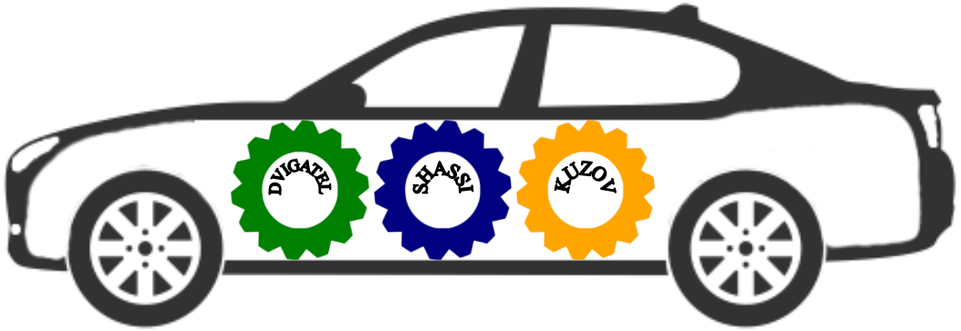
AVTOMOBILLAR KONSTRUKSIYASI



10th Topic: Gearbox. Transfer gearbox.

(10-Mavzu: Uzatmalar qutisi. Taqsimlash qutisi.)

Part 2

Associate Professor: Yusupov Sarvarbek

10-Mavzu: Uzatmalar qutisi. Taqsimlash qutisi.

(10th Topic: Gearbox. Transfer gearbox.)

O‘quv rejasi:

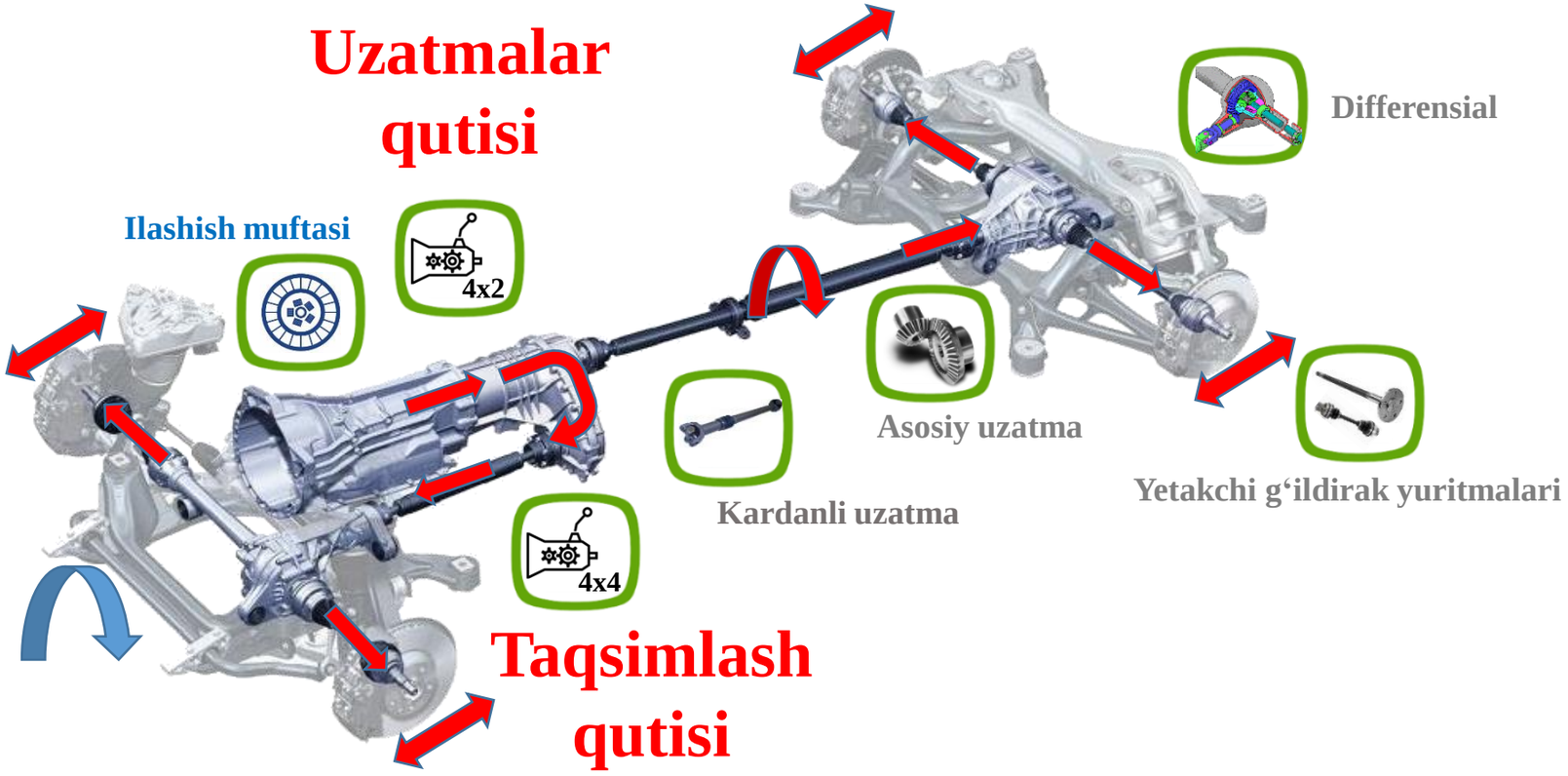
10.1. Uzatmalar qutisining vazifasi va turlari.

10.2. Pog‘onali uzatmalar qutisining konstruksiyasi va uning ishlashi.

10.3. Pog‘onasiz uzatmalar qutisining konstruksiyasi va uning ishlashi.

10.4. Taqsimlash qutisining vazifasi, konstrusiyalari va ularning ishlashi.

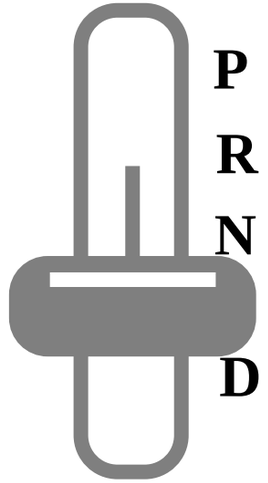
TRANSMISSIYA

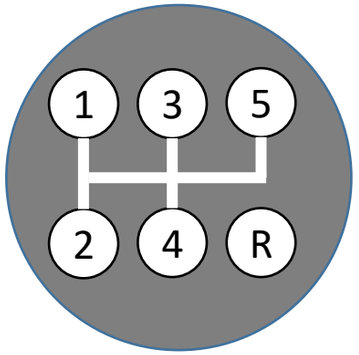


[1]

10.3. Pog‘onasiz uzatmalar qutisining konstruksiyasi va uning ishlashi.

Zamonaviy avtomobillarning aksariyatida avtomatik boshqariladigan uzatmalar qutisi qo‘llaniladi.



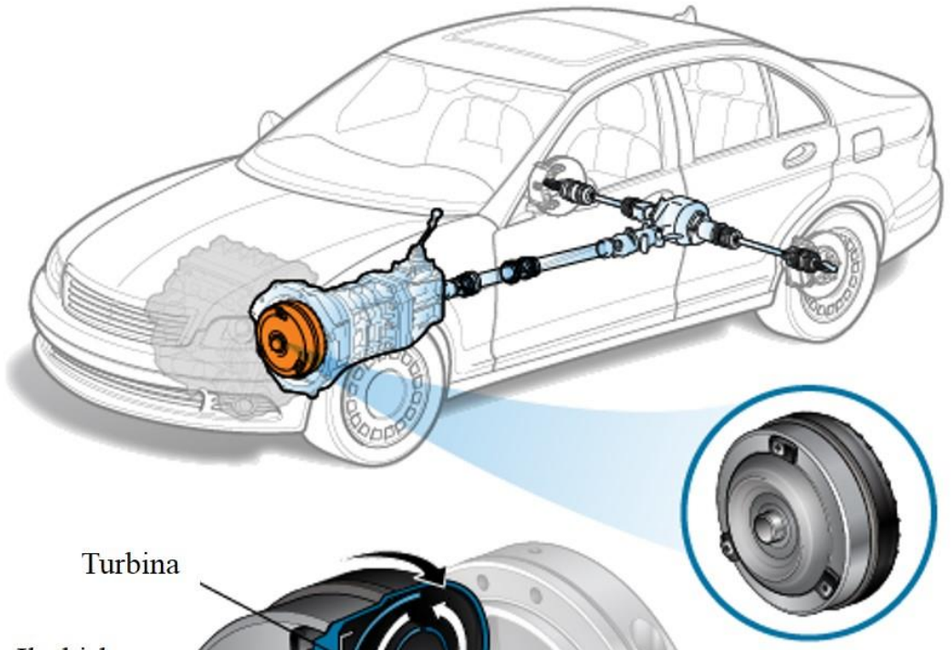


Pog‘onali uzatmalar qutisining ham avtomatik boshqarish tizimlari mavjud.

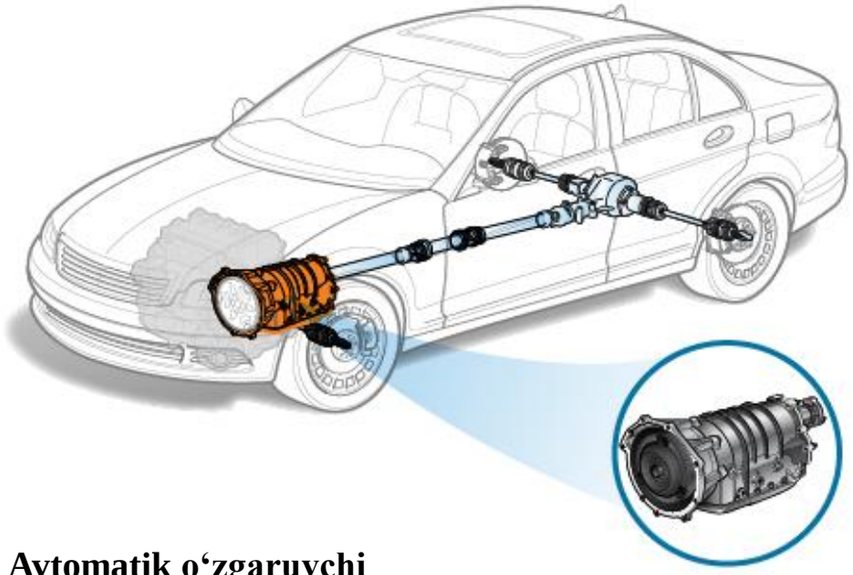
Pog‘onasiz (**gidravlik**) uzatmalar qutisini avtomatik boshqarishni yaratish osonroq.

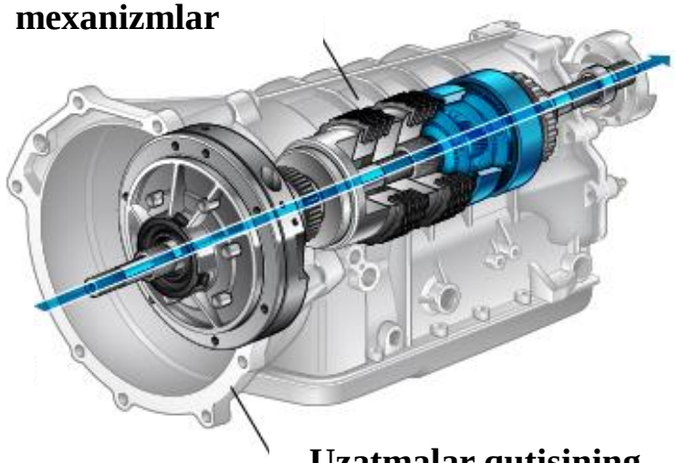
Avtomobillarda gidravlik uzatmalar qutisi sifatida **gidrotransformatorlar** keng qo‘llaniladi.

