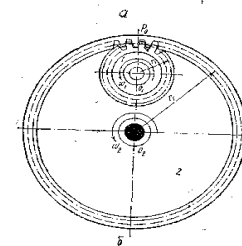
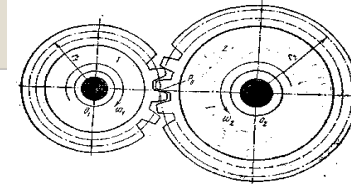


AYLANMA HARAKAT UZATUVCHI MEXANIZMLAR, UZATISH SONI

➤ Reja:

- Tishli mexanizmlar
- Tishli mexanizmning geometrik elementlari va kinematikasi
- Shesternyalari pog`onali qatorda joylashgan murakkab mexanizm
- Episiklik mexanizmlar

TISHLI MEXANIZMLAR

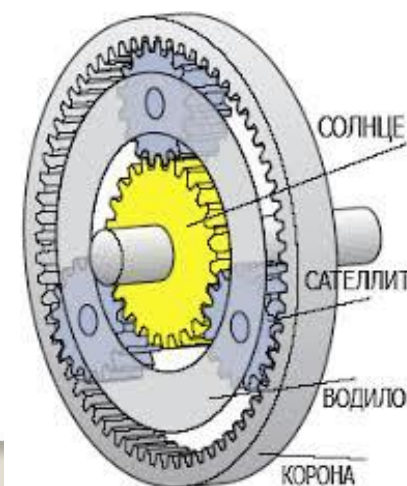


Tarkibida tishli bo'g'ini bo'lgan mexanizmlar tishli mexanizmlar deyiladi. Tishli mexanizmlar etakchi va etaklanuvchi bo'g'inlarning aylanish tezliklari o'zgarmas bo'lishi talab qilinadigan xollarda ishlatiladi va texnikada juda ko'p qo'llaniladi. Bu mexanizmning asosiy ko'rinishi quyidagi shaklda berilgan, u ikkita tishli g'ildirak va stoykalardan iborat.

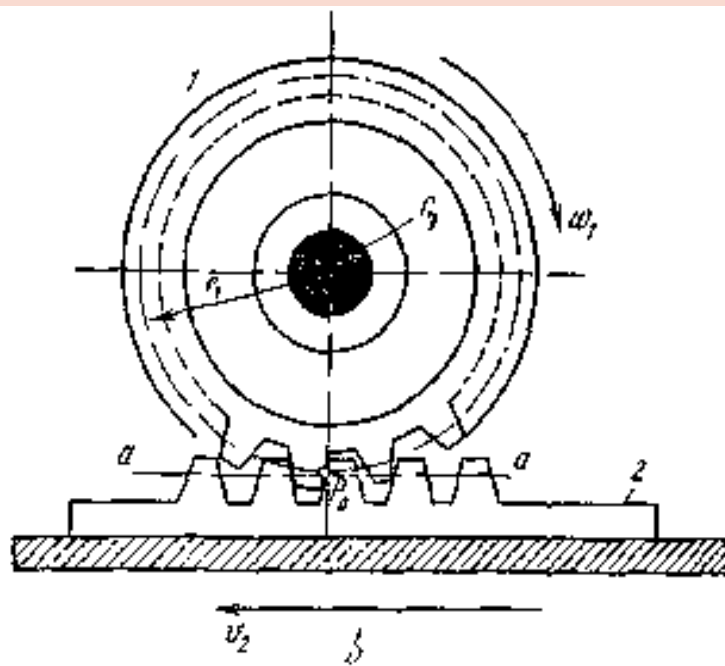
Bo'g'in 2 (etakchi) ning soat strelkasi yo'nalishiga teskari aylanishi yetaklanuvchi bo'g'in 1 ni soat strelkasi aylanishida aylantiradi. Demak bu xoldagi tishli ilashishda yetakchi va yetaklanuvchi g'ildiraklar qarama-qarshi tomonga aylanadi.

Bunday mexanizm **tashqi ilashishli mexanizm** deyiladi.

- Agar bitta g'ildirakning tishlari silindr tashqi sirtida, ikkinchisini ichki sirtida ilashib harakatlansa, etakchi va etaklanuvchi g'ildiraklar bir tomonga aylanadi va bunday mexanizm **ichki ilashishli mexanizm** deyiladi.



Agar tishli
g`ildiraklardan
birining o`lchamlari
juda katta bo`lgani
xolda g`ildirak
aylanasi to`g`ri
chiziqqa yaqin
bo`lsa, bunday
birikma reykali
mexanizm deyiladi



SHESTERNYALARI POG`ONALI QATORDA JOYLASHGAN MURAKKAB MEXANIZM

Yetaklovchi va yetaklanuvchi vallar oraligi katta bo`lganida aylanma harakatni bir juft tishli g`ildirak yordamida uzatish mumkin bo`lmay qoladi, chunki bunda g`ildiraklarning o`lchamlari kattalashadi va massalari ortadi.

Mexanizmni engil va ixcham qilish maqsadida yetakchi va yetaklanuvchi shesternyalar oralig`iga, ularning harakat tezligiga halal bermaydigan qilib oraliq, shesternyalar o`rnatiladi.

