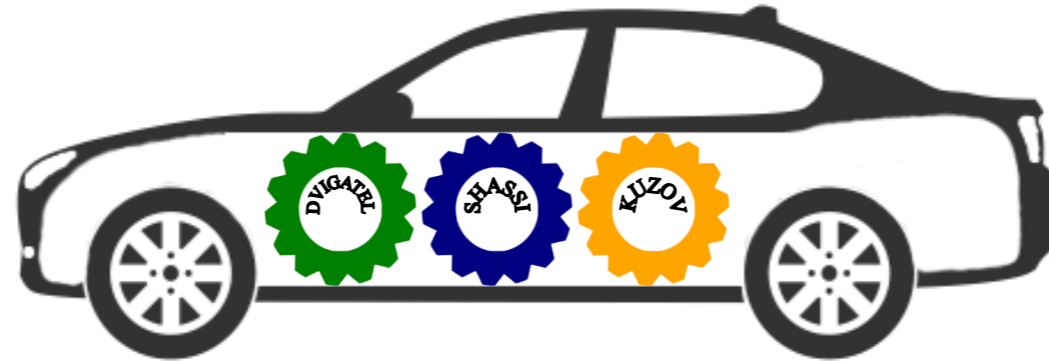


VEHICLES CONSTRUCTION

AVTOMOBILLAR KONSTRUKSIYASI



11th Topic: Cardan drive. Final drive.

(11-Mavzu: Kardanli uzatma. Asosiy uzatma.)

Part 1

Associate Professor: Yusupov Sarvarbek

11-Mavzu: Kardanli uzatma. Asosiy uzatma.

(11th Topic: Cardan drive. Final drive.)

O'quv rejasi:

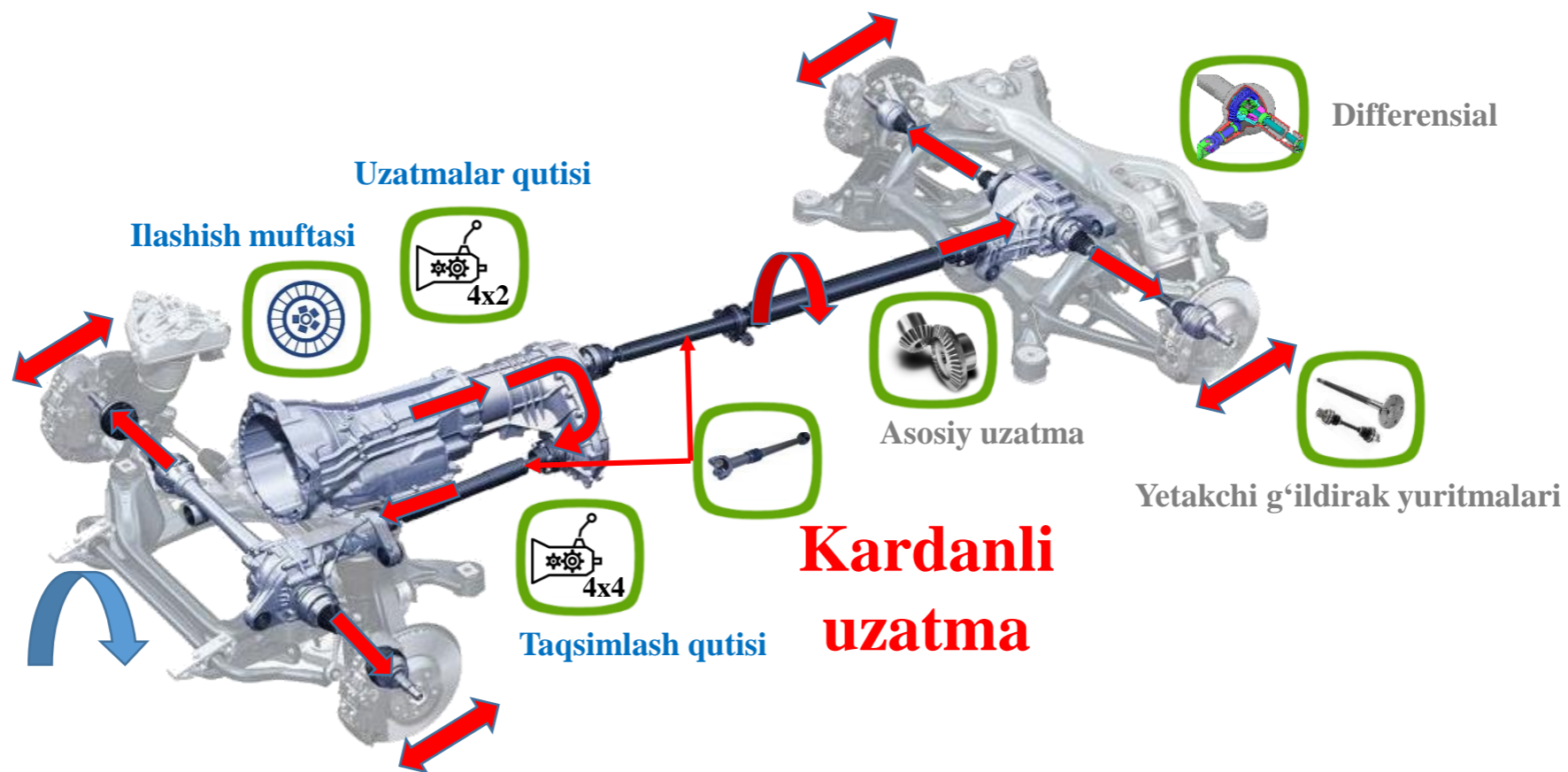
11.1. Kardanli uzatmaning vazifasi va turlari.

11.2. Kardanli uzatma konstruksiyalari va ularning ishlash prinsipi.

11.3. Asosiy uzatmaning vazifasi va turlari.

11.4. Asosiy uzatma konstrusiyalari va ularning ishlash prinsipi.

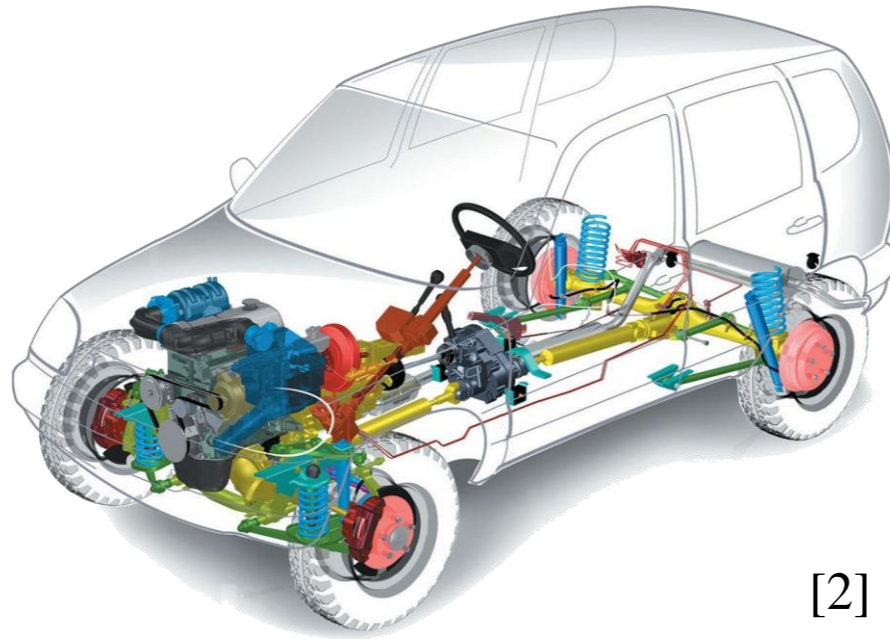
TRANSMISSIYA



[1]