Gidrotransformator



[24]





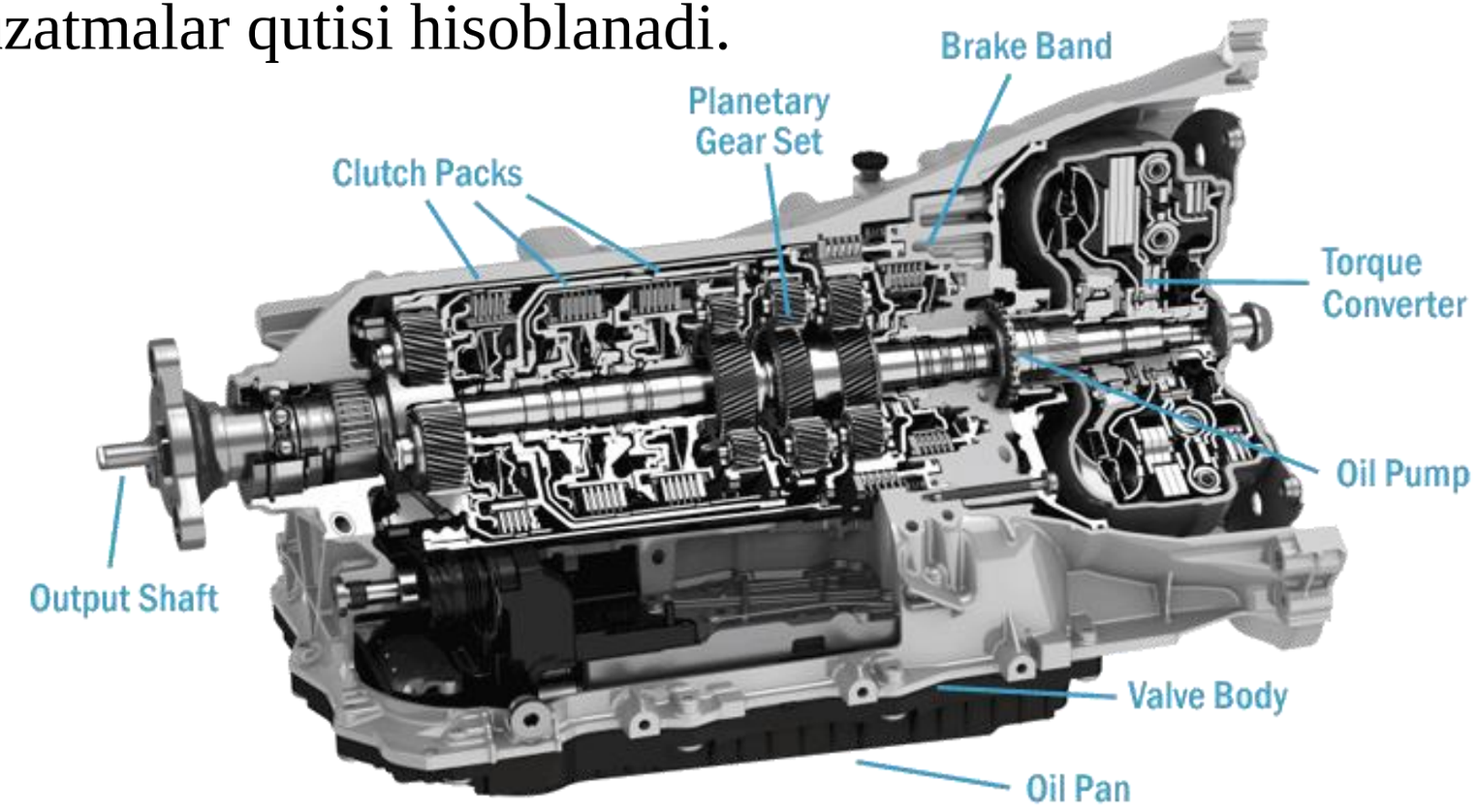
[25]

Bunday uzatmalar qutisini qo‘llash ayrim chegaralangan diapazonda istalgan uzatishlar sonini hosil qilish imkonini beradi.

Pog‘onasiz uzatmalar qutisining:

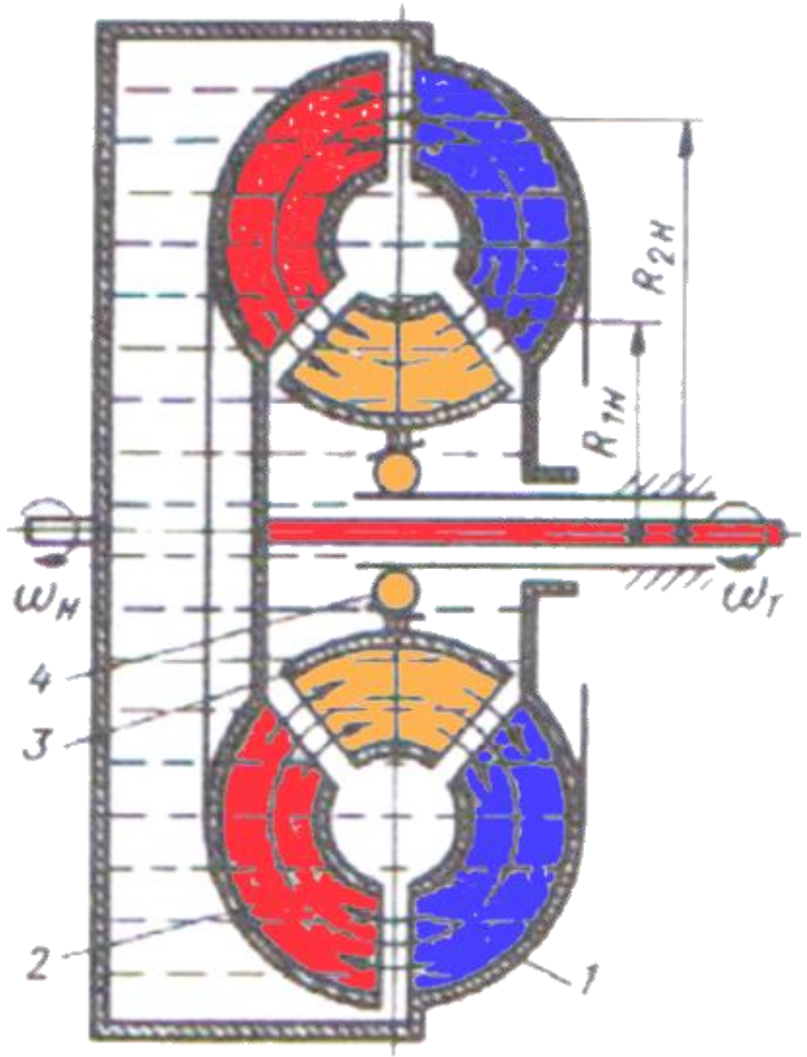
- **mexanik (impulsli, friksion va boshqa);**
- **gidravlik (gidrodinamik, gidrohajmli);**
- **elektrik va aralash turlari mavjud.**

Eng keng tarqalgani gidrodinamik pog‘onasiz uzatma (**gidrotransformator**) va unga ketma-ket biriktirilgan mexanik pog‘onali uzatmalar qutisidan iborat aralash gidromexanik uzatmalar qutisi hisoblanadi.



[26]

Gidrotransformator sxemasi va ishlash prinsipi.

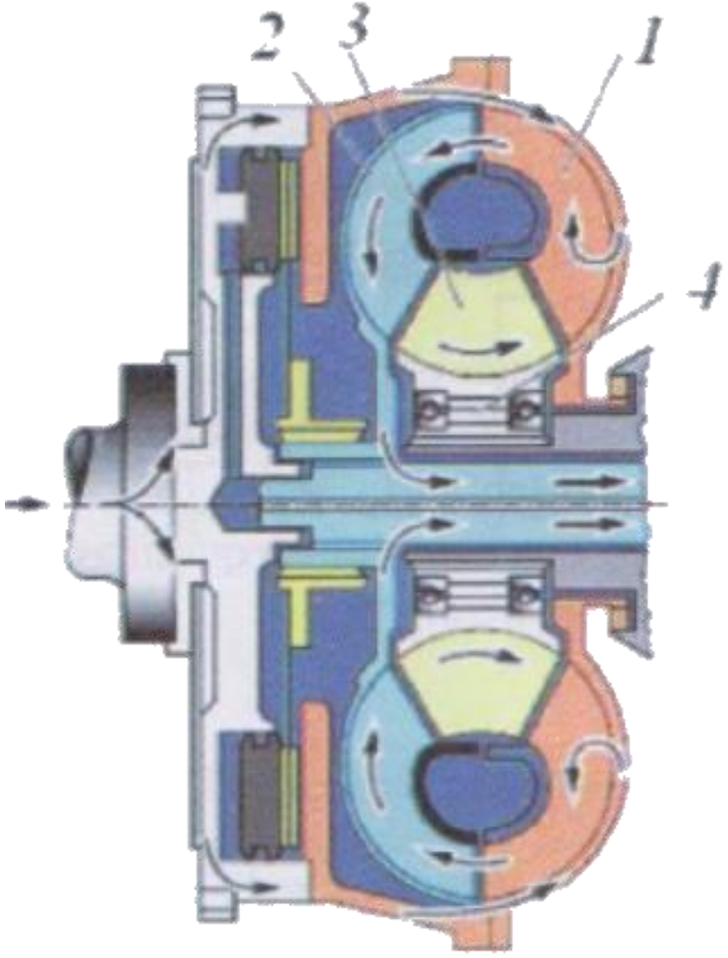


1-nasos; 2-turbina;

3-reaktor;

4-o‘zish muftasi, yoki erkin

aylanish mexanizmi.

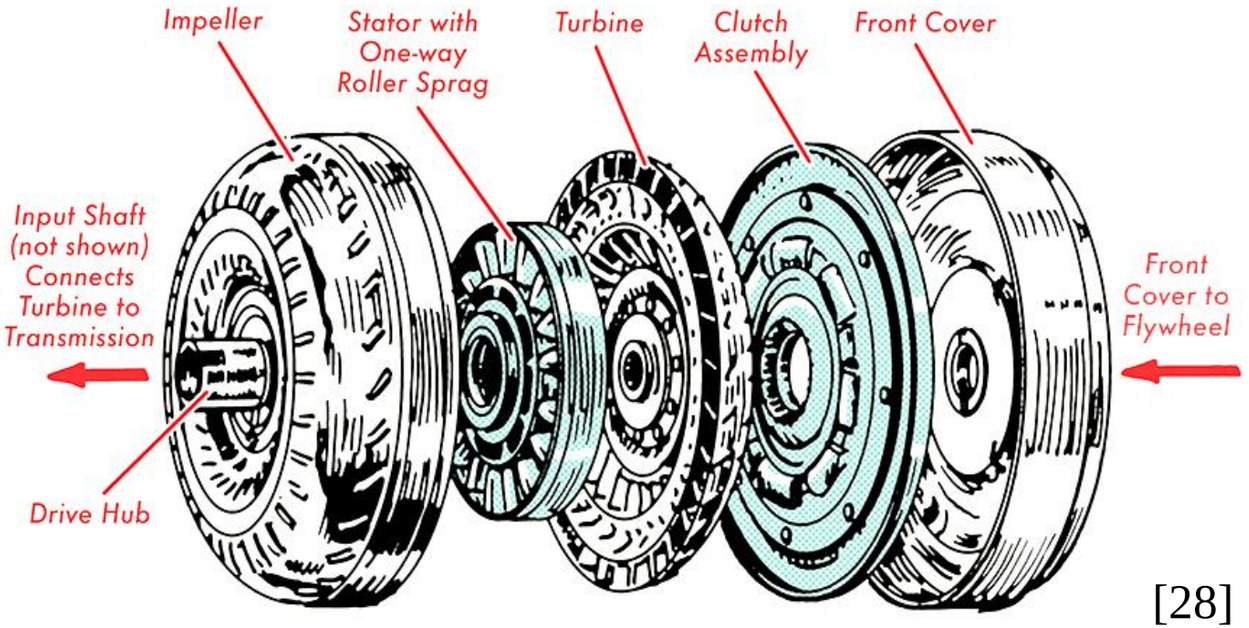


[27]

G‘ildiraklar ichida parraklar bo‘ladi.

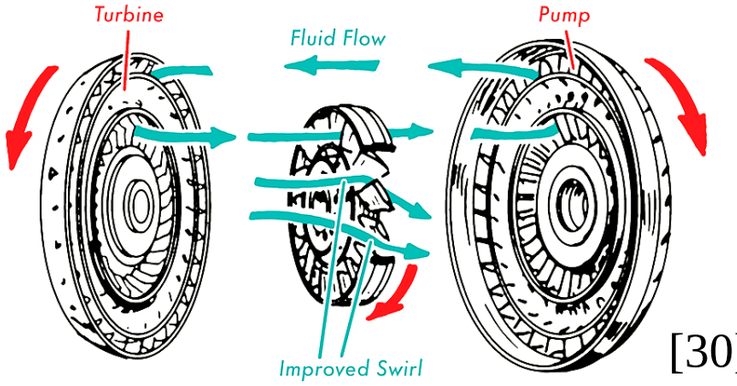
Gidrotransformator ichi moy bilan to‘la bo‘ladi.