Agar tishli g`ildiraklar bir tekislikda yotib, o`zaro kinematik juft tashkil qilib harakatlansa, qatorli birikma deyiladi. Bunga misol tariqasida paxta terish apparati barabanlarining harakatga kelishini ko`rish mumkin (8.3-shakl). Orqa o`ng qatordagi baraban shesternyasi ($z_1 = 90$) dan ikkita oraliq shesternyalar ($z_2 = z_3 = 40$) yordamida chap baraban shesternyasi ($z_4 = 90$) ga va oraliq, shesternya ($z_5 = 30$) orqali chap old baraban shesternyasi ($z_6 = 90$) ga aylanma harakat uzatiladi.

Agar birinchi shesternya bilan to`rtinchi shesternya oralig`idagi uzatish sonini topish kerak bo`lsa, har bir juft shesternyalarning uzatish sonlarini ketma-ket ulanishi bo`yicha topamiz.

Birinchi juftning uzatish soni

$$i_{12} = \frac{\omega_1}{\omega_2} = \frac{D_2}{D_1}$$

Ikkinchi juftning uzatish soni:

$$i_{23} = z_3 / z_2$$

Uchinchi juftning uzatish soni:

$$i_{34} = z_4 / z_3$$

Alohida topilgan uzatish sonlarini ko' paytirib,

$$i_{12} i_{23} i_{34} = \omega_1 \omega_2 \omega_3 / (\omega_2 \omega_3 \omega_4)$$
$$= z_2 z_3 z_4 / (z_1 z_2 z_3) =$$
$$= \omega_1 / \omega_4 = z_4 / z_1$$

ni olamiz.

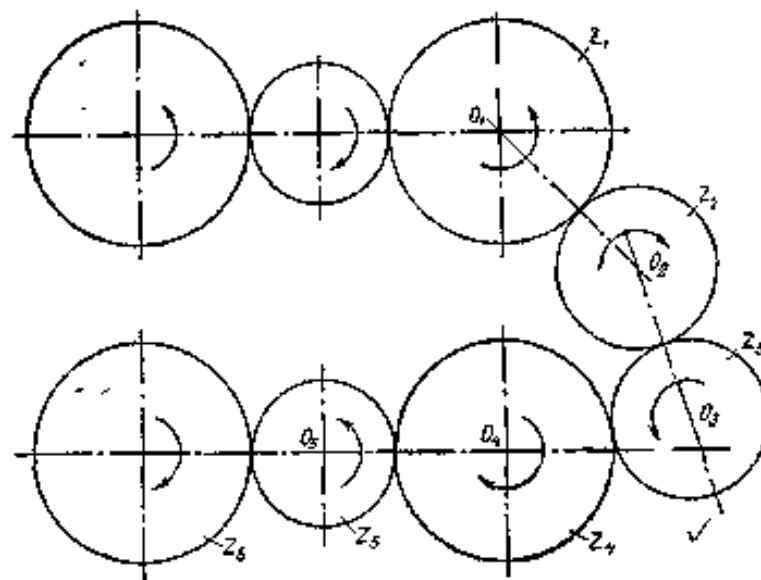
Bu qiymat qatorli birikmaning umumiy uzatish sonini beradi. Demak qatorli murakkab mexanizmda umumiy uzatish soni alohida olingan oddiy shesternyali mexanizmlarning uzatish sonlarining ko`paytmasiga teng bo`lar ekan:

$$i_{14} = z_4/z_1 = 90/90 = 1$$

Birinchi va beshinchi shesternyalarning uzatish soni esa

$$i_{15} = z_5/z_1 = 30/90 = 1/3$$

bo`lib ,beshiichi shesternyaning birinchiga nisbatan 3 marta tez aylanishini ko`rsatadi.



Yuqoridagi misollardan ko`rinadiki, oraliq shesternyalar mexanizmning umumiy uzatish soniga xalal bermaydi, lekin ularning aylanish yo`nalishini o`zgartirishi mumkin. qator shesternyalar soni juft bo`lganida aylanish yo`nalishi o`zgaradi, tok bo`lganida esa o`zgarmaydi.

Shesternyali murakkab mexanizm qatorli bo`lmay pogonali bo`lishi ham mumkin. Bunda oraliq vallarga ikkitadan shesternya biriktirilib, uzatish sonini bir necha marotaba oshirish mumkin bo`ladi.

Pog`onali uzatmaga misol tarikasida yuqorida keltirilgan paxta terish apparati barabani shesternyasi ($z_1 = 90$) dan paxtani ajratish chetki barabani shesternyasining aylanma harakat olishini ko`raylik (8.4-shakl). z_1, z_2, z_3 va z_4 qator va pog`onali shesternyalar tishlari soni: $z_1 = 90,$ $z_2 = 39,$
 $z_3 = 19, z_4 = 12.$

Umumiy uzatish soni yuqoridagi singari I va III vallarning tezliklari nisbatida topiladi:

$$\omega_1 / \omega_3 = i_{13}$$

Agar poronalarning uzatish sonini alohida-alohida topsak:

$$i_{12} = \omega_1 / \omega_2 = z_2 / z_1 ; \quad i_{23} = \omega_2 / \omega_3 = z_4 / z_3$$