11.1. Kardanli uzatmaning vazifasi va turlari.

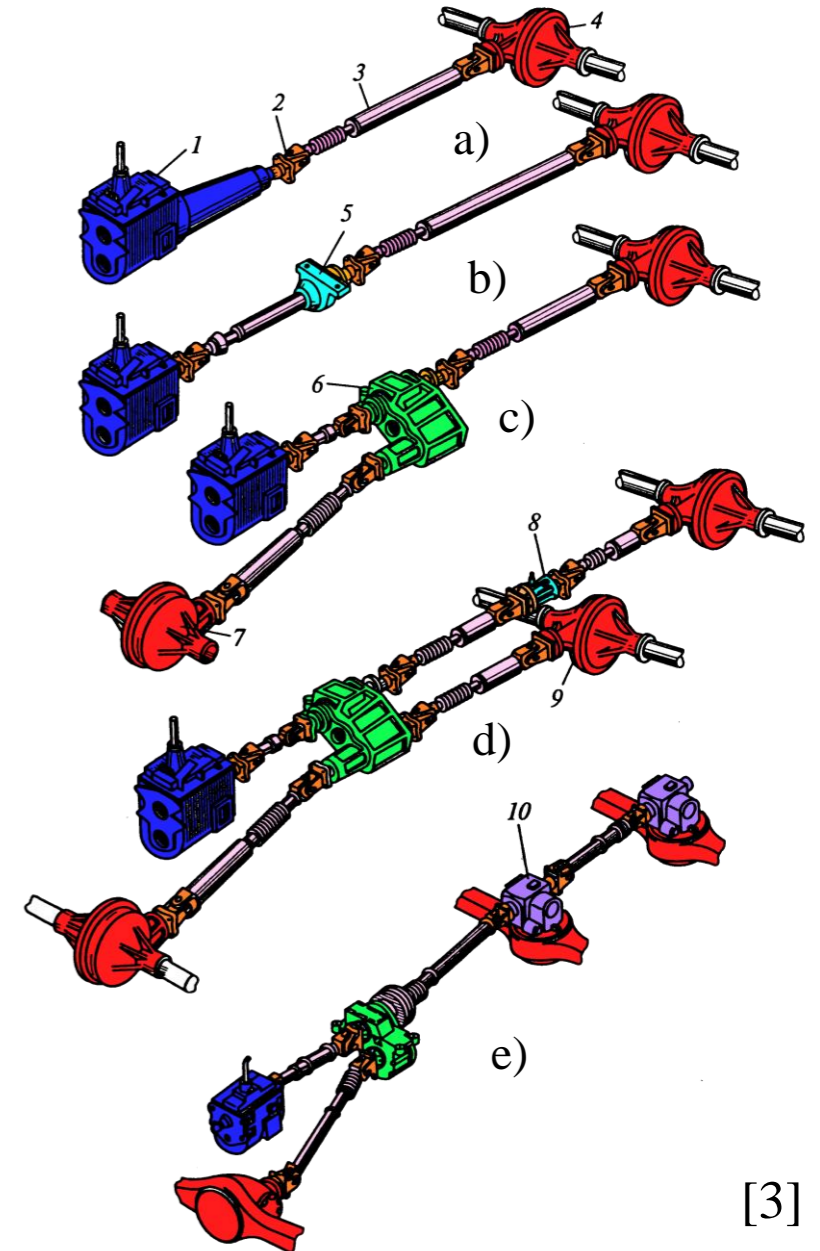
Avtomobilning **yetakchi ko‘prigi uzatmalar qutisi** yoki **taqsimlash qutisi**ga nisbatan pastroqda joylashgan.



[2]

a – bir valli; b, d, - ikki valli oraliq tayanchi bilan; c – uch valli taqsimlash qutisi bilan; e – bir valli uzatma o‘rta ko‘prikdagi qo‘shimcha reduktor bilan.

1 – uzatmalar qutisi; 2 – kardan sharniri; 3 – kardan vali;
 4,7,9 – orqa, oldi va o‘rta yetaklovchi ko‘priklar; 5,8 – oraliq tayanch;
 6 – taqsimlash qutisi; 10 – o‘rta ko‘prik uchun qo‘shimcha reduktor.

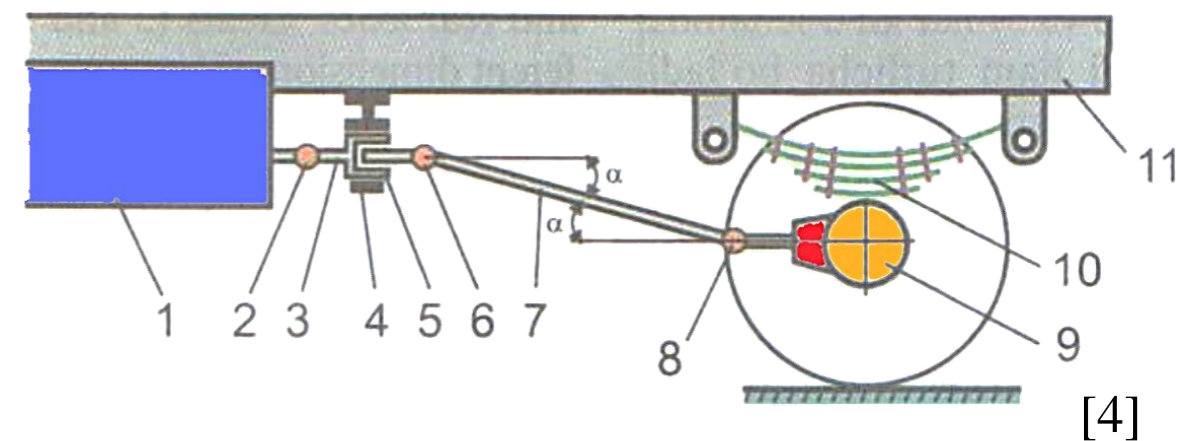


[3]

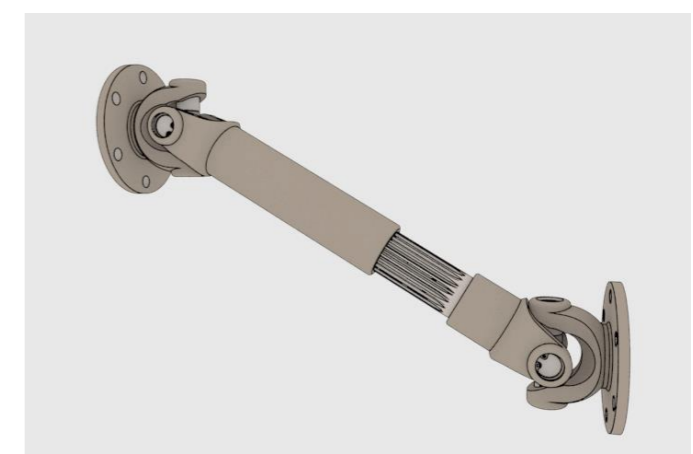
Kardanli uzatmaning vali uzatmalar qutisi

yoki **taqsimlash qutisi** valiga nisbatan α burchak ostida joylashadi.

Yetakchi ko'prik ramaga elastik osmalar yordamida mahkamlanishi sababli avtomobilning harakatida u vertikal tebranib turadi.



