 200 = 360 \text{MPa}$$

$$\text{Xavfsizlik koefitsenti } [S_F] = 1,75 \quad [S_F]' = 1 \quad [S_F] = 1,75$$

$$\text{Shesternya uchun } [\delta_{F1}] = \frac{415}{1,75} = 237 \text{Mpa}$$

$$\text{G'ildirak uchun } [\delta_{F1}] = \frac{360}{1,75} = 206 \text{Mpa}$$

$$\text{Munosabatini topamiz } \left[\frac{\delta_F}{Y_F} \right]$$

$$\text{G'ildirak uchun } \frac{206}{3,6} = 57,5 \text{Mpa}$$

$$\text{Shesternya uchun } \frac{237}{4,01} = 59 \text{Mpa}$$

$$y_b = 1 - \frac{\beta}{140} = 1 - \frac{11,5}{140} = 1 - 0,07 = 0,93$$

$$K_{Fa} = 0,92$$

$$\delta_F = \frac{F_t K_F Y_F Y_{\beta} K_{Fa}}{b_{mn} \cdot 2} \leq [\delta_F] = \frac{1765 \cdot 1,3 \cdot 3,6 \cdot 0,91 \cdot 0,92}{50 \cdot 2} = 69,1 \text{MPa} < 206 \text{Mpa}$$

Ochiq slindr simon uzatma hisobi

1. Shesterna va g'ildirak uchun material tanlash

Shesternya uchun *stal 45*

G'ildirak uchun *stal 45*

2. Egilishda ruxsat etilgan kuchlanish

$$[G_{F1,2}] = \frac{G_F \cdot \lim_b}{S_F} \cdot K_{FW} MIIa$$

Bunda: $G_{F \lim b} = 1.35HB + 100, MIIa$

$HB \leq 350$ $G_{F \lim b} = 1.8HB \rightarrow$ **stal 45** termik ishlov berish yaxshilangan qattig'igi HB 3.9 jadvalga qaraymiz.

$$G_{F \lim b} = 1.8 \cdot 230 = 415 MIIa \rightarrow$$

Shesternya uchun $\delta^{\circ}_{F \lim b} = 1.8 \cdot 230 = 415 MIIa$

G'ildirak uchun $\delta^{\circ}_{F \lim} = 1.8 \cdot 200 = 360 MIIa$

$$S_F = 1.7 \dots 2.2$$

$$K_{FL} = 1.0$$

3. Ilashish modulini aniqlash

$$m = K_m \sqrt[3]{\frac{T_3 \cdot Y_{F1,2} \cdot K_{F\beta}}{Z_1 \cdot \varphi_{ld} \cdot [G_{F1,2}]}}; \quad m = 143 \sqrt{\frac{525.3 \cdot 10^3 \cdot 3.61 \cdot 1.38}{20 \cdot 0.6 \cdot 415}} = 6.3 mm$$

m=7mm qabul qilamiz

$$K_m = 14$$

$$T_1, H \cdot M$$

$$z_1 = 17 \dots 25,$$

$$z_2 = z_1 \cdot u = 20 \cdot 3.1 = 60$$

$$z_1 = 20$$

$$\varphi_{ld} = \frac{b_1}{d_1} = 0.5 \dots 0.7$$

$K_{K\beta}$ (jadval 3,7)

$$Y_F - 42bet \quad \frac{[G_{F1}]}{Y_{F1}} \geq \frac{[G_{F2}]}{Y_{F2}}$$

4. Ilashmada ta'sir etuvchi kuchlar.

$$d_1 = mz_1 = 7 \cdot 20 = 140 mm$$

$$d_2 = mz_2 = 7 \cdot 60 = 420 mm$$

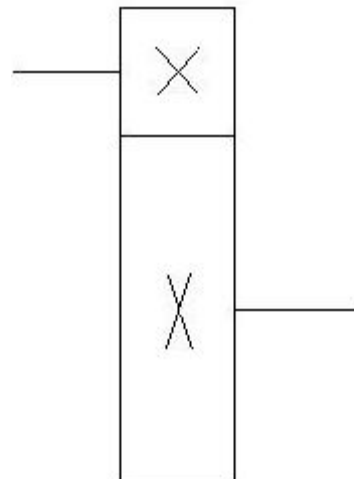
$$d_{a1} = d_1 + 2m = 90 + 2 \cdot 4.5 = 99 mm$$