Bularni o'zaro ko'paytirsak quyidagini olamiz:

$$i_{13} = i_{12} * i_{23} = \omega_1 / \omega_3 = \frac{z_2 * z_4}{z_1 * z_3}$$

z_1, z_2, z_3 va z_4 larning
pogʻoniga son qiymatlarini
qoʻysak

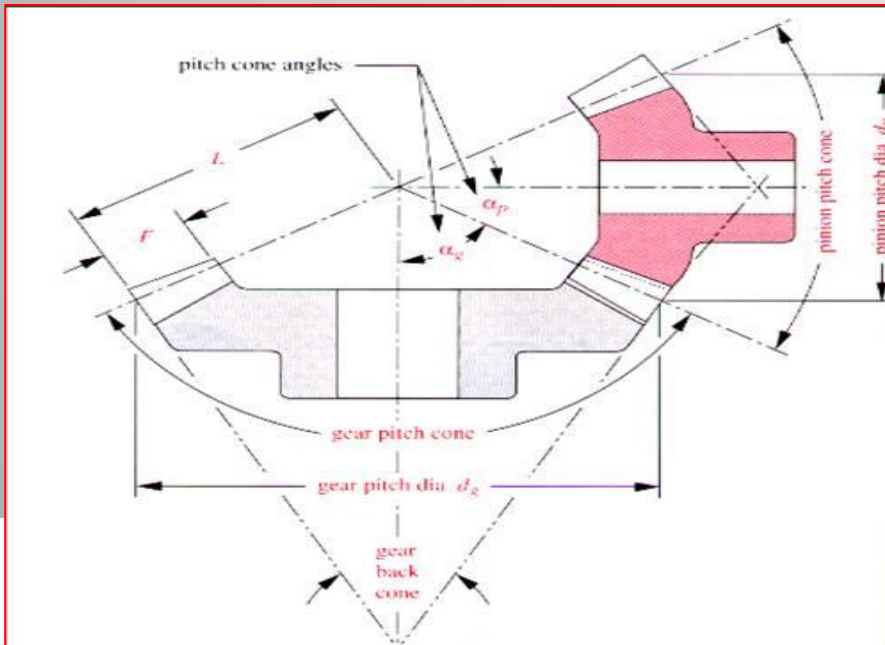
$$i_{13} = z_2 * z_4 / (z_1 * z_3) = 39 * 12 / (90 * 18) = \\ = 3 * 2 / (15 * 1) = 6 / 15 = 2 / 5 = 0,4$$

Demak chetki baraban vali terish baraban valiga nisbatan 2,5 marta tez aylanar ekan.

Koʻp pogʻonali tishli mexanizmning umumiy uzatish soni mexanizm tarkibiga kiruvchi pogʻonalar uzatish sonlarining koʻpaytmasiga teng boʻladi.

Turlari

Chiziq tishli — tishlar parallel bo'lmagan va kesishgan shaftlar orasidagi harakatni uzatish uchun ishlatiladigan konusning yuzasida hosil bo'ladi.