1-uzatmalar qutisi; 2, 6, va 8-kardanli sharnirlar; 3-oraliq kardan vali; 4-oraliq tayanch; 5-shlitsali birikma; 7-asosiy kardan vali; 9-asosiy uzatma; 10-ressora; 11-rama.



Bu esa o‘z navbatida α burchakning, shuningdek, kardan valning uzunligini o‘zgarib turishiga olib keladi.

Kardanli uzatmaning vazifasi:

o‘qlari bir chiziqda yotmagan va o‘zaro joylashuvi o‘zgarib turadigan vallar orasida **burovchi momentni** uzatib berishdan iborat.

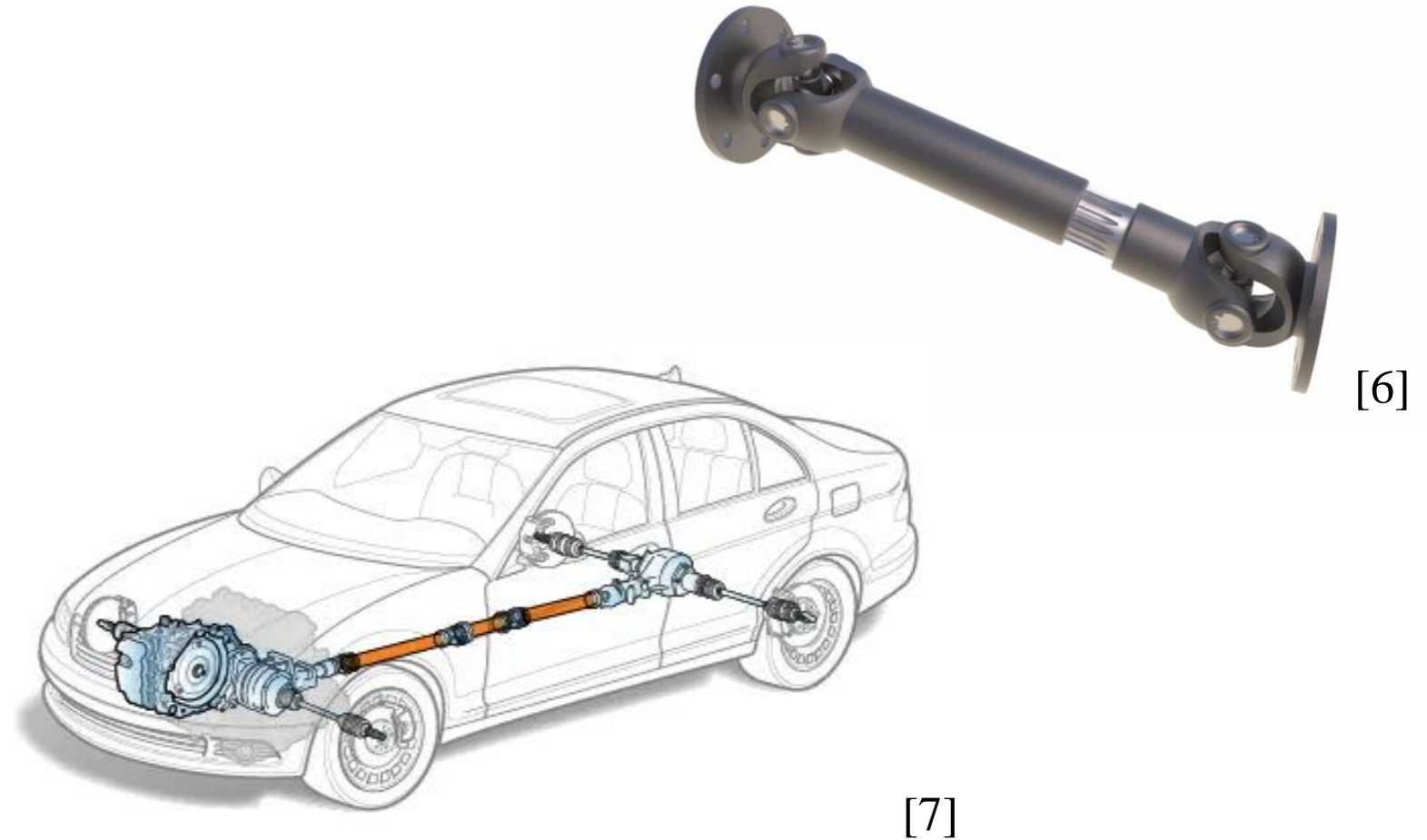
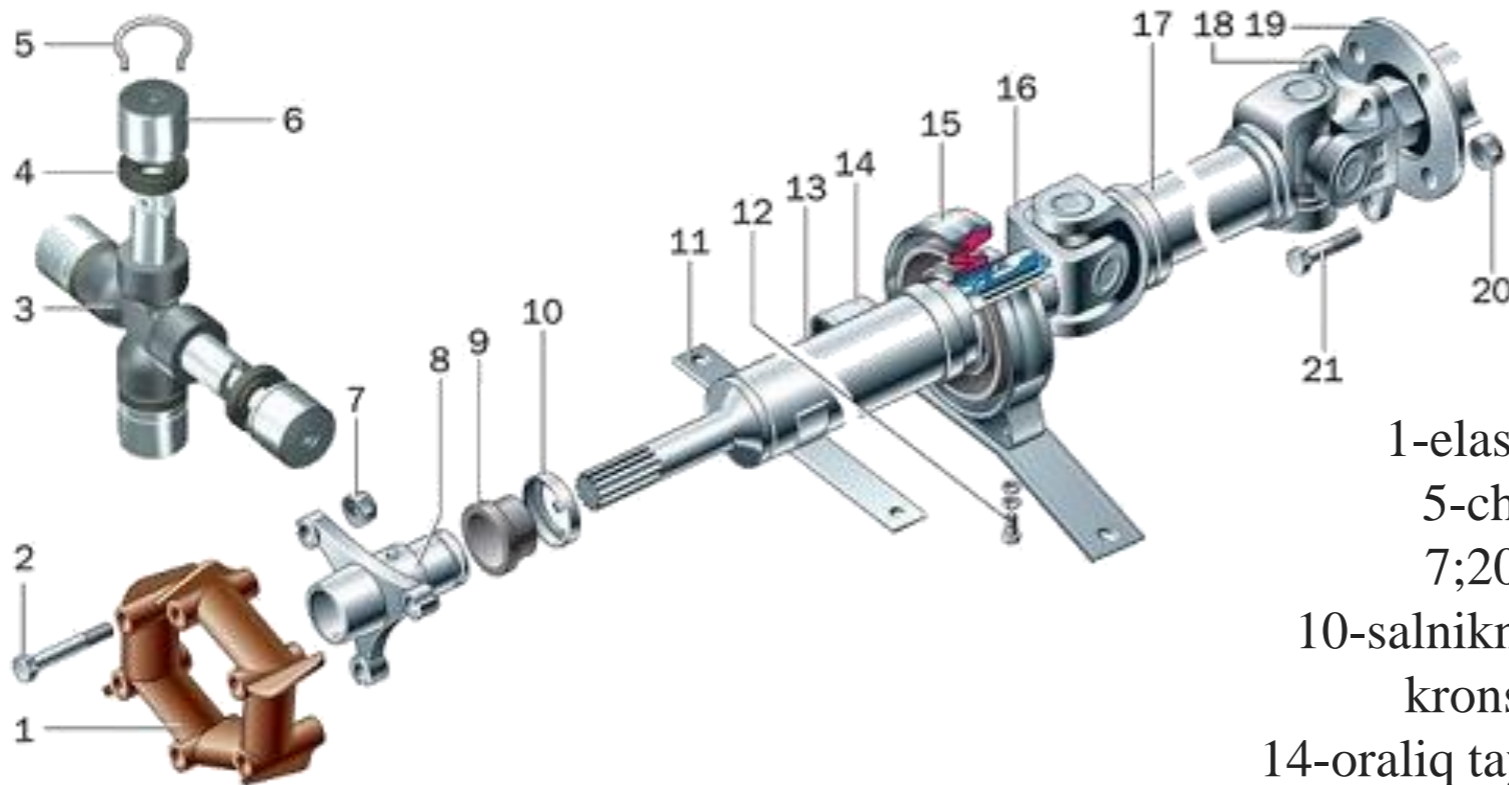


Image courtesy of ClearMechanic.com

Kardan - Italiyalik olim **Gerolamo Cardano** nomi bilan atalgan. U kardan vali va uning uchlariga mahkamlangan kardan mexanizmlaridan iborat.