$$d_{a2} = d_2 + 2m = 270 + 2 \cdot 4.5 = 279 mm$$

5. Ilashmaga ta'sir etuvchi kuchlar

$$F_t = \frac{2T_2 \cdot 10^3}{d_1} = \frac{2 \cdot 176.5 \cdot 10^3}{140} = \frac{328200}{140} = 3646.6 N$$

$$F_2 = F_t \cdot tg \alpha = 3646.6 \cdot 0.364 = 1327.36 N$$



6. Tekshirish.

$$G_F = \frac{2 \cdot 10^3 T_2 \cdot Y_F \cdot K_F}{z_1^2 \varphi_{bd} \cdot m^3} \leq [G_F]$$

$$K_F = K_{F\beta} \cdot K_{F\alpha} \cdot K_{FV} \quad \text{Jadval: 3.7...3.8}$$

$$G_F = \frac{2 \cdot 10^3 \cdot 176.5 \cdot 3.61 \cdot 1.38}{20^2 \cdot 0.6 \cdot 4.5^3} = \frac{1635026.7}{21870} = 74.8 \text{ MPa}$$

Vallarning tahminiy hisobi

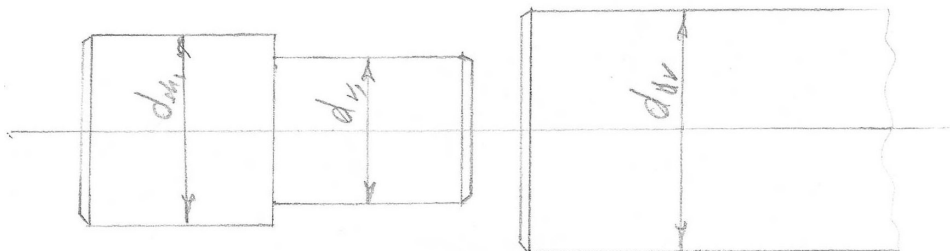
1. Birinchi val uchi konsol qismining diametri quydagicha aniqlanadi:

$$d_1 = \sqrt[3]{\frac{T_1 10^3}{0.2[\tau]}} = \sqrt[3]{\frac{45.5 \cdot 10^3}{0.2 \cdot 25}} = 20.9 \approx 22 \text{ mm}$$

Bu yerda: T -burovchi moment, Nmm

$[\tau]$ -buralishdagi ruxsat etilgan kuchlanish

d_1 ning aniqlangan qiymati standart bo'yicha yaxlitlanib, val qolgan qismlarining diametri aniqlanib, valning eskizi chizib olinadi.

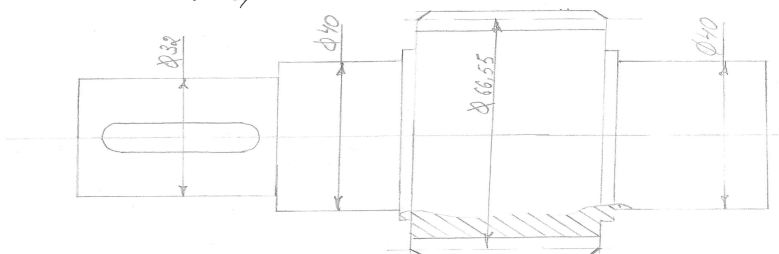


$$d_1 = 22 \text{ mm}$$

$$d_{n1} = d_1 + 5 \div 7 = 22 + 8 = 30 \text{ mm}$$

2. Ikkinchi val uchun konsol qismining diametri

$$d_2 = \sqrt[3]{\frac{T_2 10^3}{0.2 \cdot [\tau]}} = \sqrt[3]{\frac{176.5 \cdot 10^3}{0.2 \cdot 25}} = 33 \text{ mm}$$