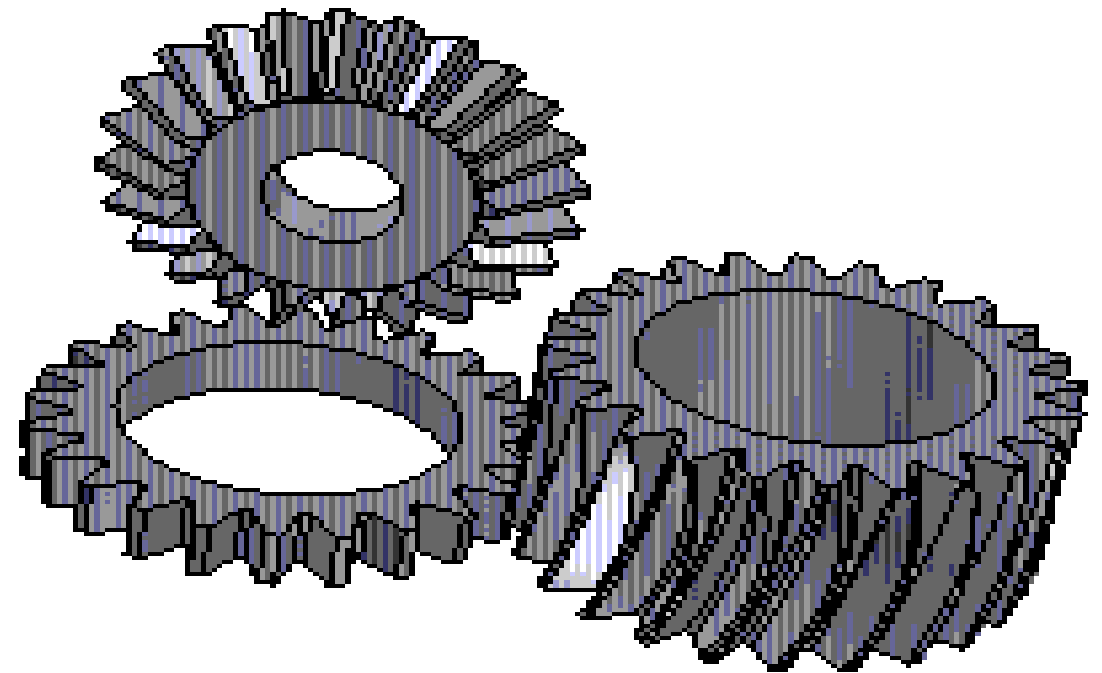


To'g'ri chiziq tishli



Egri chiziq tishli





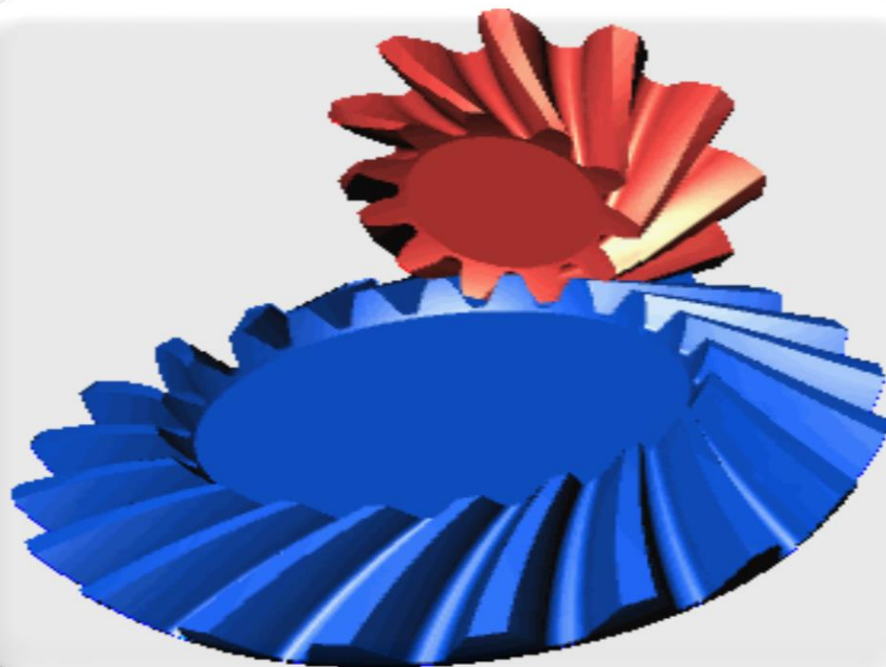
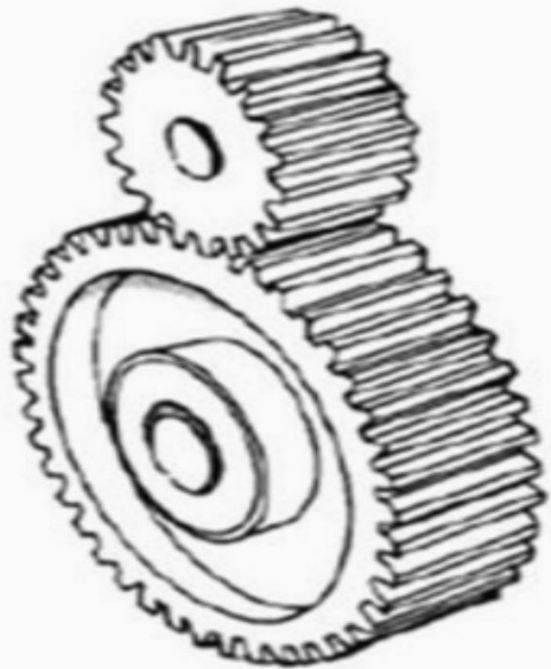
Silindrsimon tashqi ilashmali tishli mexanizmlar

To'g'ri tishli

Og'ma tishli

Shevron tishli

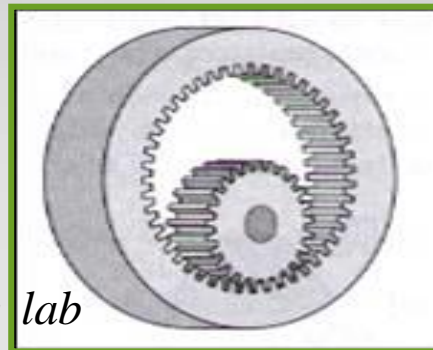
vintli



Tishli mexanizmning turlari

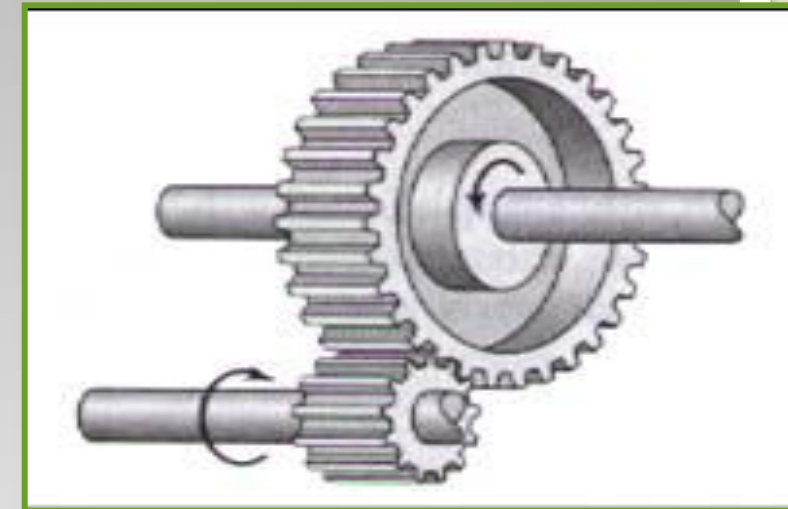
Tishli g'ildiraklarning materiallari. Tishli g'ildiraklar tayyorlanadigan materiallar uzatmaning o'lchamlari va massasiga qo'yiladigan talablarga, shuningdek quvvat, aylanma tezlik hamda g'ildiraklarni tayyorlashning talab etilgan aniqligiga qarab tanlanadi.