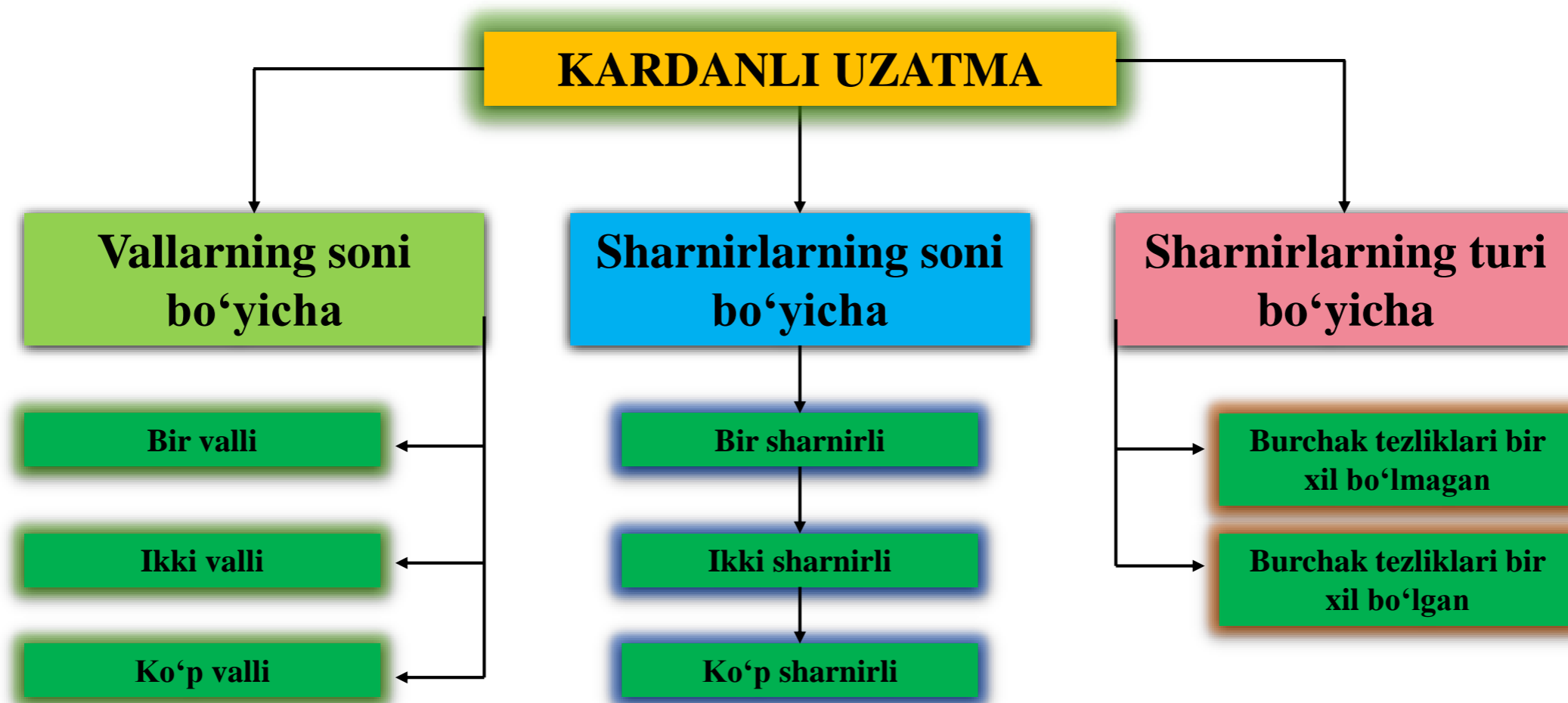
1-elastik mufta; 2;21-bolt; 3-krestovina; 4-salnik;
 5-cheklagich halqa; 6-krestovina podshipnigi;
 7;20-gayka; 8-elastik mufta flanetsi; 9-salnik;
 10-salnikning tashqi halqasi; 11-kronshteyn; 12-oraliq val
 kronshteynini qotirish bolti; 13-old kardan vali;
 14-oraliq tayanchning kronshteyni; 15-oraliq tayanch; 16-old
 kardan val vilkasi; 17-orqa kardan vali; 18-orqa kardan val
 vilkasi; 19-asosiy uzatma yetakchi valining flanetsi.

[8]

Kardanli uzatmalarning oʻrnatilish joylari:

- **uzatmalar qutisi bilan yetakchi koʻprik orasida;**
- **uzatmalar qutisi bilan taqsimlash yoki qoʻshimcha quti orasida;**
- **uch oʻqli avtomobillarning ikkita yetakchi orqa koʻpriklarning asosiy uzatmalari orasida;**
- **mustaqil osmali yetakchi gʻildiraklarning yarim oʻqlari bilan asosiy uzatma orasida;**
- **oldingi gʻildiraklari boshqariluvchi gʻildiraklar bilan yarim oʻqlar orasida;**
- **rul chambaragi bilan rul mexanizmi orasida va shunga oʻxshash boshqa yordamchi mexanizmlarda.**

Kardanli uzatmaning turlari.



11.2. Kardanli uzatma konstruksiyalari va ularning ishlash prinsipi.

Kardanli uzatma:

- **Kardanli sharnirlari;**
- **Vallar;**
- **Oraliq tayanch.**

➤ **Kardanli sharniri deb,** sharnirli bo‘g‘inga aytilib, uning yordamida aylanma harakat (**burovchi moment**)ni bir valdan ikkinchi valga o‘zgaruvchan burchak ostida uzatadi.