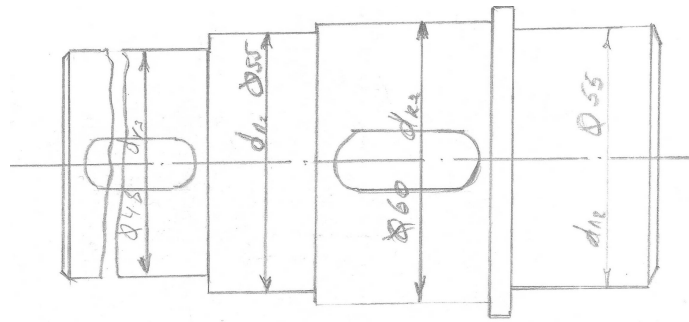
$$d_2 = 34 \text{ mm}$$

$$d_{n2} = d_2 + 5 \div 7 = 34 + 6 = 40 \text{ mm}$$

$$d_{k1} = d_{n1} + 5 \div 7 = 40 + 5 = 45 \text{ mm}$$

3. Uchinchi val uchun konsol qismining diametri

$$d_3 = \sqrt[3]{\frac{T_3 10^3}{0.2 \cdot [\tau]}} = \sqrt[3]{\frac{525.3 \cdot 10^3}{0.2 \cdot 20}} = 50 \text{ mm}$$



$$d_1 = 50mm$$

$$d_{n3} = d_3 + 5 \div 7 = 50 + 5 = 55mm$$

$$d_{k2} = d_{n3} + 5 \div 7 = 55 + 5 = 60mm$$

Gildirak konstruksiyasini o'lchamlari

Gubchak: $d_g = 1.6d_{val} = 1,6 \cdot 45 = 72mm$
 $l_g = (1,2 \div 1,5)d_{val} = 54 \div 67.5mm$

Disk qalinligi:

$$C \geq 0.25b_2 = 0.25 \cdot 50 = 12.5mm$$

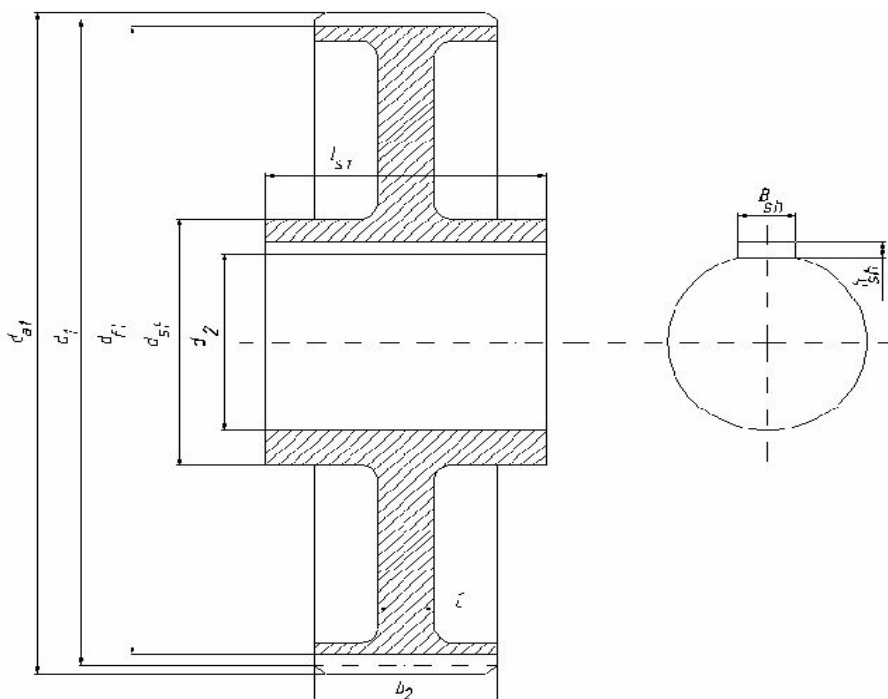
$$d_2 = \frac{m \cdot z_2}{\cos \alpha} = 200mm$$