- **Nasos** — **yetakchi;**
- **Turbina** — **yetaklanuvchi;**
- **Reaktor** — **momentni oshirish vazifasini bajaradi.**

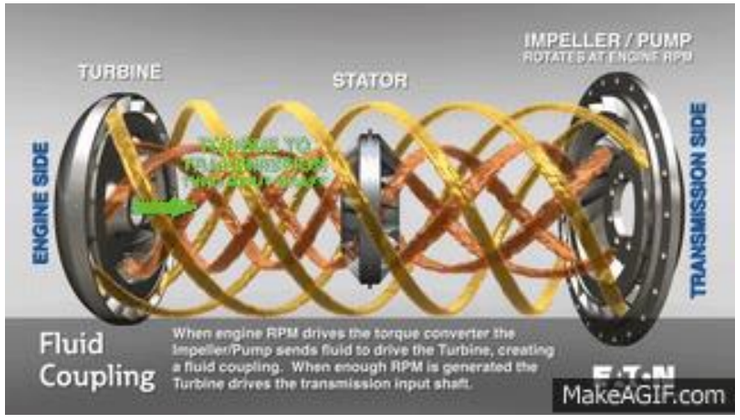


[28]

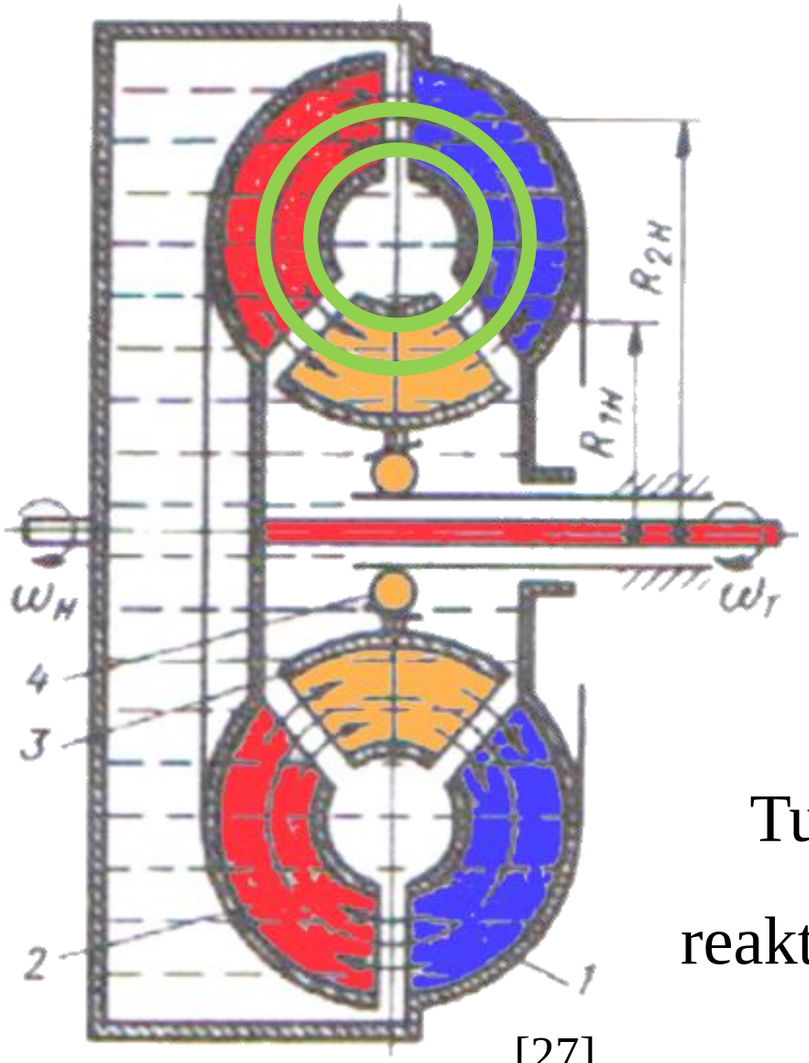
Nasos g‘ildiragi aylanma harakatni dvigatel validan oladi.



[30]



[29]



[27]

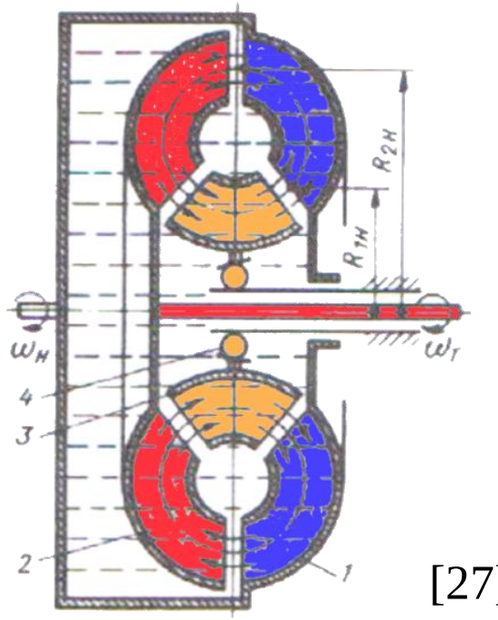
Nasos parraklari orasidagi moy markazdan qochma kuch ta’sirida kichik radiusdan ***R1n*** katta radiusga ***R2n*** intiladi.

Nasosdan moy kinetik energiya oladi.

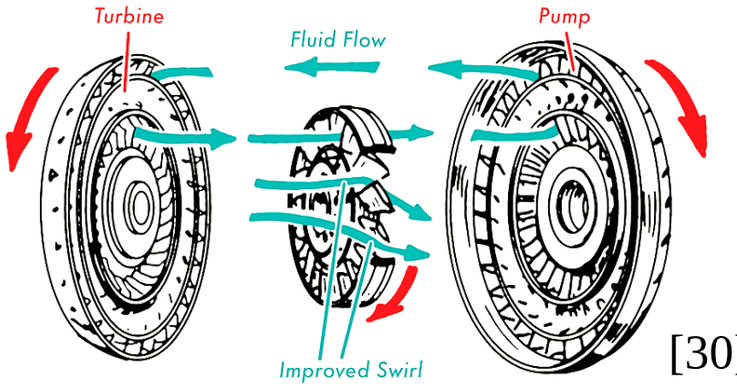
Moy oqimi **turbina** parraklariga urilishi natijasida kinetik energiya uzatilib, uni harakatga keltiradi.

Turbinada energiyani yo‘qotgan moy kichik radiusdan ***R1n*** reaktorga qaytadi.

Reaktor moy oqimining yo‘nalishini nasos parraklari yo‘nalishiga o‘zgartiradi.



[27]



[30]

Moy **nasosga** qarshiliksiz kiradi.

Reaktor gidrotransformatorda uzatilayotgan momentni **2...4** karra oshirib bera oladi.

Reaktorsiz momentni oshirib bo‘lmaydi.

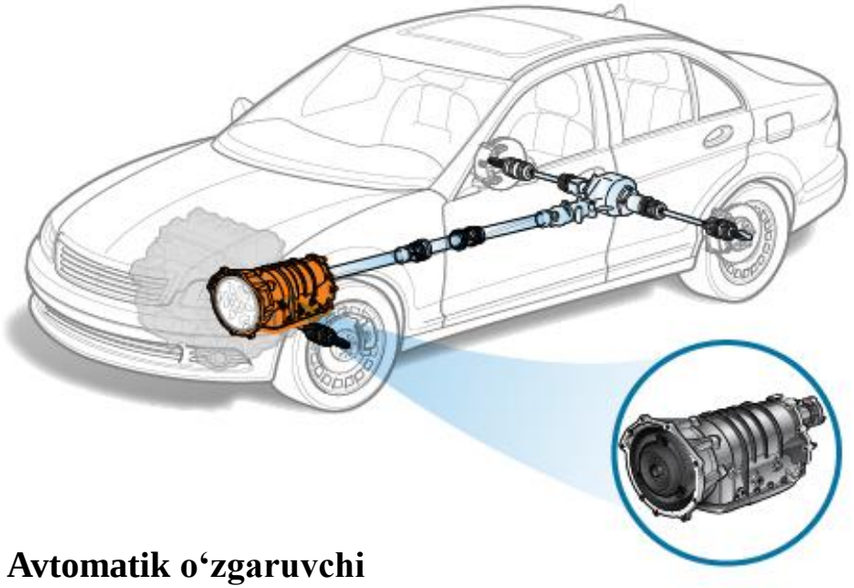
Turbina aylanish tezligi nasosning aylanish tezligiga yaqinlashganda o‘zish muftasi (4) reaktorning erkin aylanishini ta’minlaydi.

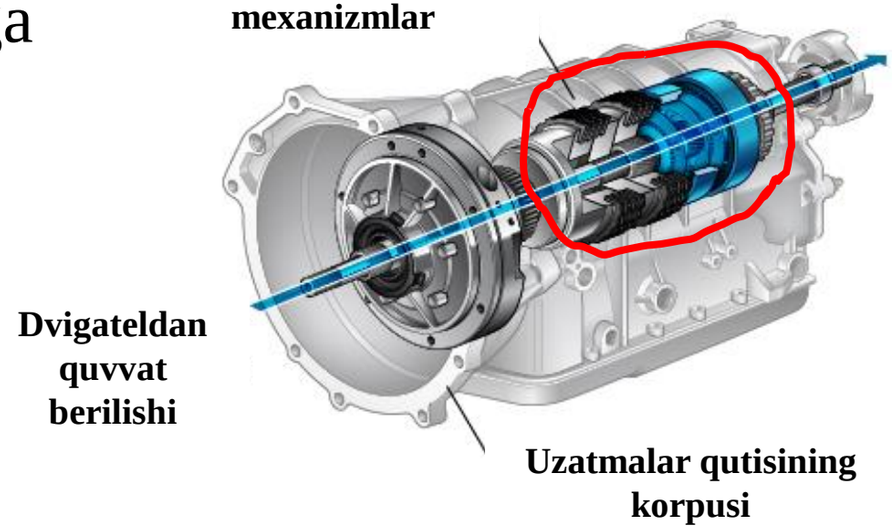
Gidrotransformator gidromufta rejimida ishlaydi.

Gidrotransformator orqali burovchi momentni oshirish diapazoni **2…4** bo‘lib, bu avtomobilni harakatlanishi uchun yetarli emas.

Shuning uchun gidrotransformatorga qo‘shimcha mexanik qismlar qo‘llaniladi.

Uzatma - gidromexanik uzatmalar qutisi deb ataladi.

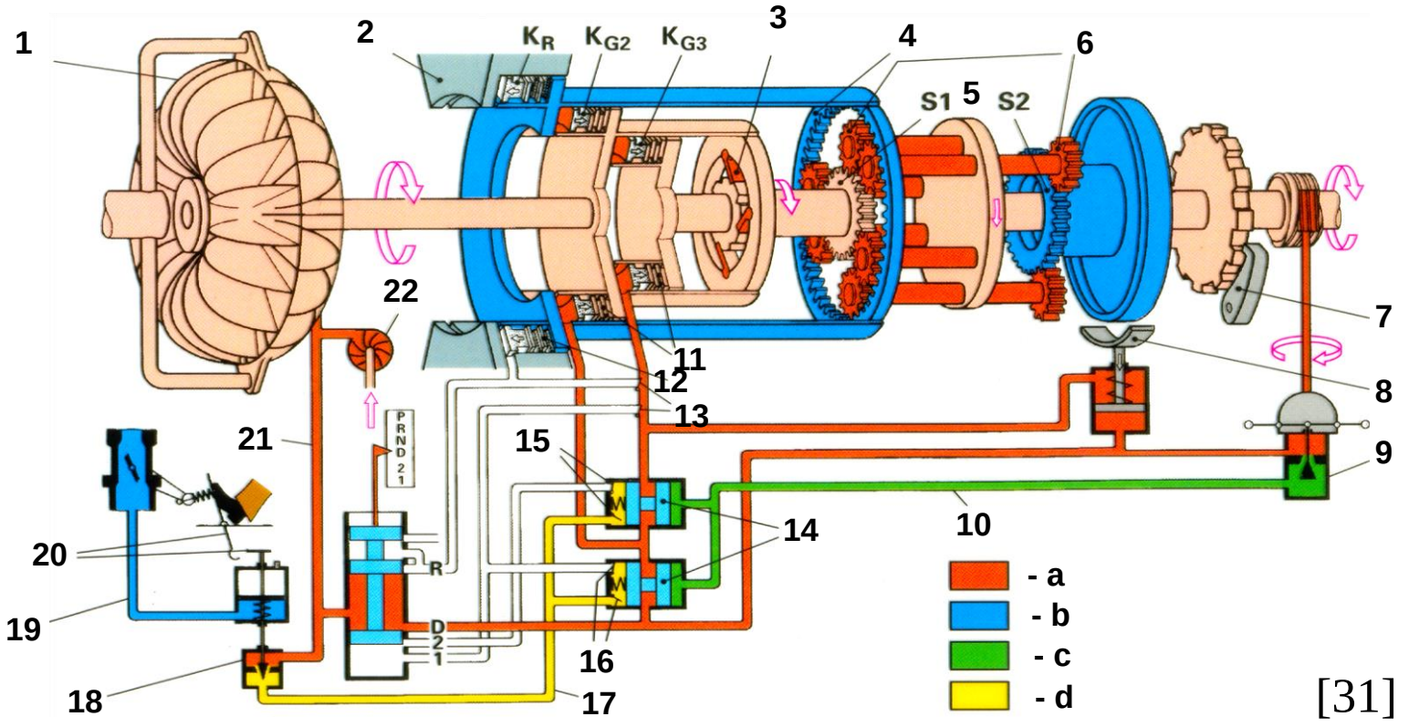




[25]

3 pog‘onali gidravlik boshqariluvchi avtomatik uzatmalar qutisining ishlash prinsipi.