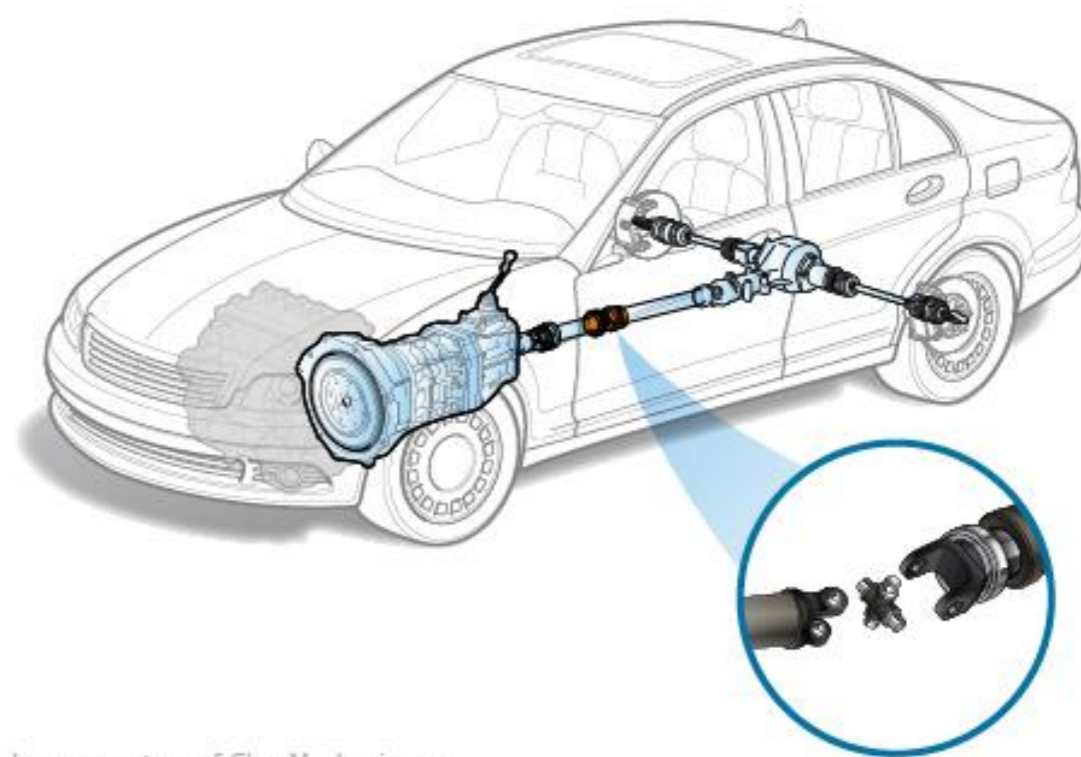


Image courtesy of ClearMechanic.com

[9]

Konstruksiyasi bo'yicha kardanlı sharnirlar ikki turga bo'linadi: **1. Bikr;**
2. Elastik.

1. Bikr sharnirlar ikki turga bo'linadi:

- ✓ **Burchak tezligi bir xil (teng) bo'lgan;**
- ✓ **Burchak tezligi bir xil (teng) bo'lmagan.**

Bikr hamda burchak tezliklari teng bo'lmagan kardán sharnirlar podshipniklarning turi bo'yicha:

- ❖ **sirpanuvchi vtulkali;**
- ❖ **ninasimon podshipnikli.**

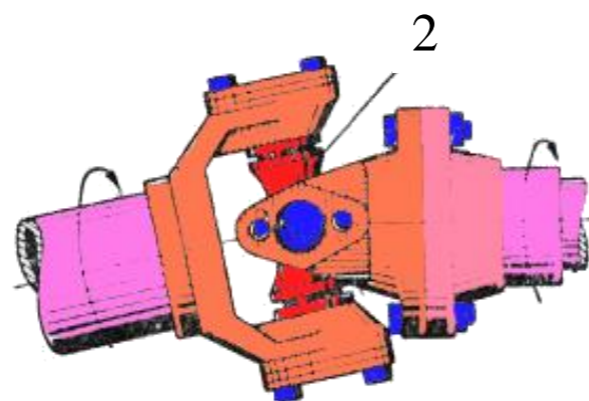
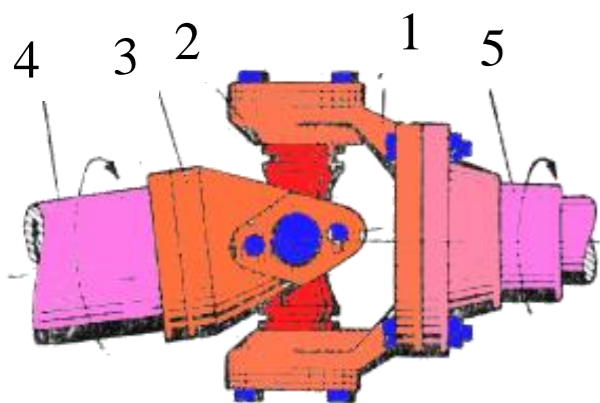
2. Elastik kardánlar ham ikki turga bo'linadi:

- **rezina vtulkali;**
- **rezina diskli.**

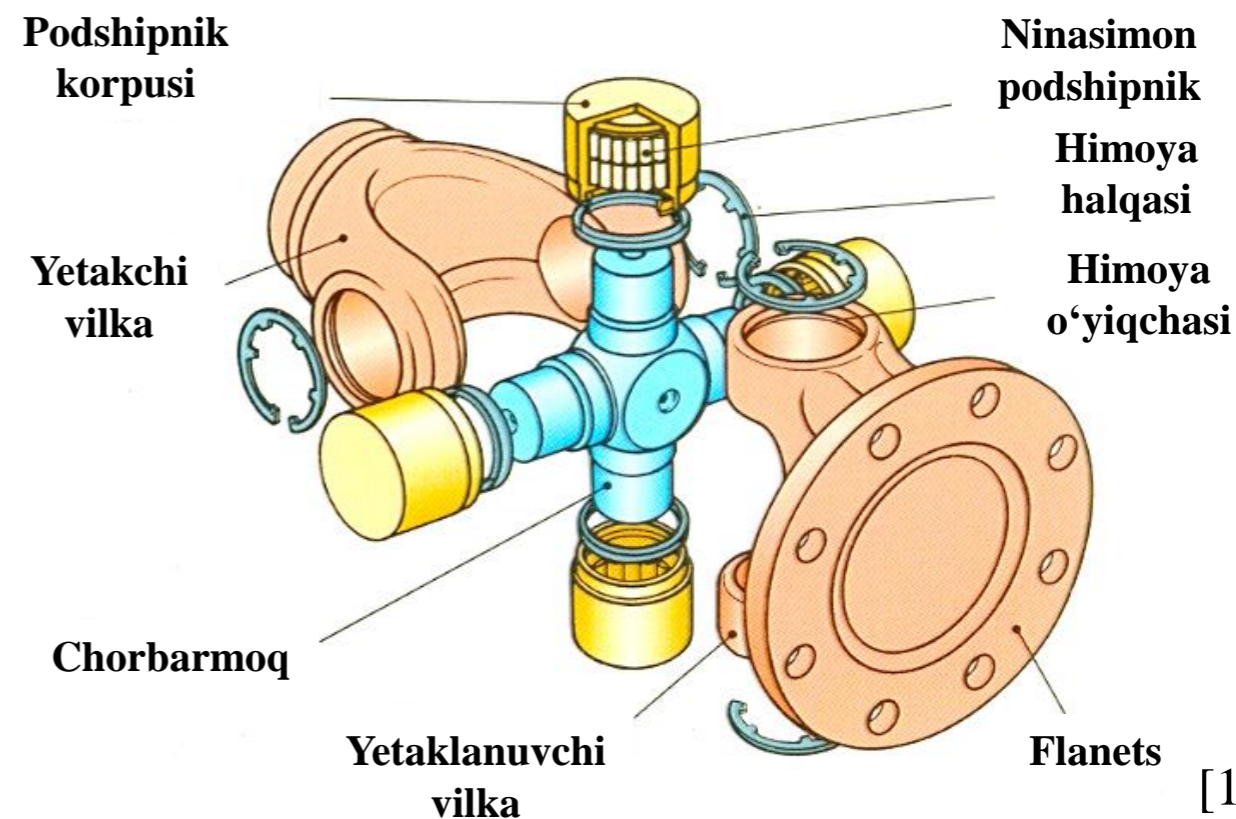
1. Ko‘pchilik hollarda **bikr kardan sharnirlar** ishlatiladi.

Bikr kardanli sharnirlar mahkamlangan vilkalardan ularni biriktiruvchi krestovinalardan va ninasimon podshipniklardan tashkil topgan.