$$d_{f2} = d_2 - 2.5m = 195mm$$

$$d_{a2} = d_2 + 2m = 204mm$$

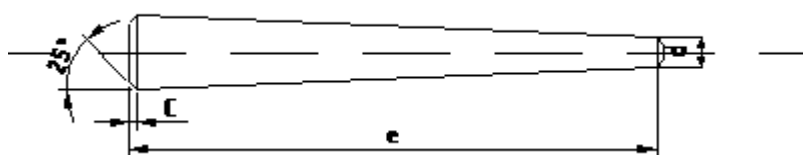
Tishli g'ildiraklar bu tishli gardish, gubchak va ularni biriktirib turadigan diskdan iborat bo'lib, bu elementlarning o'lchamlarini formulalar yordamida aniqlash mumkin. G'ildirakning tishli gardishi tashqi kuchga chidamli, ya'ni mustahkam, bikrligi yuqori bo'lishi kerak, buning uchun gardishning qalinligi silindrsimon tishli g'ildiraklar uchun $S > 2.5m$ olinadi.

Tishli g'ildiraklarning gubchagi g'ildirakning valiga o'tqazilib ko'rinishi simmetrik yoki nosimmetrik bo'lishi mumkin. Gubchakning uzunligi valning diametriga hamda g'ildirakning materialiga bog'liq bo'ladi. G'ildirakning diski gubchakni gardish bilan biriktiradi, qalinligi g'ildirakni qanday yo' bilan tayyorlanishiga bog'liq.



Korpus elementlari o'lchamlari

Korpusda podshipnik uchun mo'ljallangan uyalarni ochishda o'qdosh-ligini ta'minlash uchun qutining asosi bilan qutining qopqog'i o'zaro ko-nussimon yoki silindrsimon shtiv bilan biriktirilib, uyalar qayta ishlana-di. Shtivlarda ichki rezba bo'lishi mumkin, bu esa kerak paytda shtivni olib tashlashni osonlashtiradi. Shtivning o'lchamlari:



$$d = 10mm$$

$$c = 1,6mm$$

$$e = 30..60mm$$

Reduktor korpusi va qopqog'i devorining qalinligi

$$\delta = 0,025a_w + 1 = 0.025 \cdot 125 + 1 = 4.5 \text{ mm} \quad \delta = 8 \text{ mm}$$

$$\delta_1 = 0.02a_w + 1 = 0.02 \cdot 125 + 1 = 4 \text{ mm} \quad \delta_1 = 8 \text{ mm}$$

Yuqori korpus va qopqog'ining belbog'ining qalinligi.

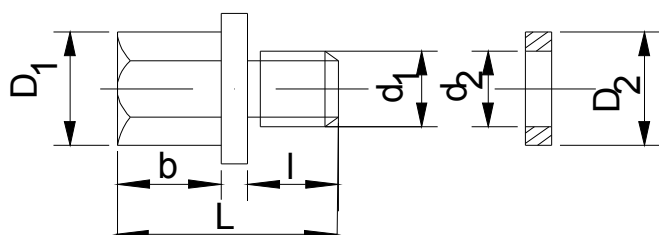
$$b = 1.5\delta = 1.5 \cdot 8 = 12 \text{ mm}$$

$$b_1 = 1.5\delta_1 = 1.5 \cdot 8 = 12 \text{ mm}$$

Pastki korpus qalinligi.

$$\rho = 2.35\delta = 2.35 \cdot 8 = 19 \text{ mm} \quad \rho = 18 \text{ mm}$$

Uzatmalar ishlash jarayonida g'ildiraklarni yog'lash uchun ishlatilgan moylar asta-sekin ifloslanib, o'zining moylash xususiyatini yoqotadi. Shuning uchun bu moylarni vaqti-vaqti bilan almashtirib turish kerak. Korpusning qopqog'idagi darchadan moy quyiladi. Moy hajmini tek-shirish uchun hamda ishlatilgan moyni to'kish uchun korpus asosining yon tomonida teshik ochiladi. Moyni to'kish uchun ochilgan teshik silindrsimon yoki konussimon bo'lishi mumkin. Silindrsimon probka ish-latilsa moylar tirqishdan chiqib ketmasligi uchun rezinali moslama ish-latiladi, konussimon probkalarda bu moslamalar ishlatilmaydi.