Ichki tishlar

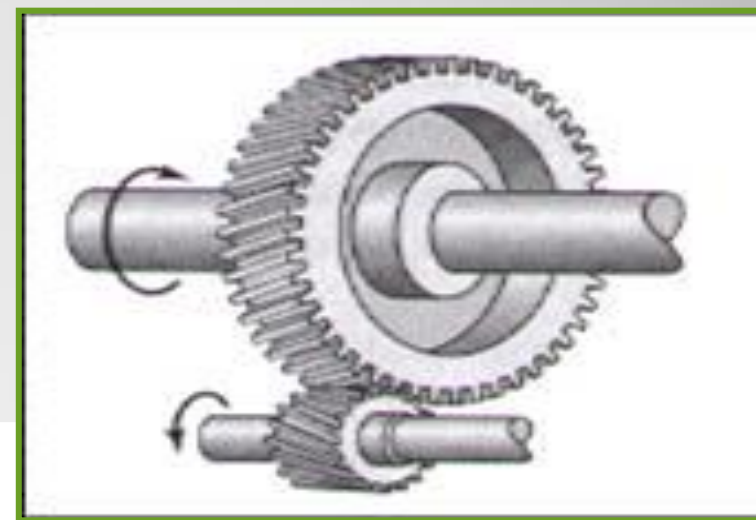


Qiyshiq tishli

– Bo'luvchi silindr vintsimon chizig'i bo'ylab joylashgan tishli g'ildirak - qiyshiq tishlidir. Tishni qiyshiqdigi - uni val o'qiga nisbatan joylashgan burchagi bilan aniqlanadi. Harakatni silliq va shovqinsiz uzatishi, yuklanish darajasining kattaligi qiyshiq tishli g'ildirakning afzalligi. Ilashmadagi F_a - b o'ylama kuch ta'sirida g'ildirakni val o'qiga bo'ylab siljishga qarshiligini ortishi - uning kamchiligi.



Pinion (small gear)

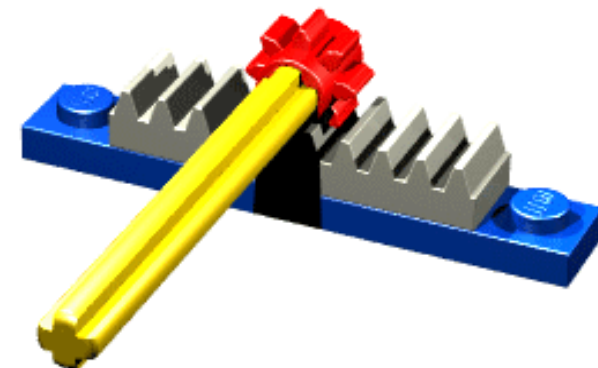
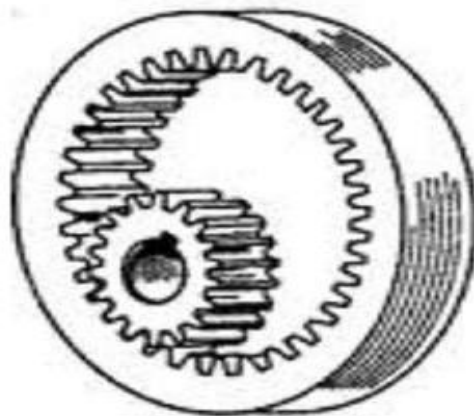
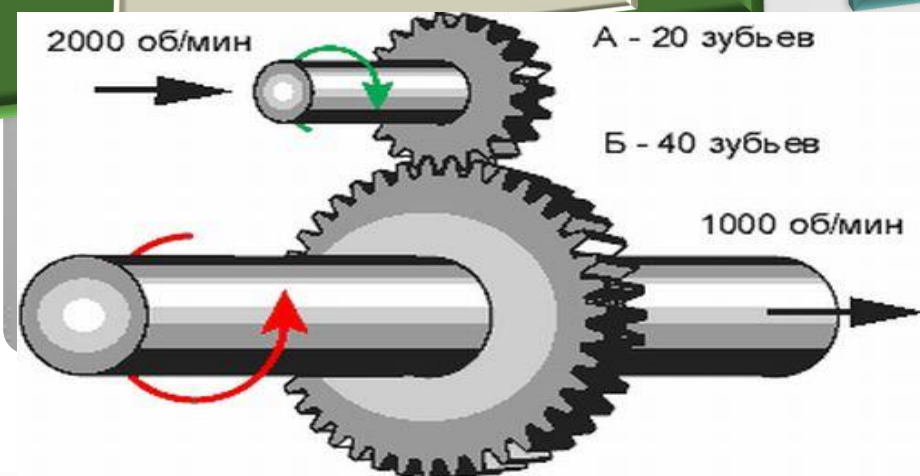


Ilashishi bo'yicha:

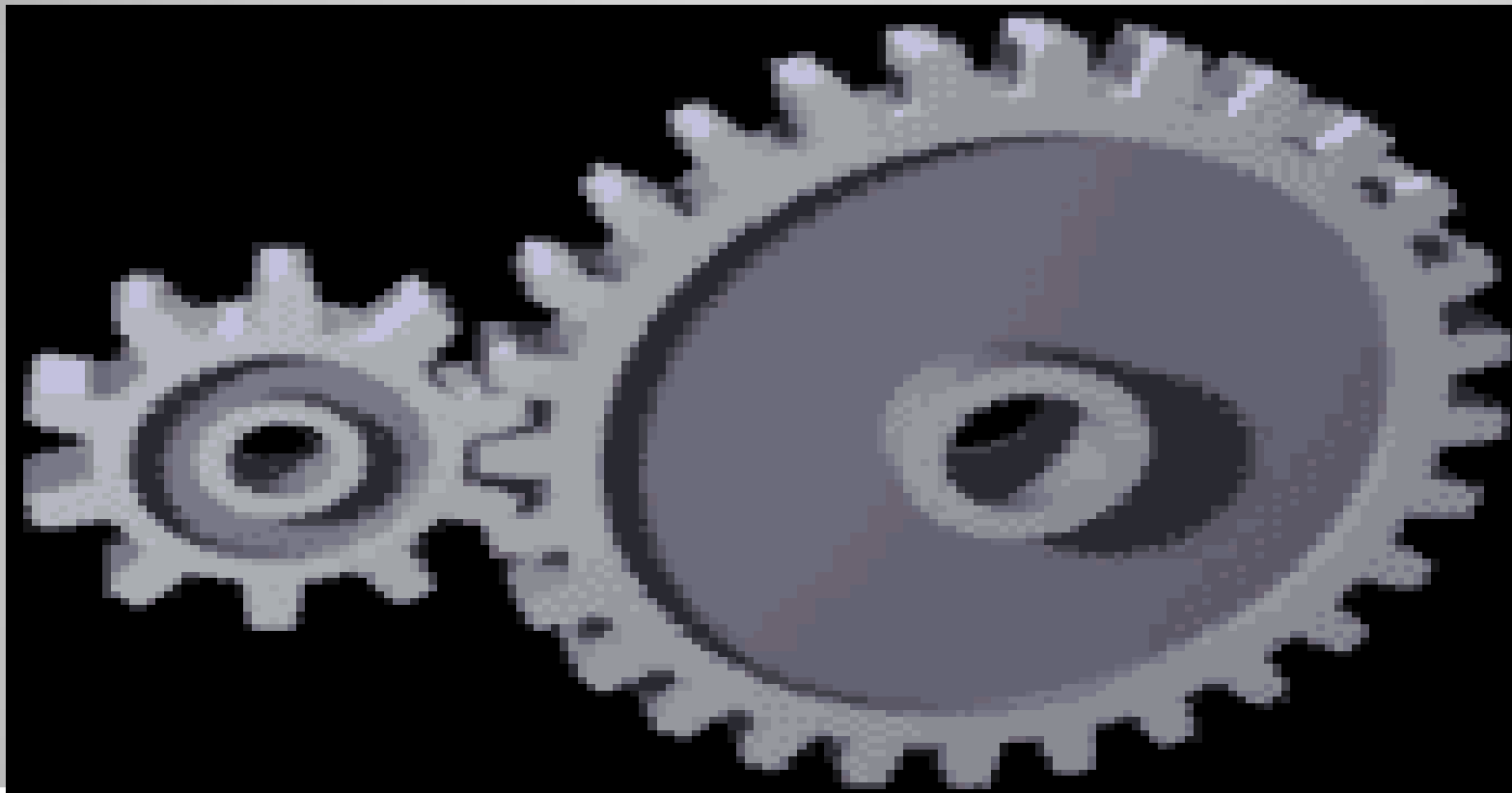
tashqi

ichki

reykali

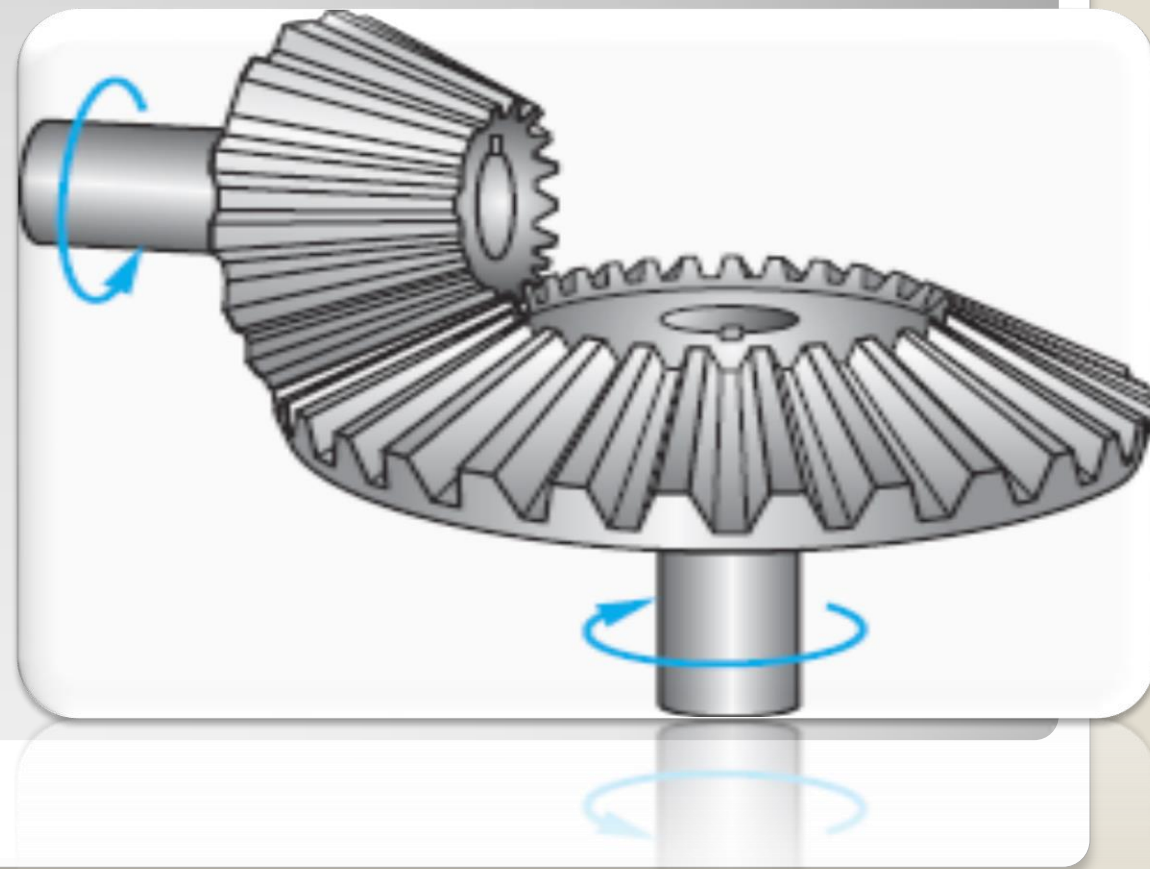


To'g'ri Tishlar



Chiziq Tishli

- Tishli quti va pinion 90 gradusda kesib o'tishi mumkin
- Tishli va pinion o'rtasida tezlik o'zgarishiga imkon beradi, agar mitti tirkaklar sifatida yaratilgan bo'lmasa