Vilkalar bir-biriga nisbatan perpendikular bo‘lgan tekislikda qo‘zg‘alishi mumkin.



1-yetakchi vilka; 2-krestovina; 3-yetaklanuvchi vilka;
4 va 5-kardan val.

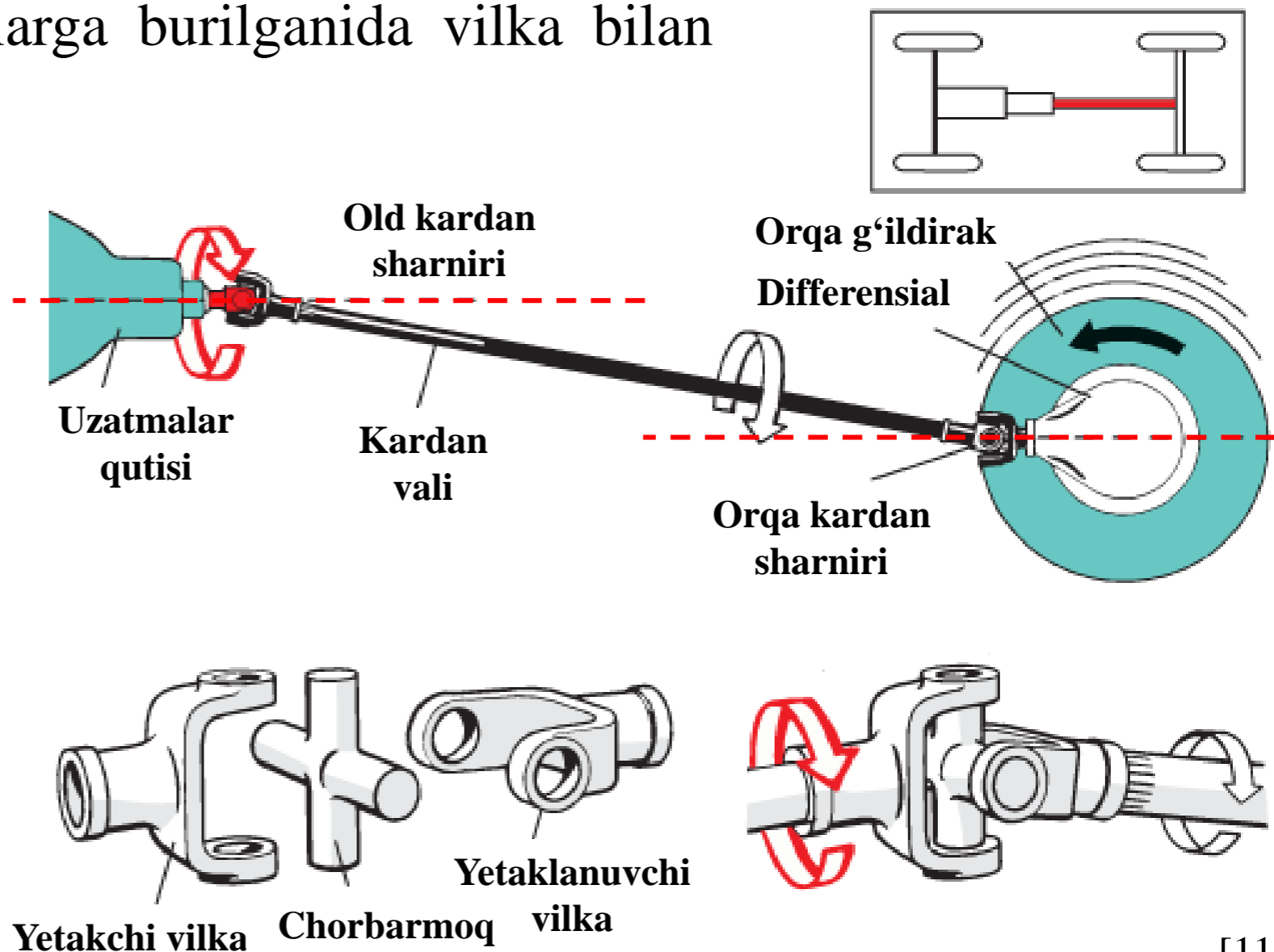


[10]

Kardan sharniri oraliq burchaklarga burilganida vilka bilan krestovina ham og'adi.

Agar aylanma harakat bitta kardan bilan uzatilsa, yetakchi val bir tekisda aylanadi.

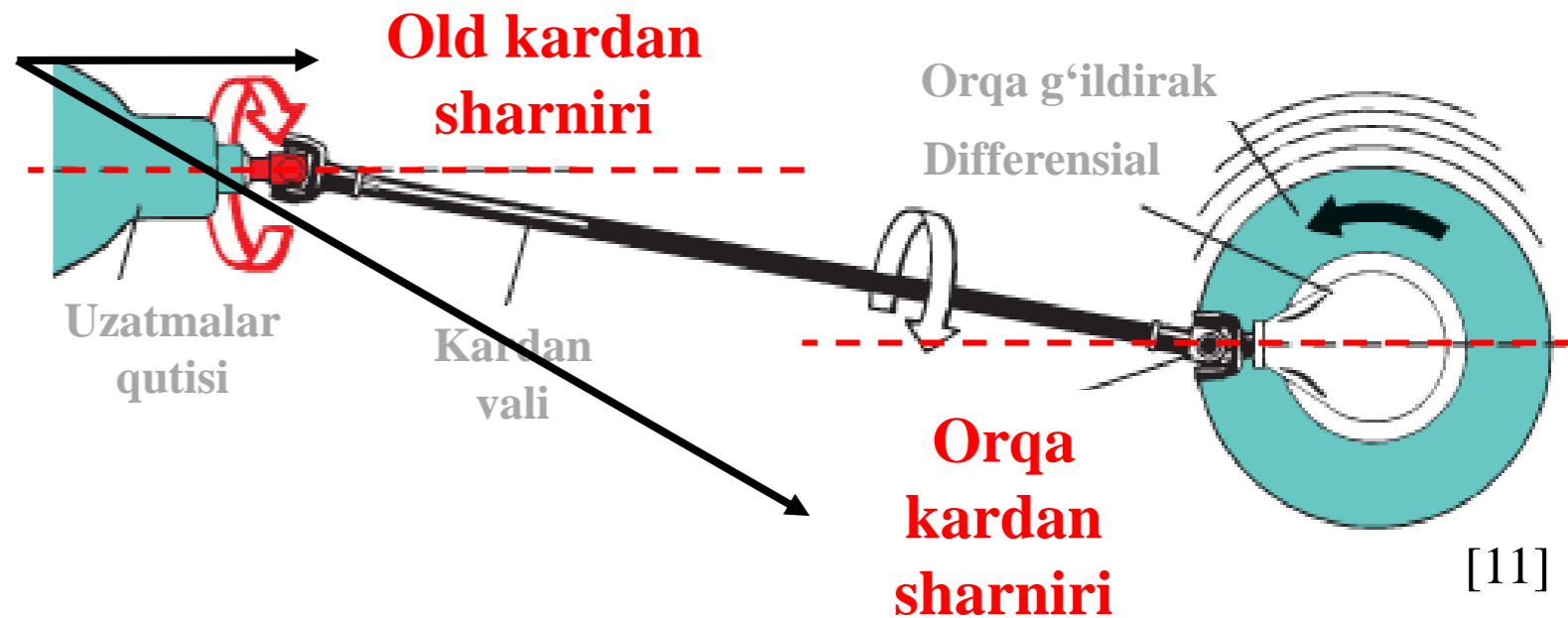
Yetaklanuvchi val esa notekis aylanib, mexanizmlarni va g'ildirak shinalarining yeyilishini tezlashtiradi.