$$d_1 = M16x1,5$$

$$b = 4mm$$

$$D_1 = 25.4mm$$

$$d_2 = 20mm$$

$$L = 28mm$$

$$D_2 = 32mm$$

$$l = 13mm$$

$$b_2 = 3mm$$

Moyni to'kishni tezlashtirish uchun teshiklar korpus asosining yuziga nisbatan 1-2 gradus qiyalik bilan ochiladi.

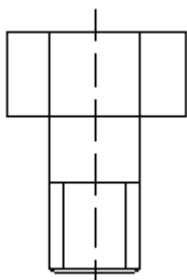
Moy hajmini o'lchagich moslamalar har xil ko'rinishda bo'ladi.

Boltlarni tanlash

Korpusni yig'ish uchun har xil diametrli boltlar ishlatiladi.

1. Yopiq uzatmalarni fundamentga mahkamlash uchun ishlatiladigan fundament boltlar diametri d_1 ni a_ω , d_{e_2} qiymatlariga nisbatan tanlanadi.

$$a_\omega = 125 \quad \text{M 16}$$



$$K = 28mm$$

$$C = 16mm$$

$$D_0 = 26mm$$

$$d_0 = 16mm$$

1. Fundament bolt o'rnatilgan o'yoqchanning o'lchamlari d_1 ga bog'liq bo'lib; bolt bilan mahkamlansa $h_{01} = 2,5(d_1 + \delta)$. Bolt o'rnatilgan teshikchanning balandligi $h_1 = 2,5\delta$ olinadi.

2. Yopiq uzatma qopqog'ining asosi bilan mahkamlash uchun diametri d_3 bo'lgan bolt ishlatiladi. Boltlar orasidagi masofa $L_3 = (8 \div 10)d_3$ olinadi,

bolt o'rnatilgan teshukchanning balandligi $h_3 = 1,5\delta$

M12

3. Podshipnik qopqoqlarni mahkamlash uchun diametri d_4 bo'lgan bolt ishlatiladi.

Boltning diametri va soni podshipnik tashqi diametriga nisbatan tanlanadi.

5. Korpus qopqog'idan moy quyish uchun hamda uzatmani ishlash jara-yonida kuzatish uchun maxsus darcha ochiladi. Bu darchani qopqoq yordamida berkitib diametri d_5 bo'lgan bolt yordamida mahkamlanadi.

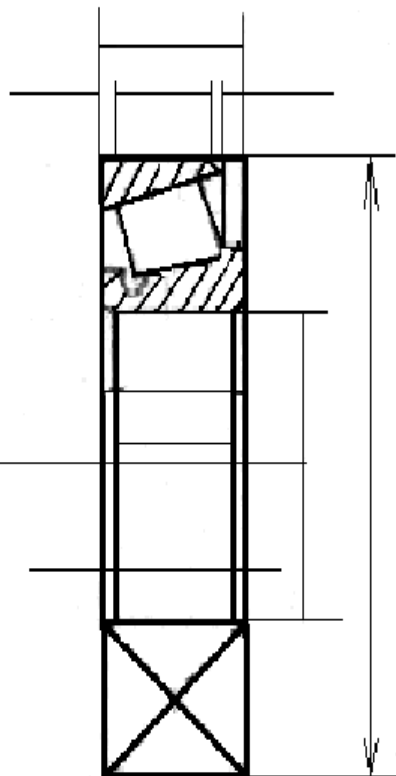
M10

Podshipnik tanlash

Podshipniklar val hamda o'qlarning shiplariga o'rnatilib, tayanch vazifasini o'taydi. O'q yoki val orqali tayanchga tushadigan kuchni bevosita podshipnik qabul qiladi. Mashinaning ishlash sifati podshipniklarga ko'p jihatdan bog'liq. Shuning uchun podshipniklarni tanlash, loyihalash va ish jarayonida ularni kuzatib turish masalalariga alohida e'tibor berish lozim.