1-gidrotransformator, 2-korpus, 3-erkin yurish mexanizmi, 4-tojli tishli g‘ildirak, 5-markaziy planetar mexanizm halqa, 6-sattelitlar, 7-blokirovkalash mexanizmi (parkovka uchun), 8-friksion lenta, 9-markaziy regulyator, 10-bosim regulyatori, 11-kuch uzatuvchi muftalar, 12-tormozlovchi muftalar, 13-klapan, 14-o‘chirish klapani, 15-16-klapanlar, 17-modulli bosim, 18-drossel klapani, 19-dvigatelning bosimi, 20-“kik-daun” o‘chirgichi, 21-ishchi bosim, 22-moy nasosi.

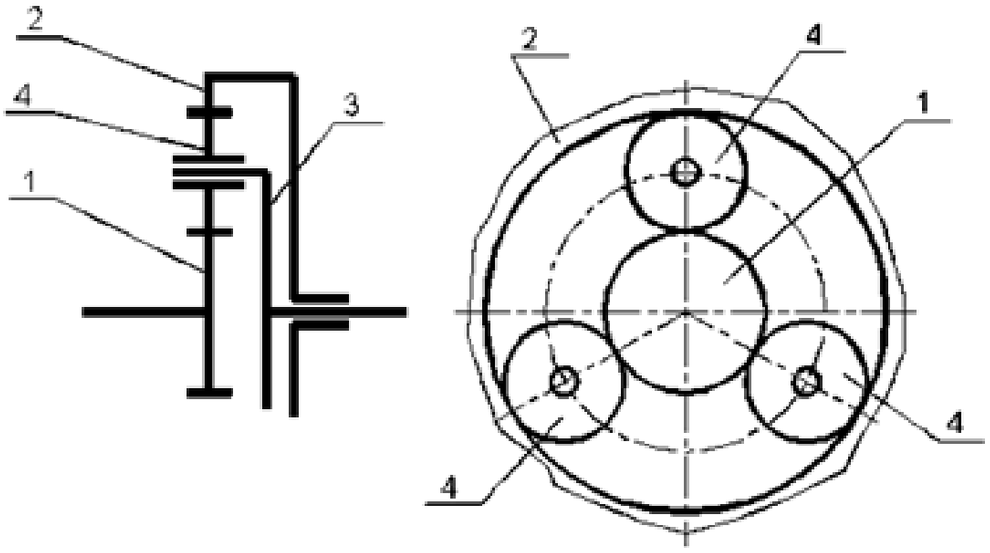


[31]

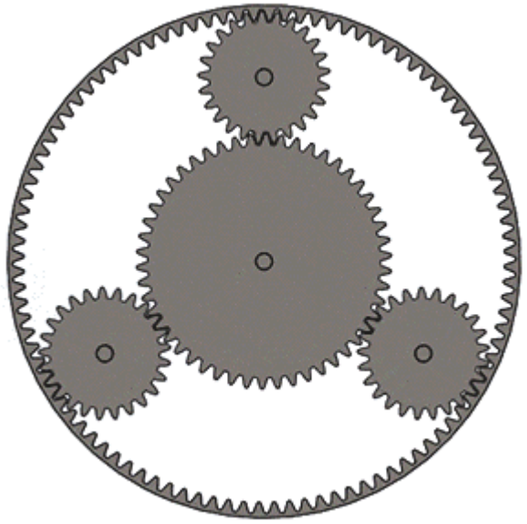
a-ishchi bosim,
b-dvigatelning bosimi,
c-bosim regulyatori,
d-modulli bosim.

Planetar mexanizmlar odatda gidromexanik uzatmalar qutisida qo‘llaniladi.

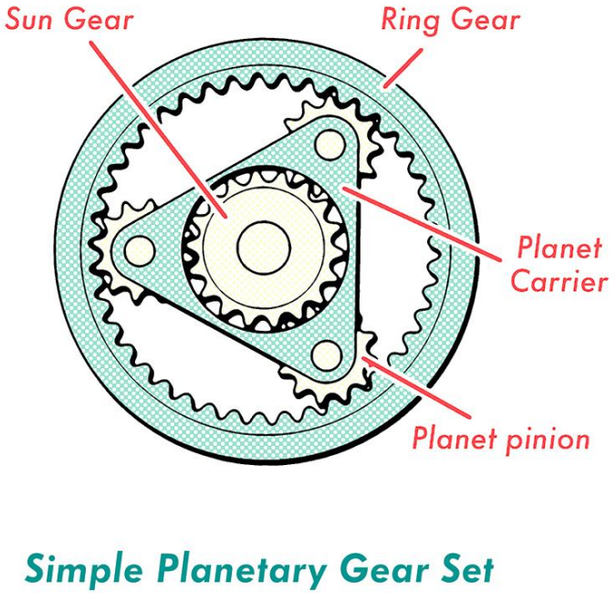
Silindrik tishli g‘ildiraklardan iborat 3 valli planetar mexanizmning quyoshli deb nomlangan tishli g‘ildirak valda o‘rnatilgan.



[32]



[33]

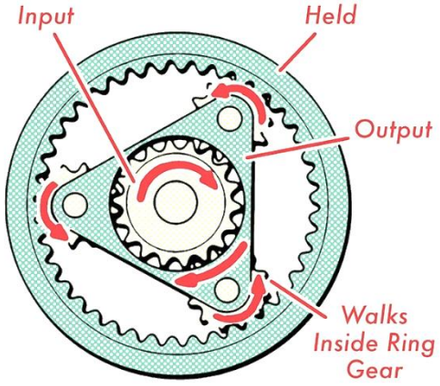


[34]

1-quyoshli shesternya; 2-tojli shesternya; 3-vodilo; 4-satellitlar.

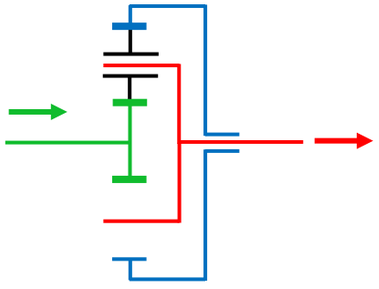
Planetar mexanizmda kuchni uzatilishi:

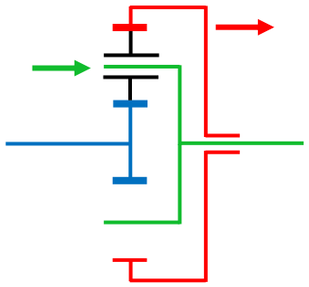
Sun Gear: input gear
Planetary Carrier: output gear
Ring Gear: held stationary



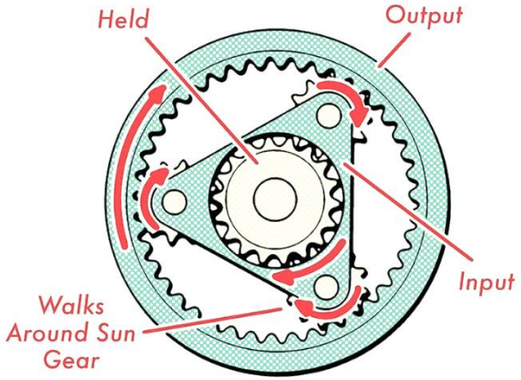
Gear Reduction with Sun Gear as Input

[35]





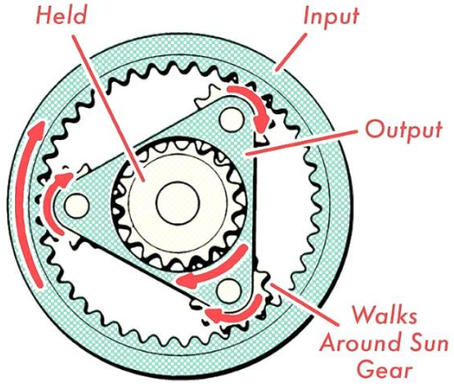
Sun Gear: held stationary
Planetary Carrier: input gear
Ring Gear: output gear



Overdrive with Sun Gear Held

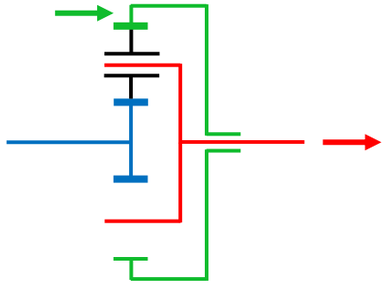
[36]

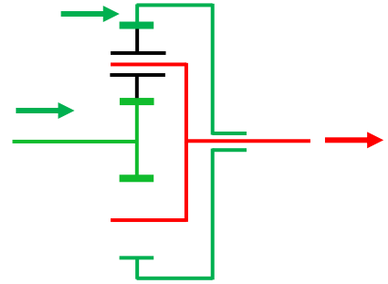
Sun Gear: held stationary
Planetary Carrier: output gear
Ring Gear: input gear



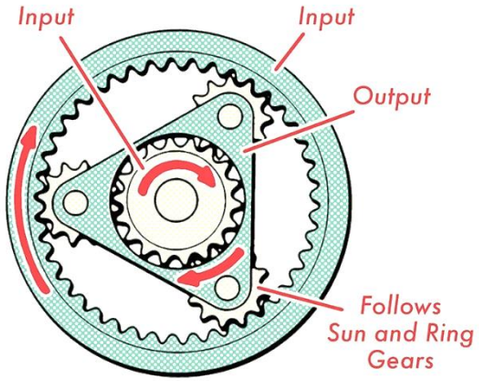
Gear Reduction with Ring Gear as Input

[37]





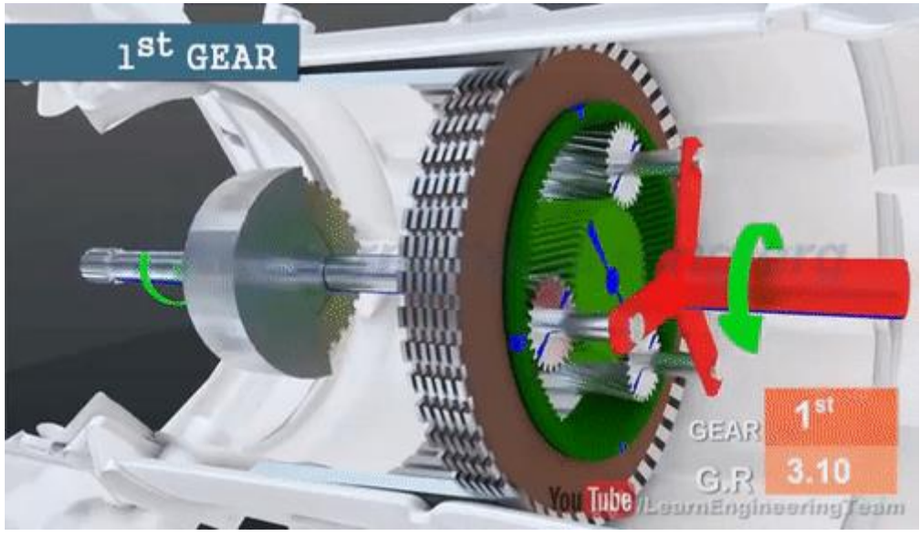
Sun Gear: input gear
Planetary Carrier: output gear
Ring Gear: input gear