Vallar orasida α kattalashganida yetaklanuvchi valning notekis aylanishi ham  .

Bu kamchilikni yo‘qotish uchun

Kardan valining ikki uchiga vilkalari bir tekislikda yotuvchi kardanlar o‘rnatilganida,



birinchi kardanli sharnir hosil qiladigan notekis aylanishni

ikkinchi kardanli sharnir tekislab berishi hisobiga yetakchi g'ildiraklar tekis aylanadi.



✓ Burchak tezligi bir xil (teng) bo'lgan;

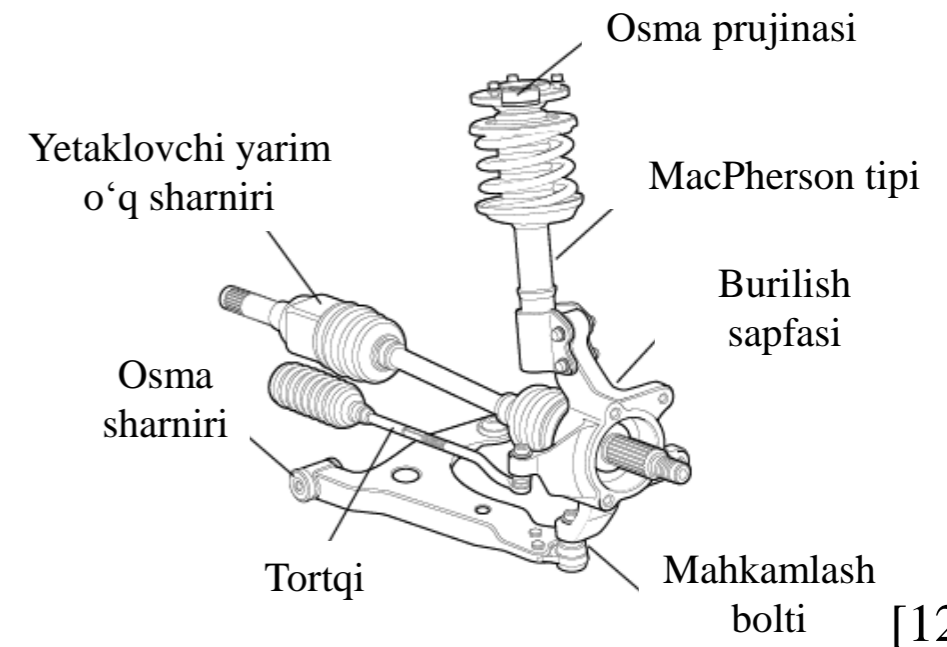
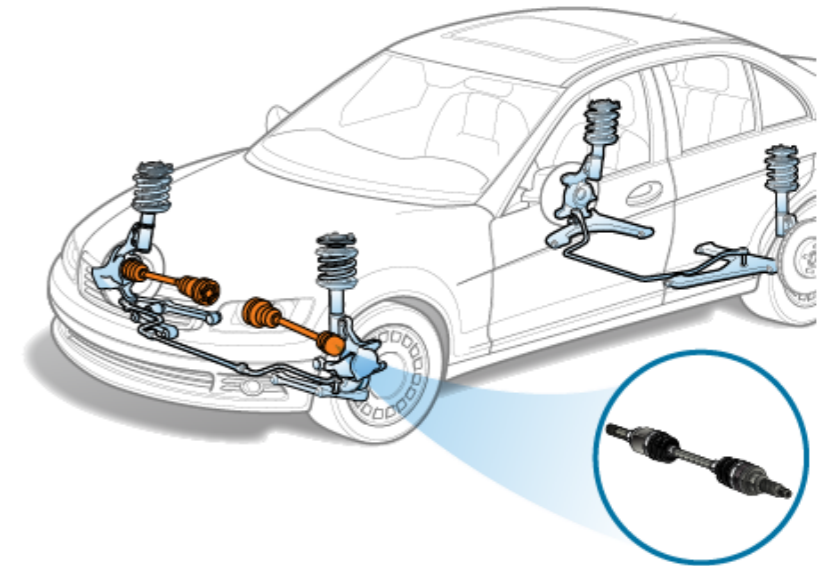
Avtomobil yo'llari uchun moslashtirilmagan yo'llarda ham yura oladigan avtomobillarning old o'qi boshqariladigan,

yetaklovchi g'ildiraklari yuritmalarida **burchak tezliklari bir xil bo'lgan sharnirlarning** ikki turi qo'llaniladi.

Ular:

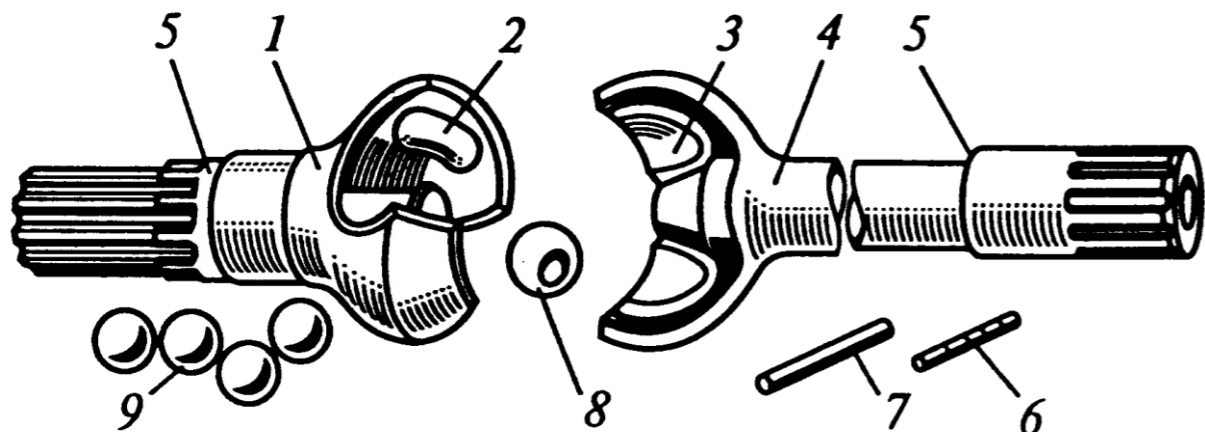
a) sharikli (zoldirli);

b) kulachokli (mushtchali).



[12]

a) sharikli (zoldirli);



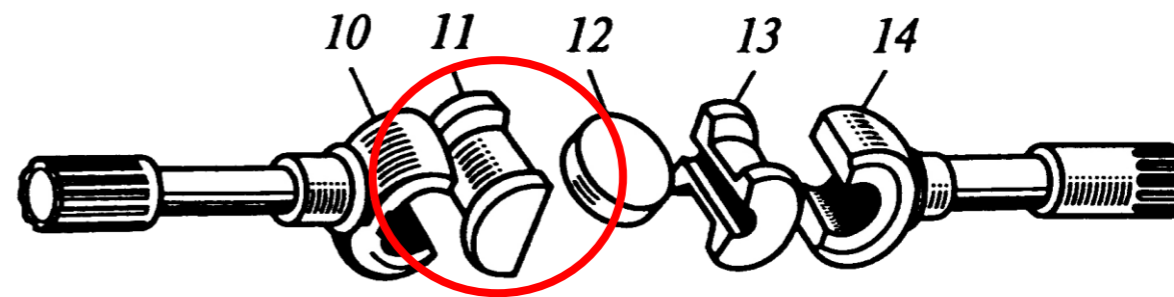
1,4 – вилки шарикового шарнира;

2,3 – делительные канавки; 5 – шлицевые валы

вилок; 6 – шпилька; 7 – штифт; 8 – центральный

шарик; 9 – рабочие шарики.

b) kulachokli (mushtchali).