1. Yetaklovchi va yetaklanuvchi g'ildirak vallariga juda yengil seriyali bir qatorli zoldirli radialpodshipnik tanlaymiz.

| | | | |
|--------|----------------|--------|----------------|
| | $d_1 = 40mm$ | | $d_1 = 30mm$ |
| | $D = 90mm$ | | $D = 72mm$ |
| | $B = 23mm$ | | $B = 19mm$ |
| | $T = 25.25mm$ | | $T = 20.75mm$ |
| | $c = 20mm$ | | $c = 17mm$ |
| № 7308 | $e = 0.32$ | № 7306 | $e = 0.36$ |
| | $r = 2,5mm$ | | $r = 2,5mm$ |
| | $C_r = 66kN$ | | $C_r = 43kN$ |
| | $C_0 = 47.5kN$ | | $C_0 = 29.5kN$ |



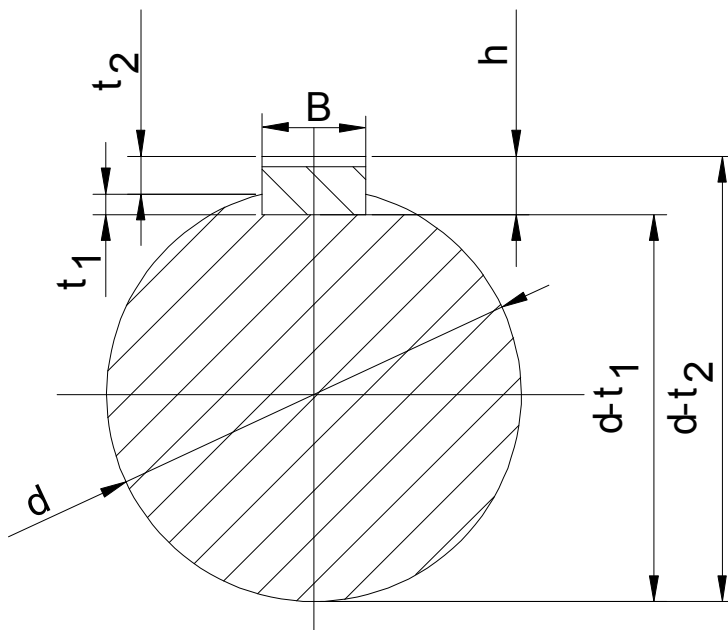
Shponka tanlash

I val $T_1 = 45.5 \cdot 10^3 \text{ Nm}$ $d_1 = 22 \text{ mm}$ $l = 50 \text{ mm}$ $t_1 = 4 \text{ mm}$ $h = 7 \text{ mm}$
 $b = 8 \text{ mm}$

$$\delta_{ez} = \frac{2 \cdot T_2}{d(l-b)(h-t_1)} = \frac{2 \cdot 45.5 \cdot 10^3}{22(50-8)(7-4)} = 32.8 \text{ MPa} \leq [\delta_{ez}] = 100 \div 120 \text{ MPa}$$