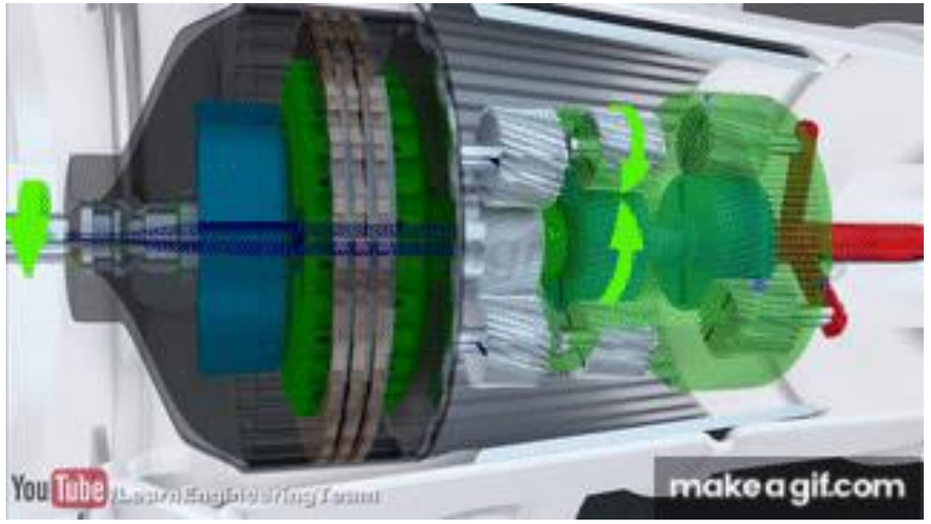
Direct Drive with Input to Ring and Sun Gears

[38]

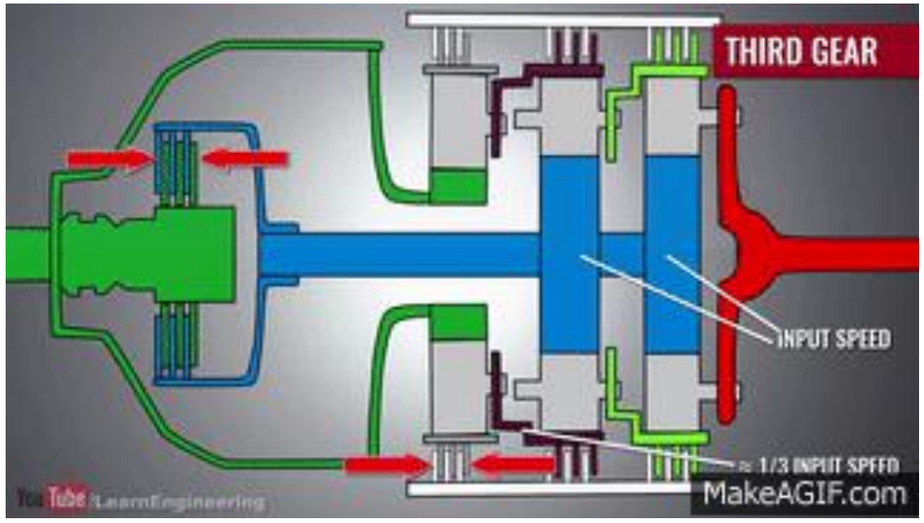
Avtomatik uzatmalar qutisining qisqachi ishlashi.



[39]

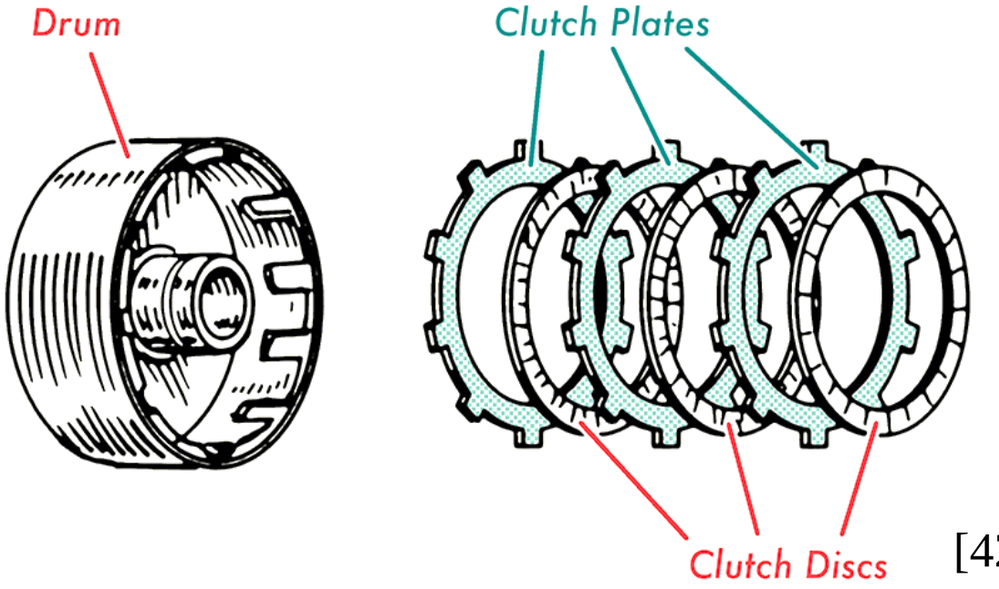


[40]

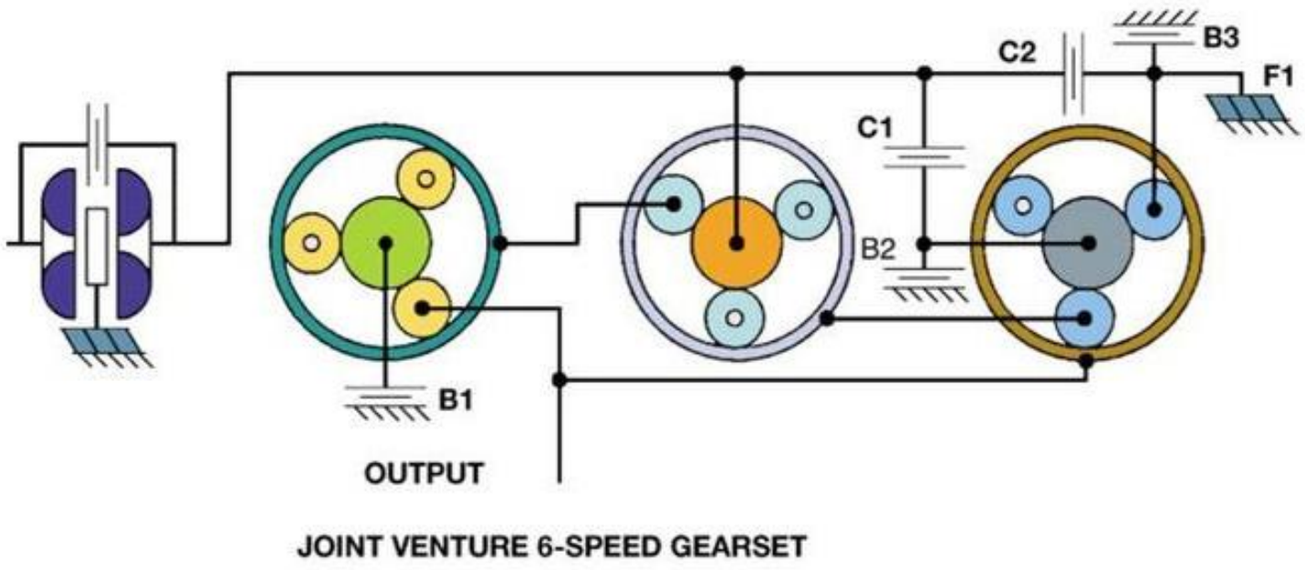


[41]

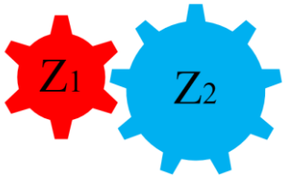
Planetar mexanizmining uzatishlar soni.



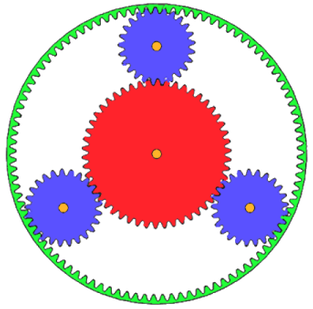
[42]



JOINT VENTURE 6-SPEED GEARSET



$$U = \frac{z_2}{z_1}$$



$$U = 1 + \frac{z_R}{z_S}$$

[33]

Joint Venture Gearset							
Range	C1	C2	B1	B2	B3	F1	Ratio
1			X			X	4.48:1
Manual 1			X		X		4.48:1
2			X	X			2.87:1
3	X		X				1.84:1
4		X	X				1.41:1
5	X	X					1:1
6		X		X			0.74:1
Reverse	X				X		2.88:1

[43]

Uzatmalar qutisining uzatishlar soni:

Pog‘onali
(MT – Manuel Transmission)

1 – 3,461
2 – 1,750
3 – 1,096
4 – 0,857
5 – 0,710
R – 3,230

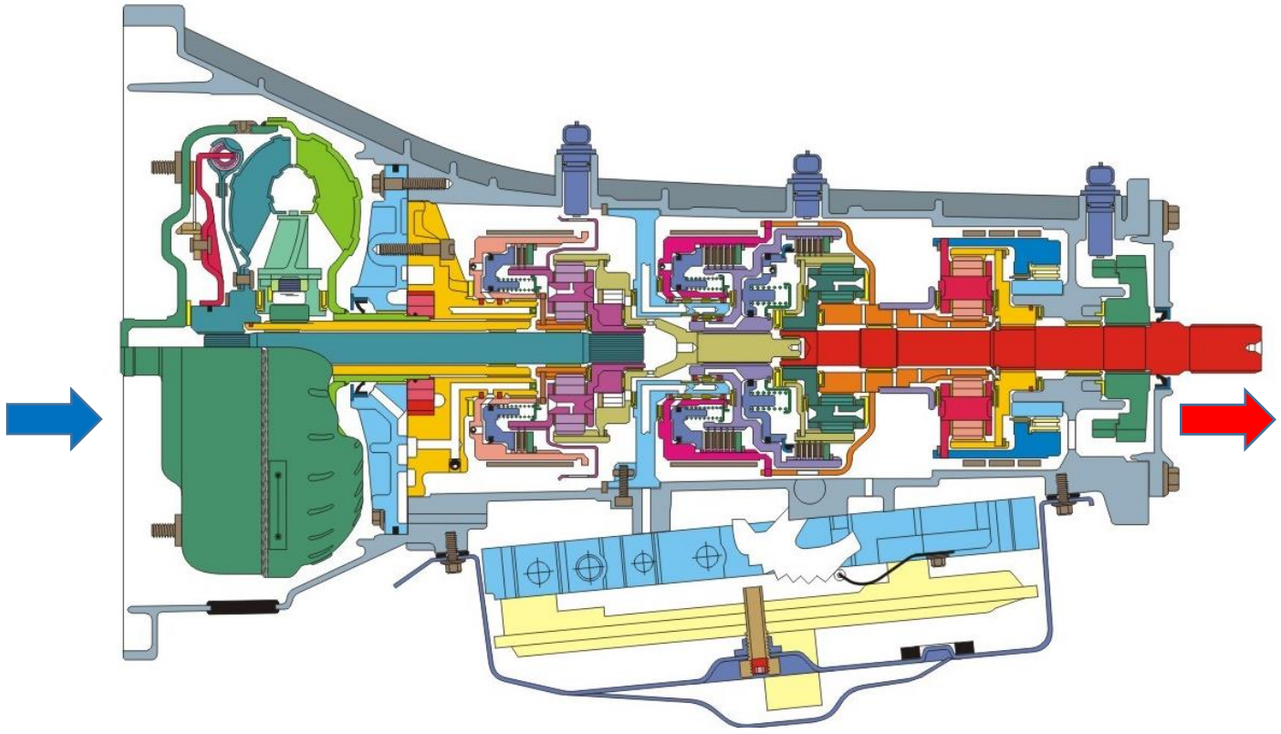
Pog‘onasiz
(AT – Automatic Transmission)