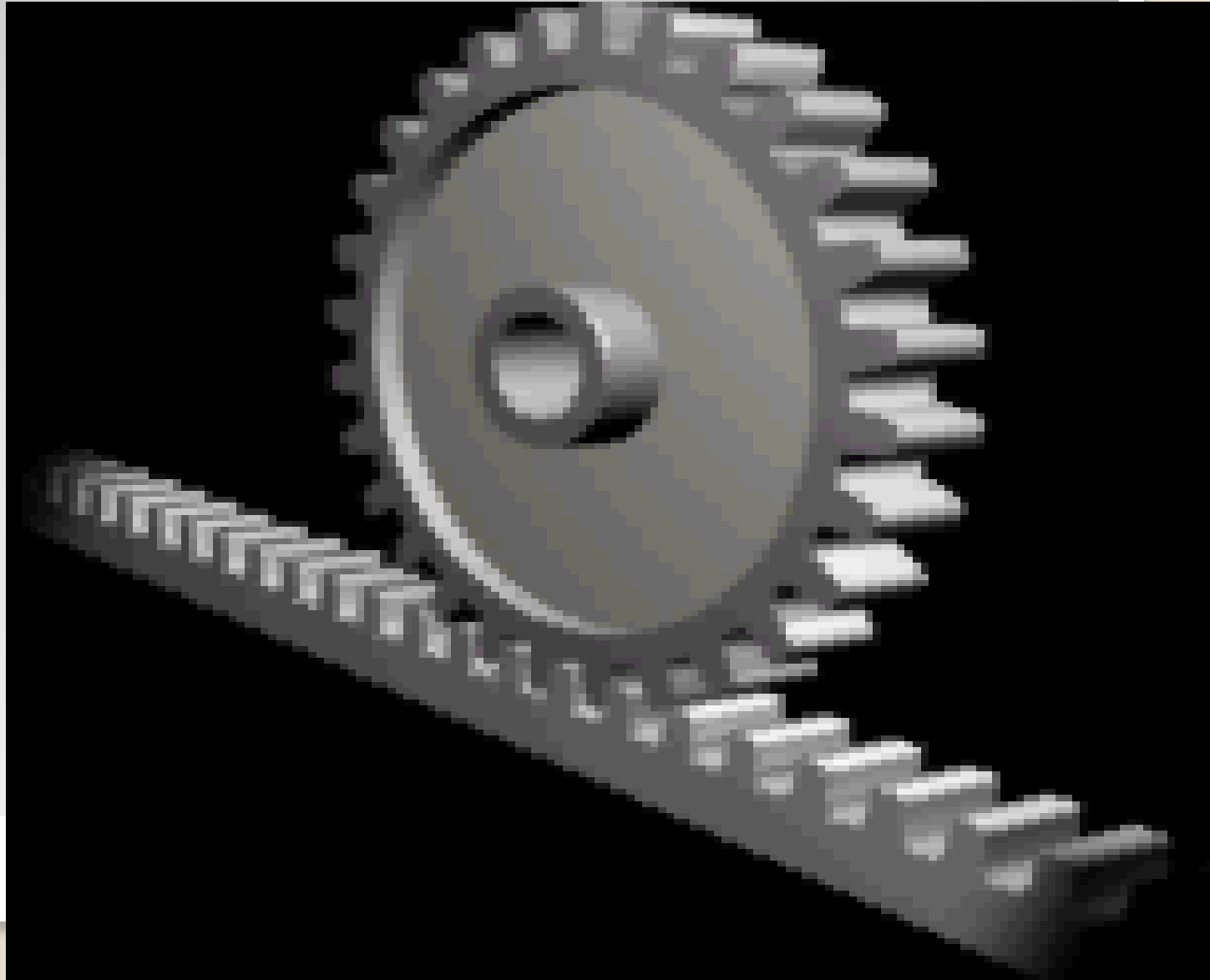
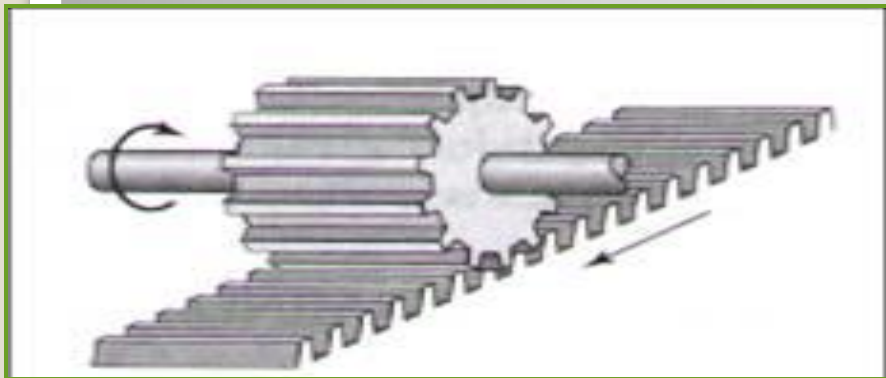
Chervyakli tishlar

- O'tkazish harakati yo'nalishini 90 ga o'zgartiradi Vintadan vitesgacha aylanish tezligini pasaytiradi va kuchni oshiradi



To'g'ri reykali tishlar

- Aylanma harkatni to'gri chizikli tekis harakatga aylantiradi yoki aksincha.