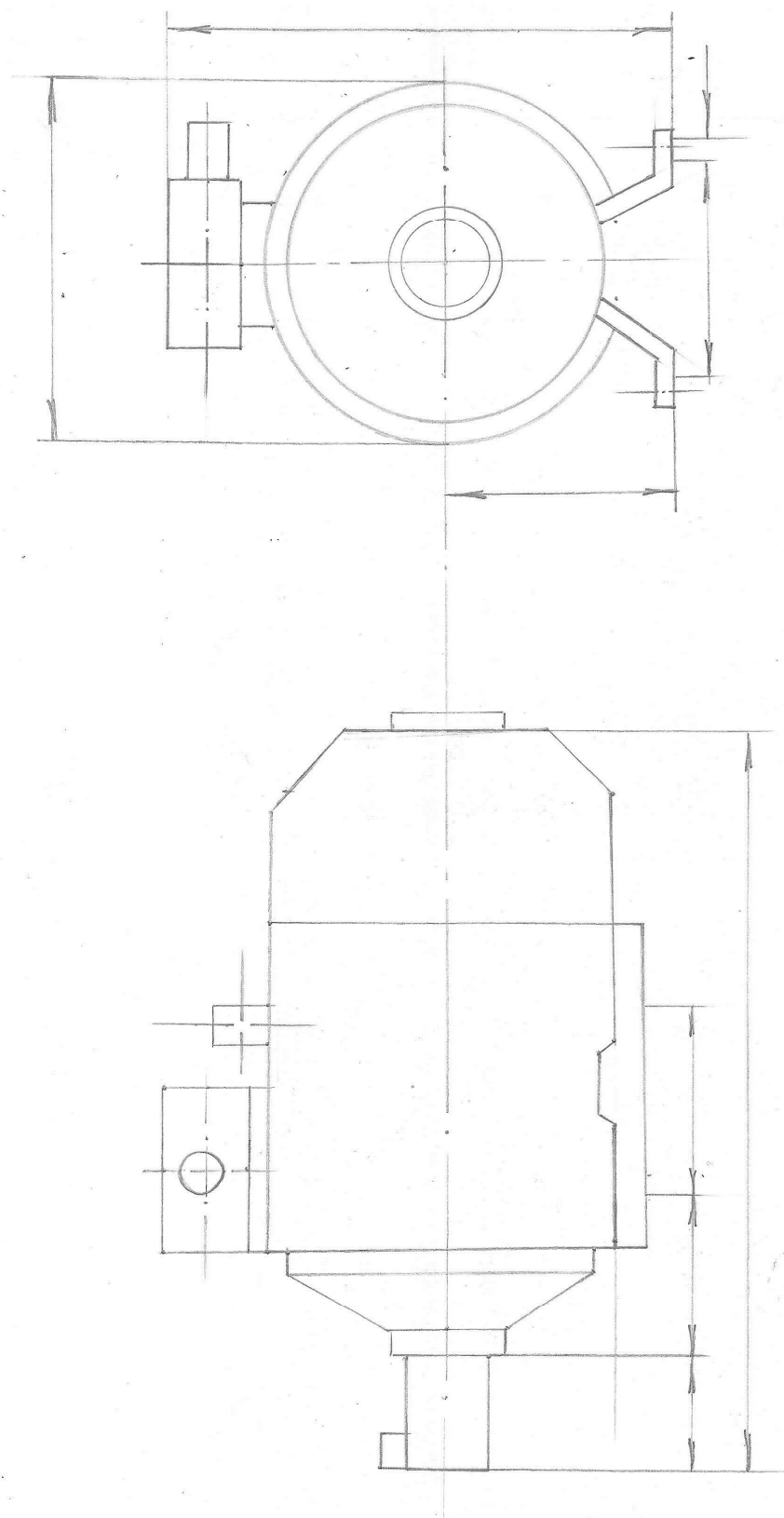
II val $T_2 = 176.5 \cdot 10^3 \text{ Nm}$ $d = 34 \text{ mm}$ $l = 60 \text{ mm}$ $t_1 = 3,3 \text{ mm}$ $h = 8 \text{ mm}$
 $b = 10 \text{ mm}$

$$\delta_{ez} = \frac{2 \cdot T_3}{d(l-b)(h-t_1)} = \frac{2 \cdot 176.5 \cdot 10^3}{33(60-10)(8-3,3)} = 45.5 \text{ MPa} \leq [\delta_{ez}] = 100 \div 120 \text{ MPa}$$



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1981 г



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S = 4.7%

| L_1 | L_2 | H | D | d_1 | d_2 | l_1 | l_2 | l_3 | b | d |
|-------|-------|-----|-----|-------|-------|-------|-------|-------|-----|-----|
| 452 | 534 | 310 | 260 | 32 | 32 | 80 | 70 | 140 | 190 | 12 |