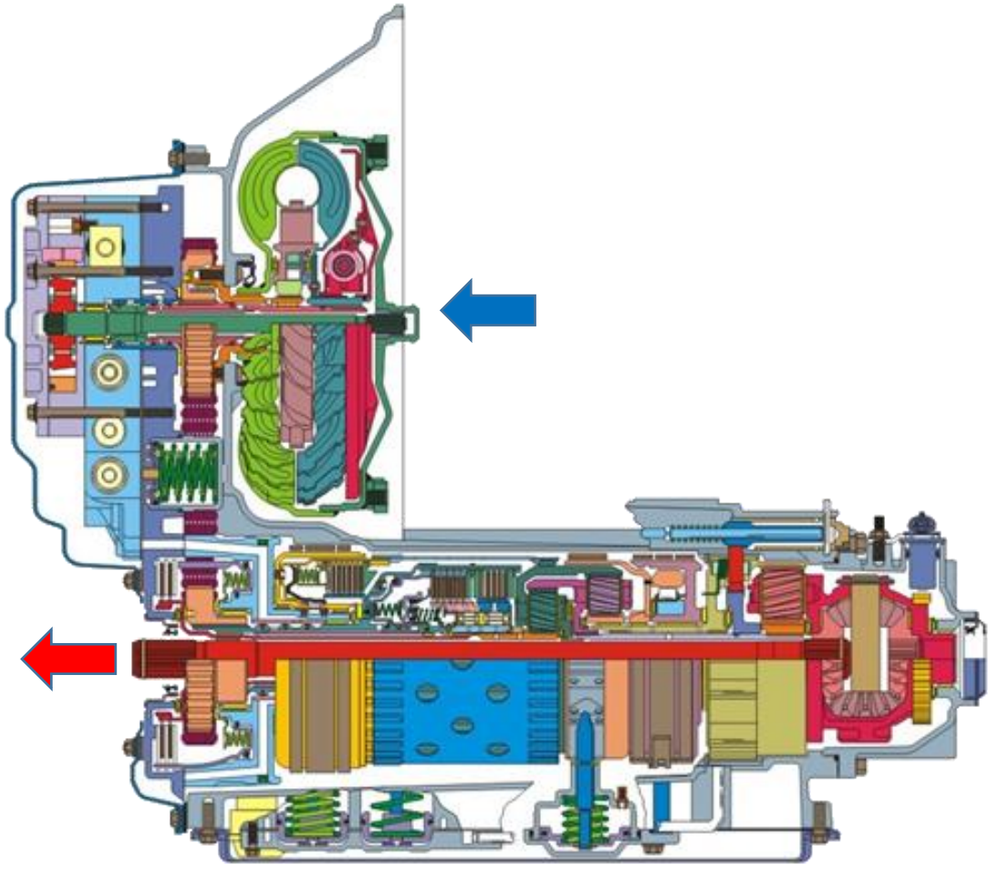
1 – 3,300
2 – 1,961
3 – 1,580
4 – 1,348
5 – 1,000
6 - 0,726
7 – 0,582
R – 2,950

O‘qlari bir o‘qda bo‘lgan

O‘qlari bir o‘qda bo‘lmagan

pog‘onasiz uzatmalar qutisi.



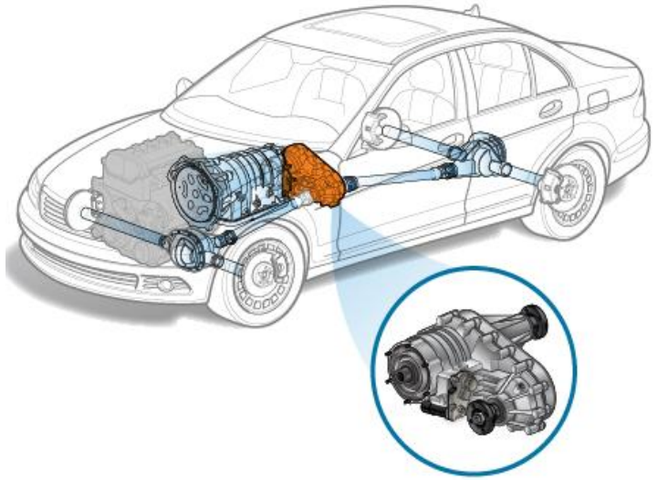


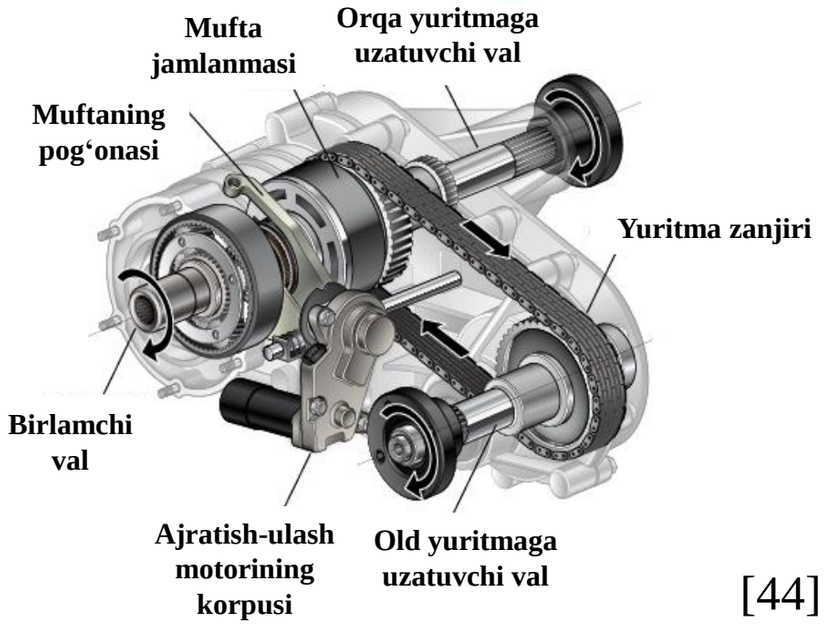
[31]

10.4. Taqsimlash qutisining vazifasi, konstrusiyalari va ularning ishlashi.

Taqsimlash qutisi o‘ta qiyin yo‘llardan ham yura oladigan avtomobillarda ishlatiladi va aylantiruvchi momentni avtomobilning yetaklovchi ko‘priklariga uzatish uchun xizmat qiladi.

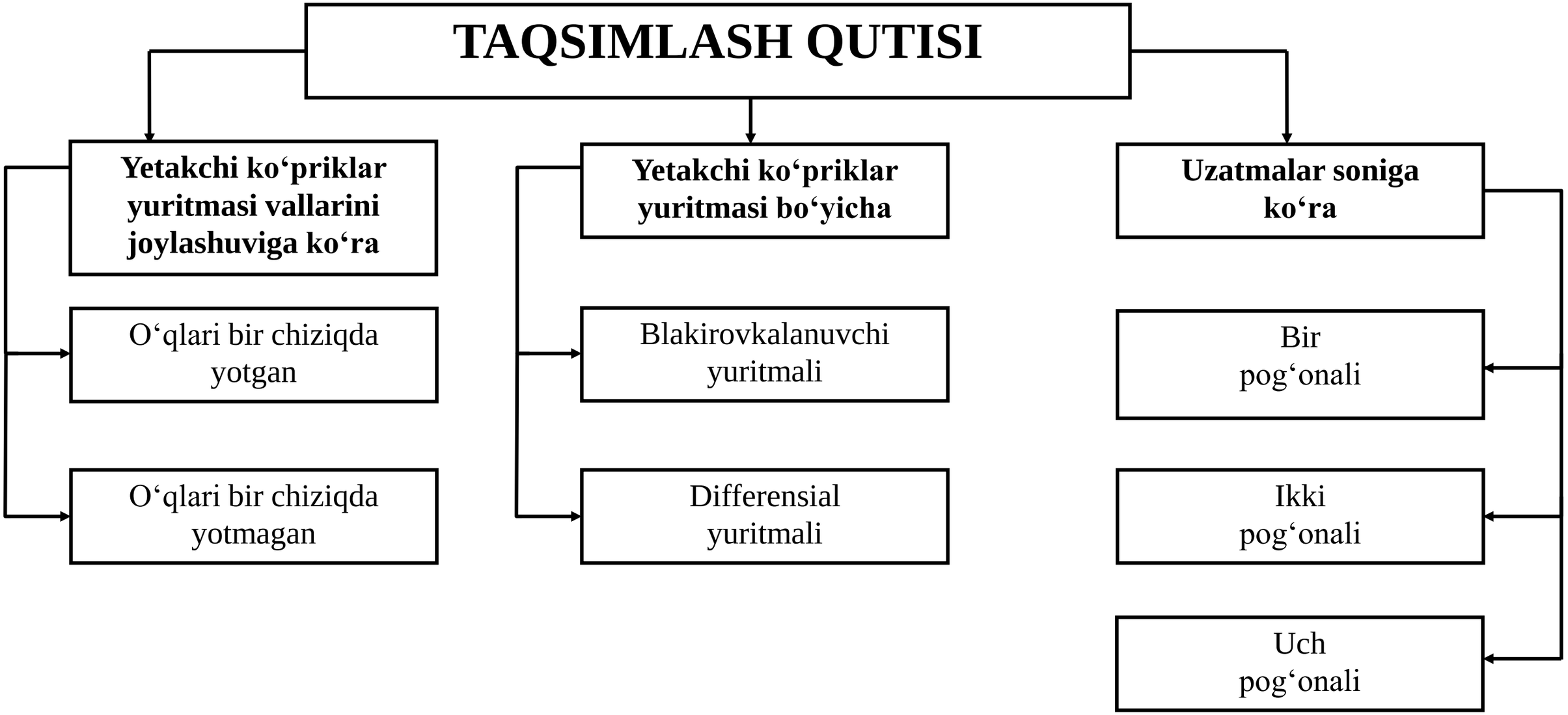
Avtomobilning bajaradigan vazifasiga qarab taqsimlash qutisi **qo‘shimcha pasaytirish uzatmasi bo‘lgan** yoki **bo‘lmagan** qilib tayyorlanadi.





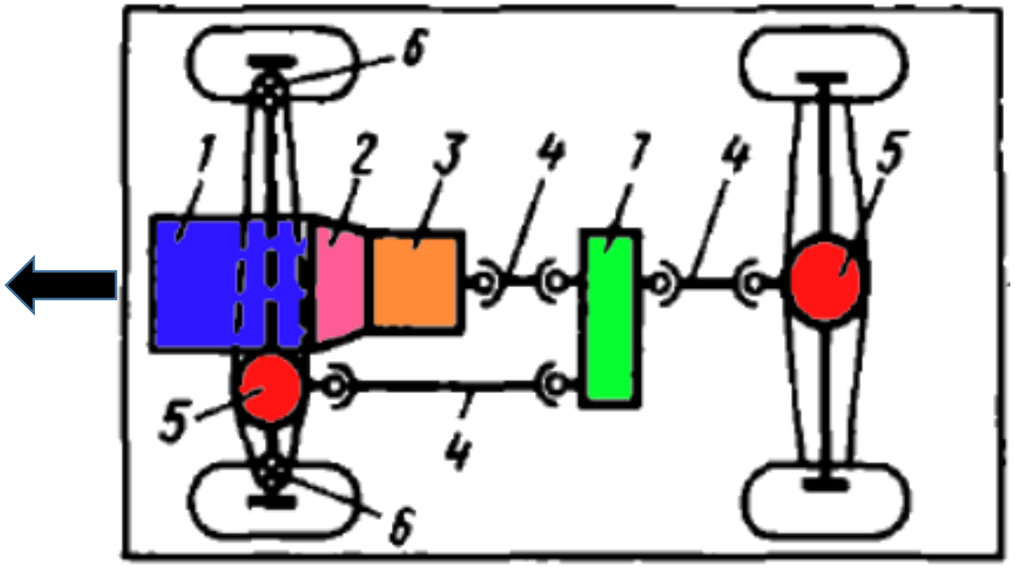
[44]

Taqsimlash qutisining turlari:

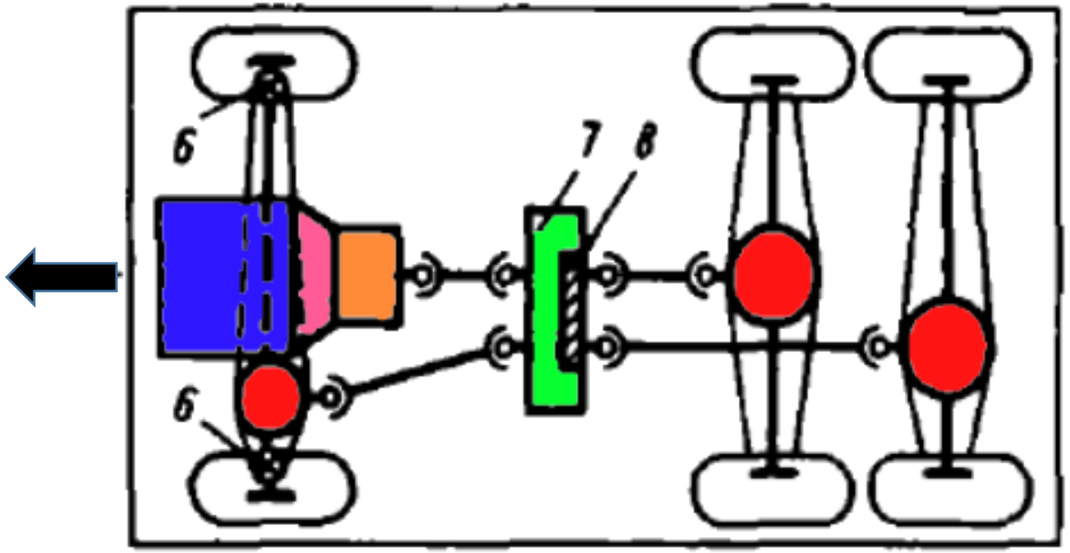


Taqsimlash qutisi g‘ildirak formulasi **4x4**, **6x6** bo‘lgan yengil va yuk avtomobillarda qo‘llaniladi.