Ilashishning asosiy qonuni.

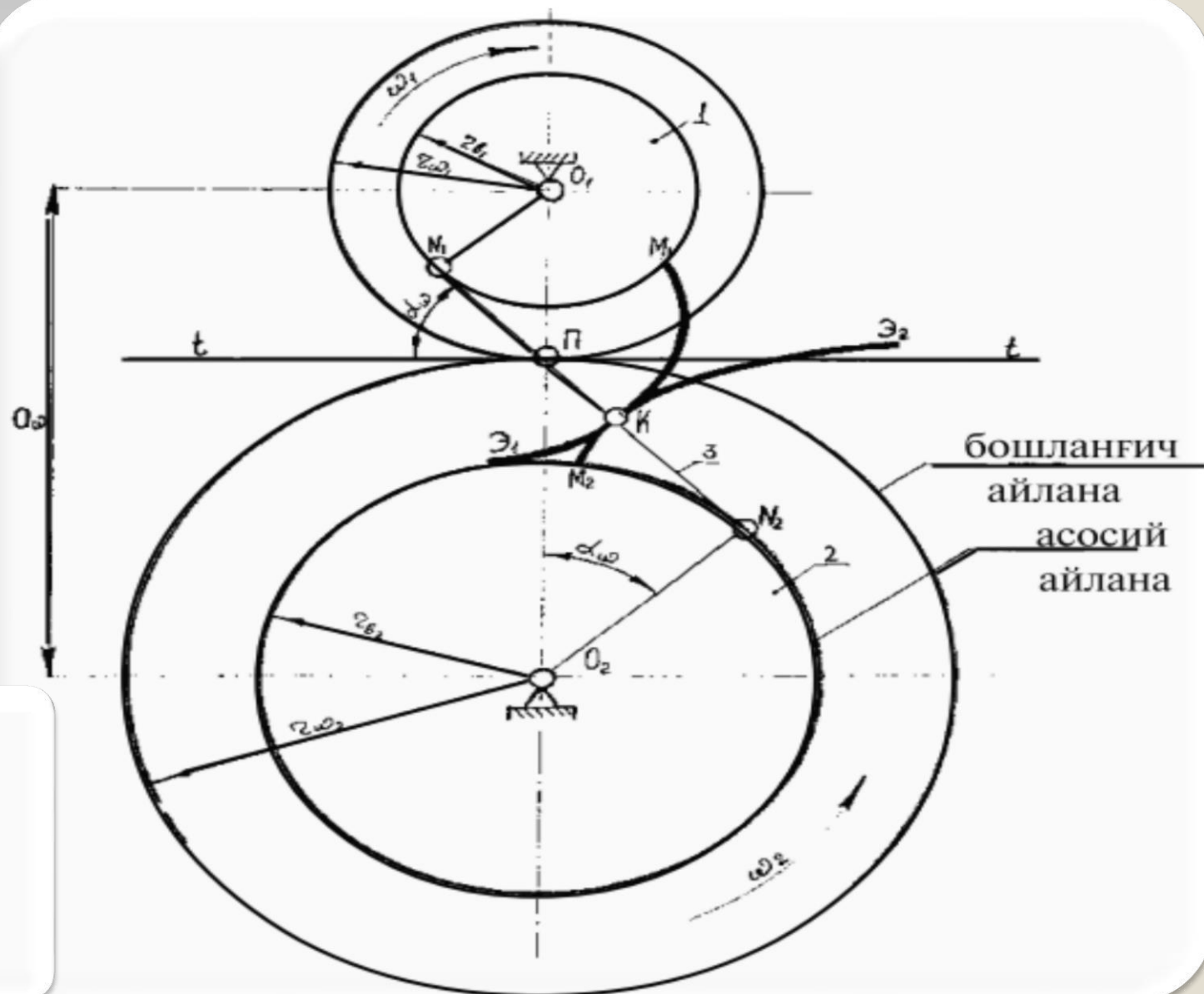
- Shunday qilib, ilashishning asosiy qonuni yoki Villis teoremasi deb ataluvchi tishli uzatmaning asosiy xususiyatlaridan biri aniqlanadi.
- Bu teorema (qonun) quyidagicha ifodalanadi.
- Tishli uzatmaning uzatish nisbati o'zgarmas bo'lishi uchun ikki tishni tegib turuvchi nuqtasidan o'tgan normal doimo π nuqtadan o'tib, α_ω – markazlar oralig'ini g'ildiraklar burchak tezliklari nisbatiga teskari proporsional tarzda bo'lishi kerak.

• *Ilashish qonuni*

$$O_2 N_2 = r_{B2},$$

$$O_1 N_1 = r_{B1}$$

$$\frac{r_{B2}}{r_{B1}} = \frac{O_2 \Pi}{O_1 \Pi} = \frac{\omega_1}{\omega_2}$$



Novikov
uzatmalari.