4x4



6x6



[45]

Taqsimlash qutisining sxemalari:

1 - yetakchi val;

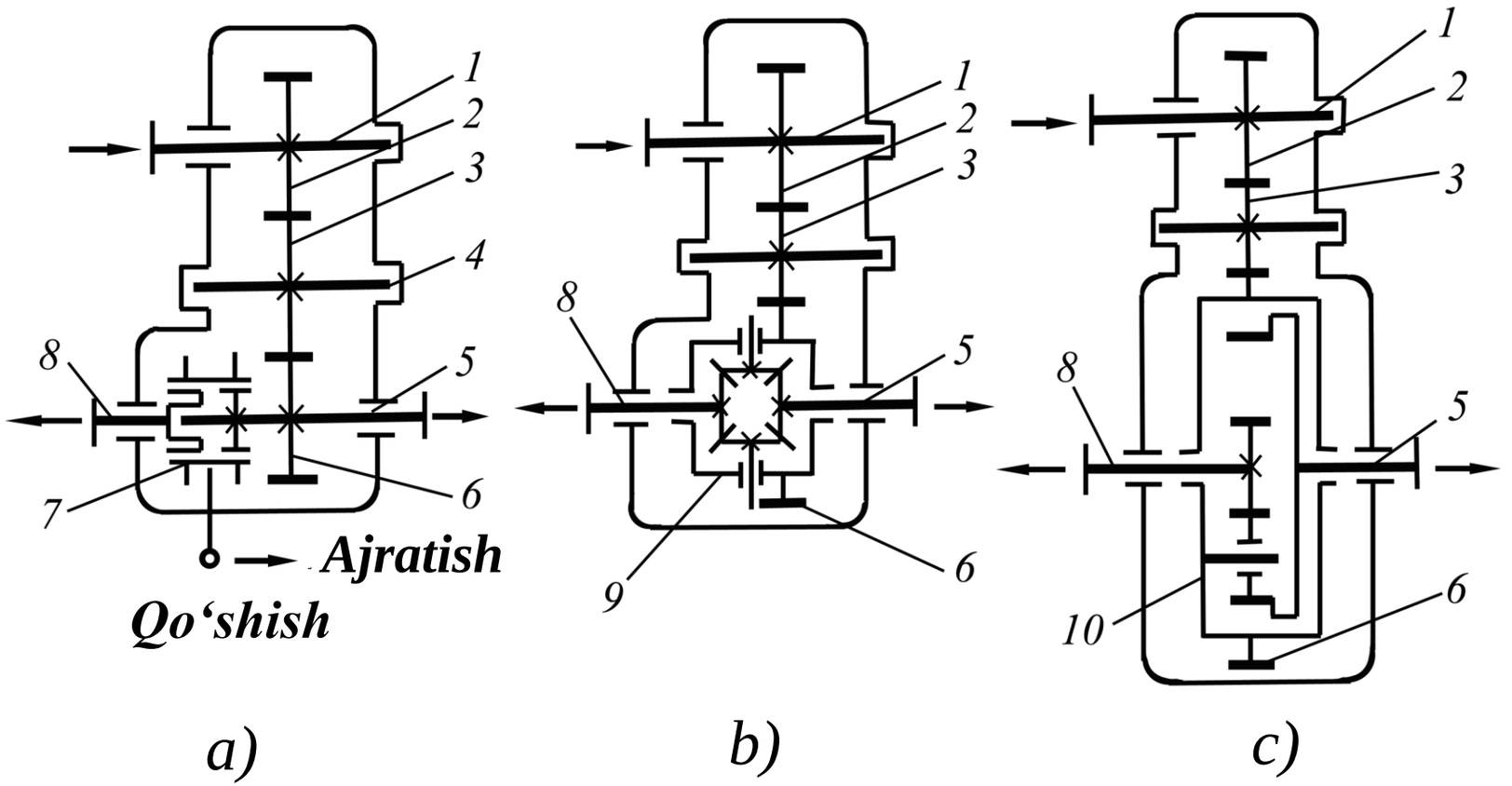
2,3,6 - shesternyalar; 4 - oraliq

val; 5,8 - yetakchi ko‘prik

vallari; 7 - mufta;

9 - simmetrik differensial;

10 - assimetrik differentsial.

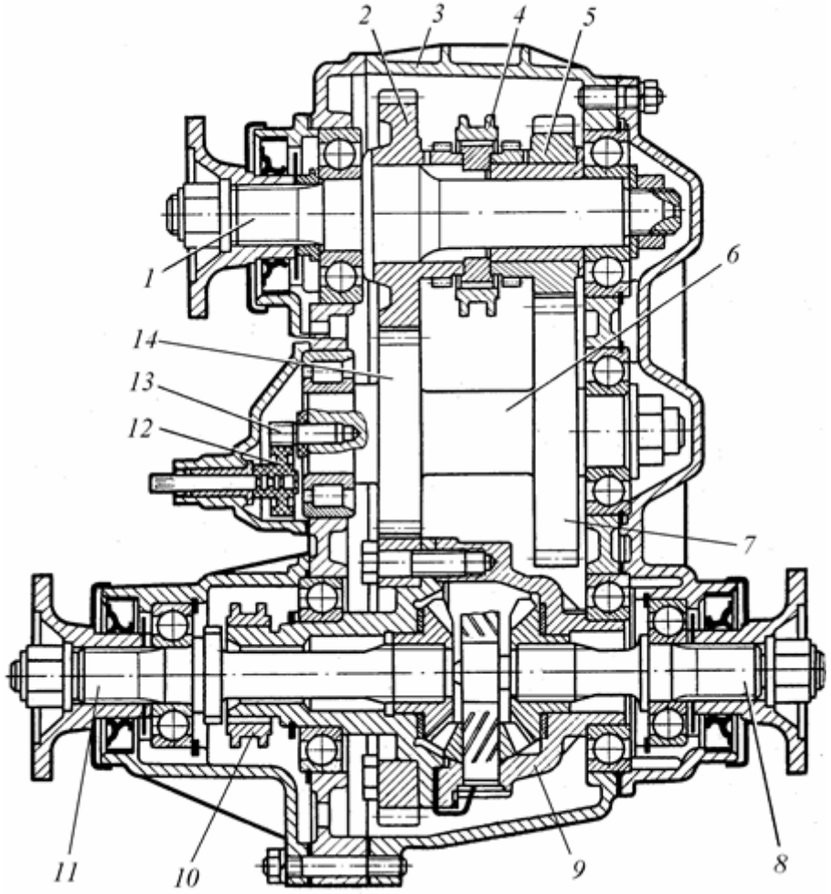


a) *b)* *c)*

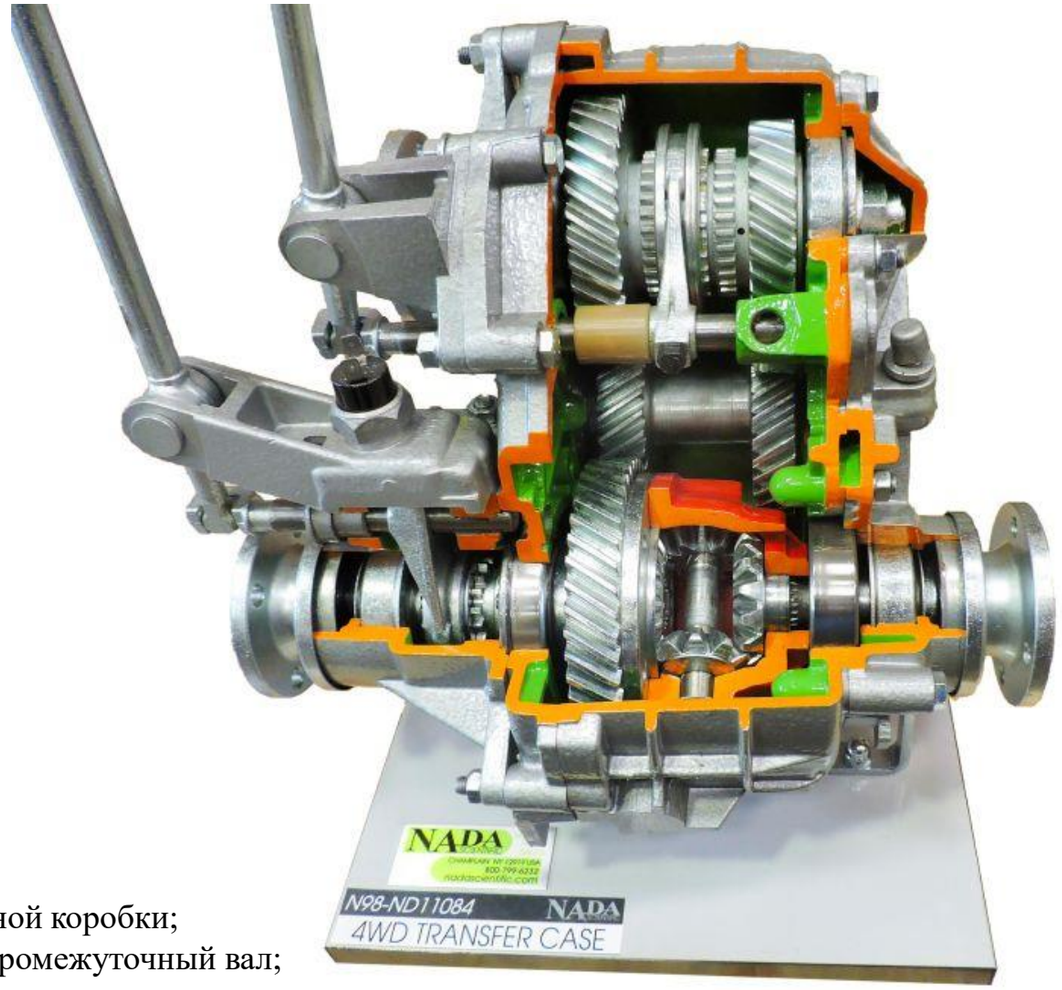
a – old va orqa ko‘prik vallarini ulaydigan muftali taqsimlash qutisi;

b, c - differensial taqsimlash qutisi. [46]

Differensial taqsimlash qutisi.



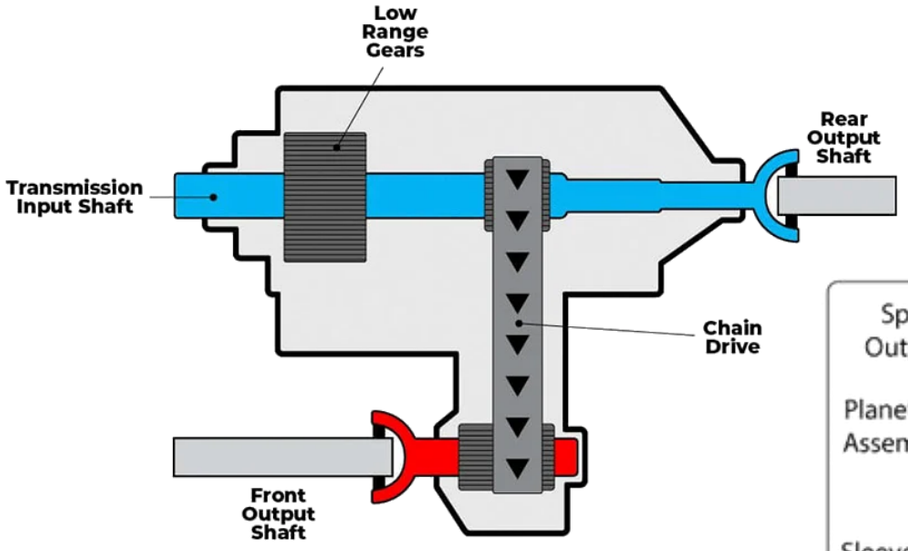
[47]



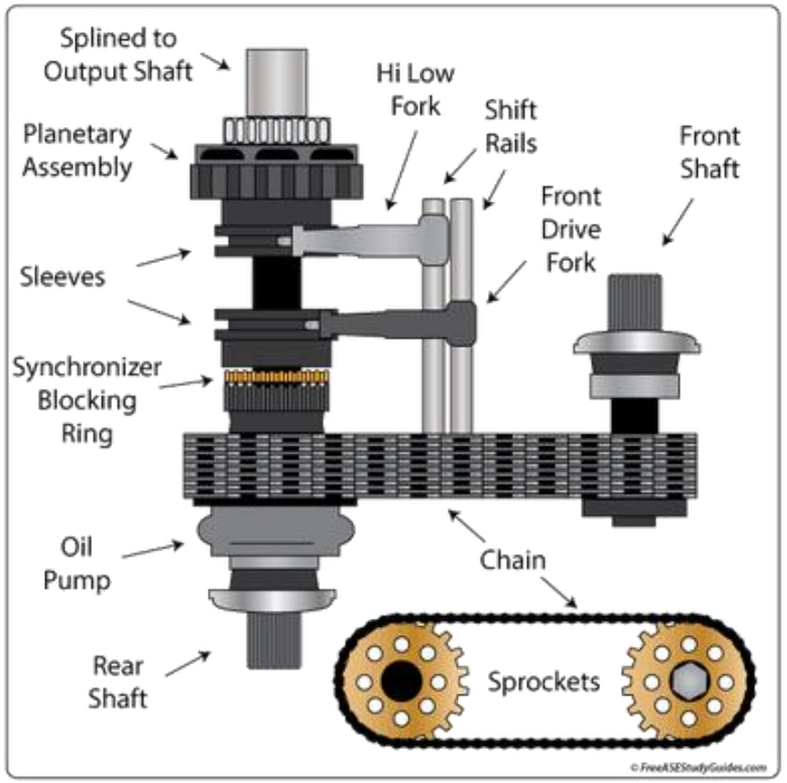
[48]

1 – ведущий вал; *2* – ведущая шестерня высшей передачи; *3* – картер раздаточной коробки;
4 – зубчатая муфта включения передач; *5* – ведущая шестерня низшей передачи; *6* – промежуточный вал;
7, *14* – шестерни промежуточного вала; *8* – вал привода заднего моста;
9 – межосевой симметричный дифференциал; *10* – зубчатая муфта блокировки дифференциала;
11 – вал привода переднего моста; *12*, *13* – ведомая и ведущая шестерни привода спидометра соответственно.

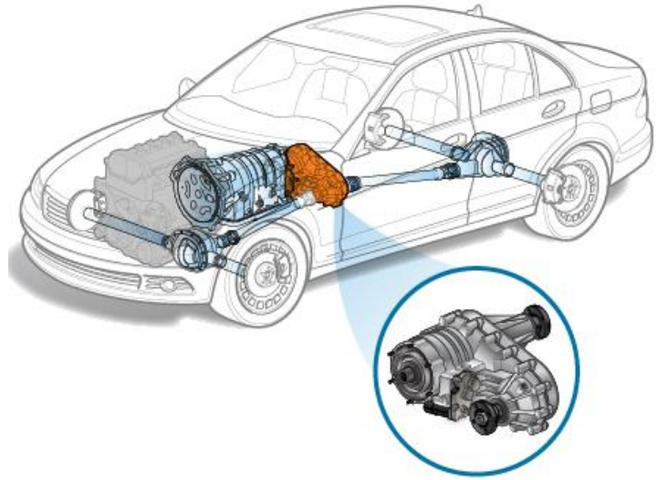
Zanjir yuritmali taqsimlash qutisi.

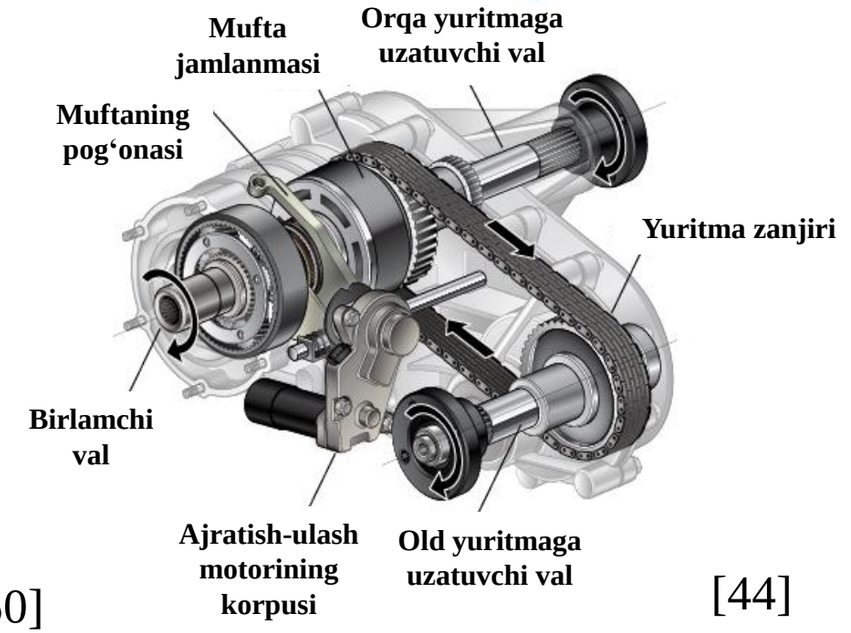


[49]



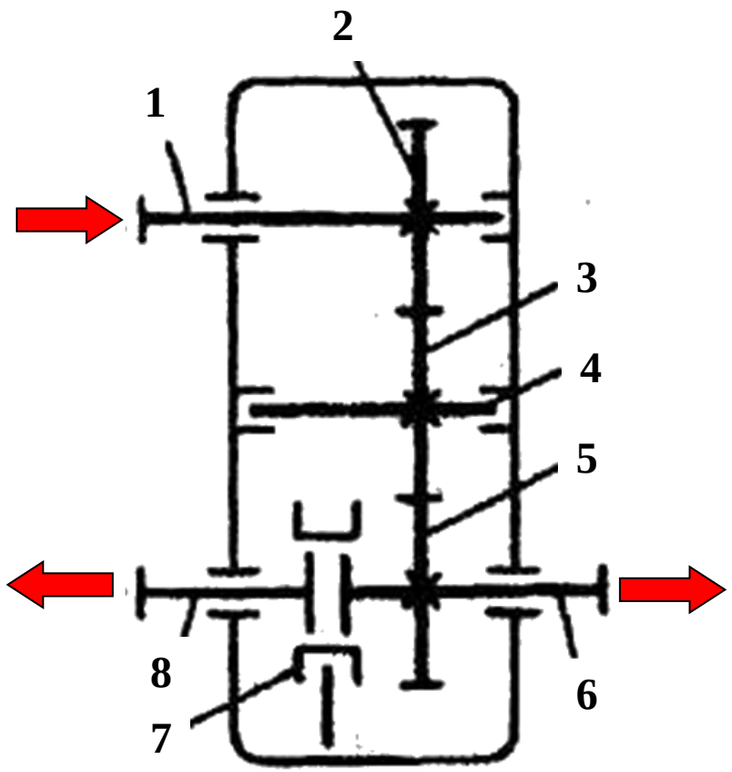
[50]

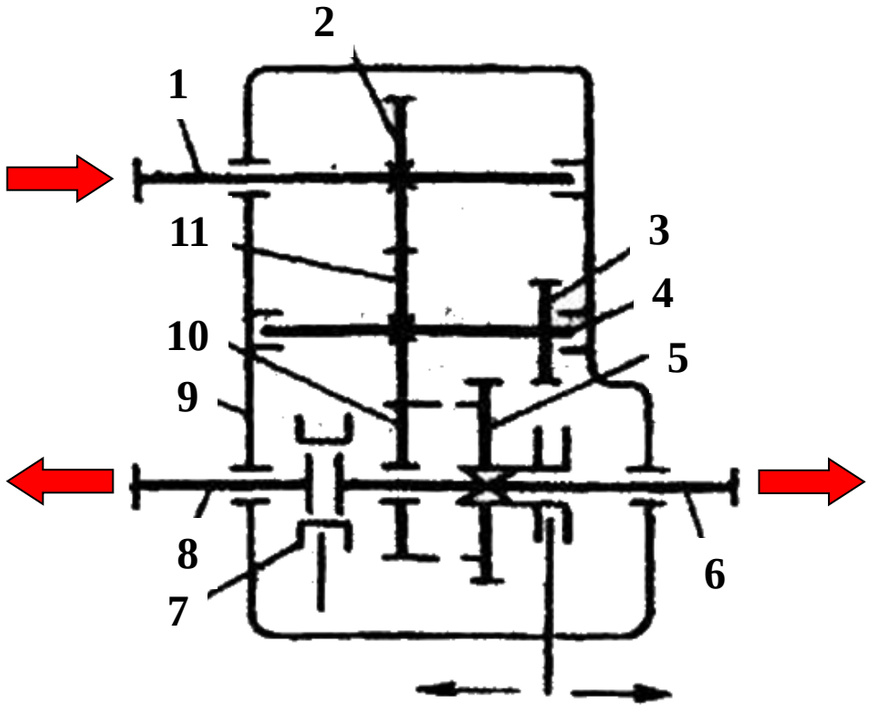


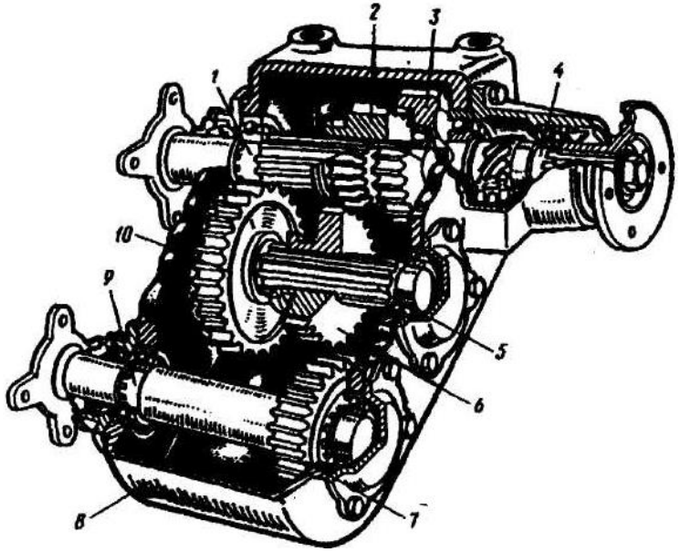


[44]

Pasaytiruvchi uzatmasi bo‘lmagan: Pasaytiruvchi uzatmasi bo‘lgan:







To‘g‘ri Pasaytiruvchi [51]

1-yetaklovchi val; 2-yetaklovchi shesternya; 3-oraliq val shesternyasi; 4-oraliq val; 5-yetaklanuvchi shesternya; 6-orqa ko‘prik vali; 7-tishli mufta; 8-old ko‘prik yuritmasi vali; 9-taqsimlash qutisining korpusi; 10-doimiy ilashib turuvchi shesternya; 11-oraliq valning oldingi shesternyasi.

Pasaytiruvchi uzatma avtomobilning yetaklovchi g‘ildiraklaridagi tortish kuchini yana ham oshirishga imkon beradi.

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