**Tutashgan joylaridagi
ishqalanishning kattaligidir**

10,14 – вилки кулачкового шарнира;

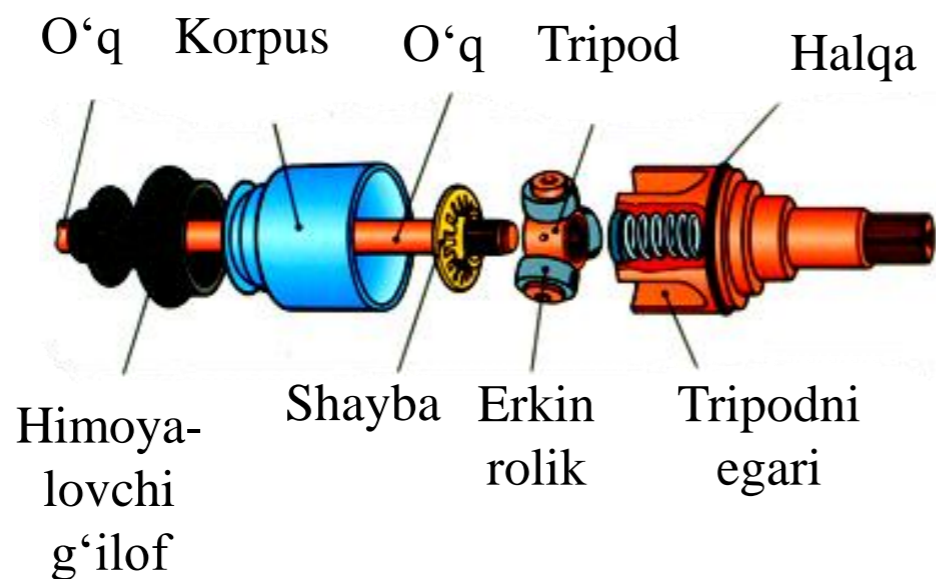
11,13 – кулачки; 12 – диск шарнира.

Kamchiligi:

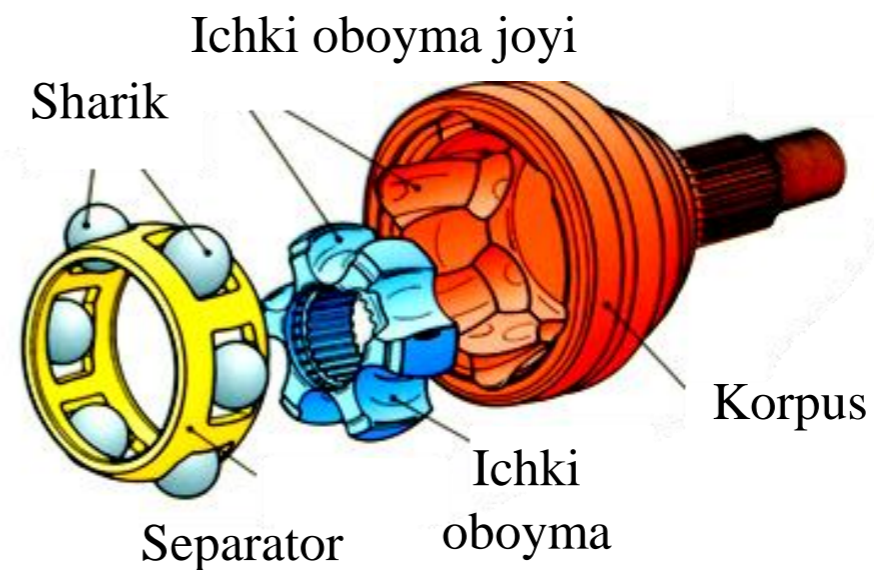
- **FIK pasayadi;**
- **Ishlash paytida sharnirning qiziydi;**
- **Yeyilishi ortadi.**

[13]

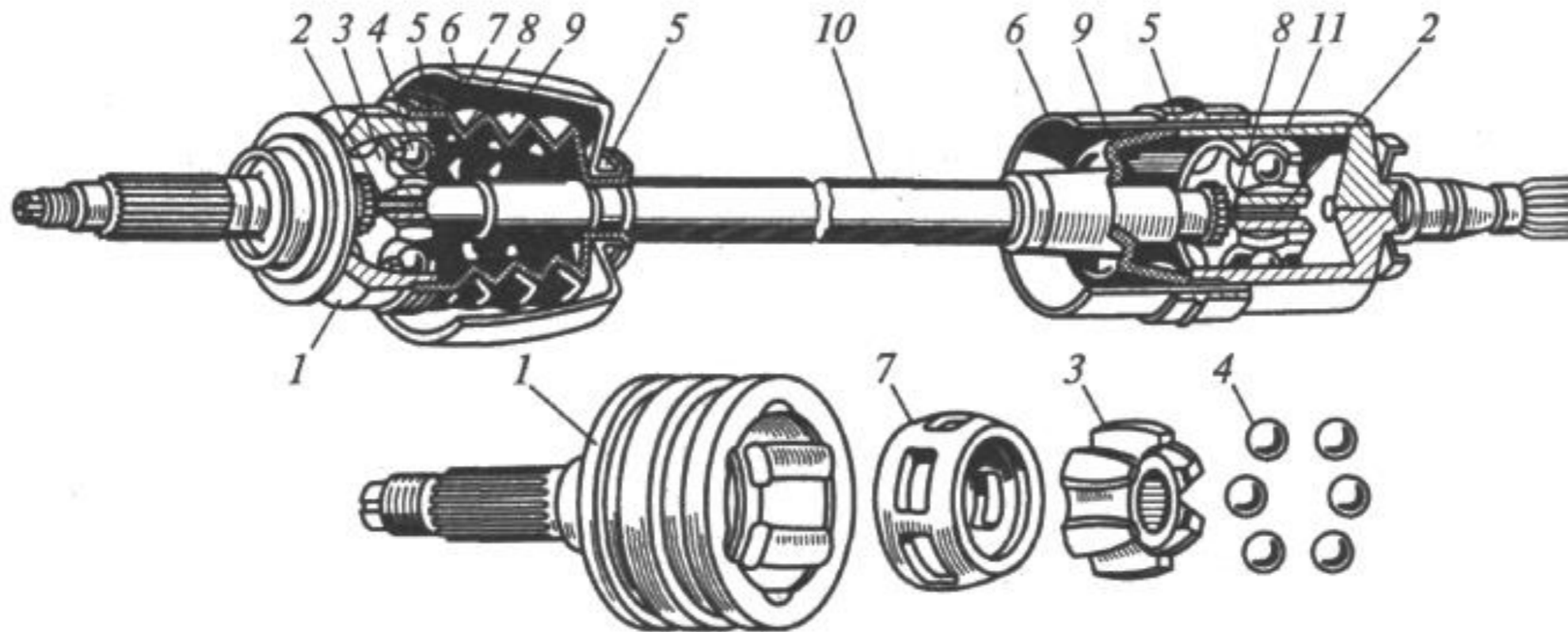
Ichki universal sharnir (uch shipli “Tripod” turidagi sharnir):



(Birfild turidagi) Olti sharikli kardan sharniri:



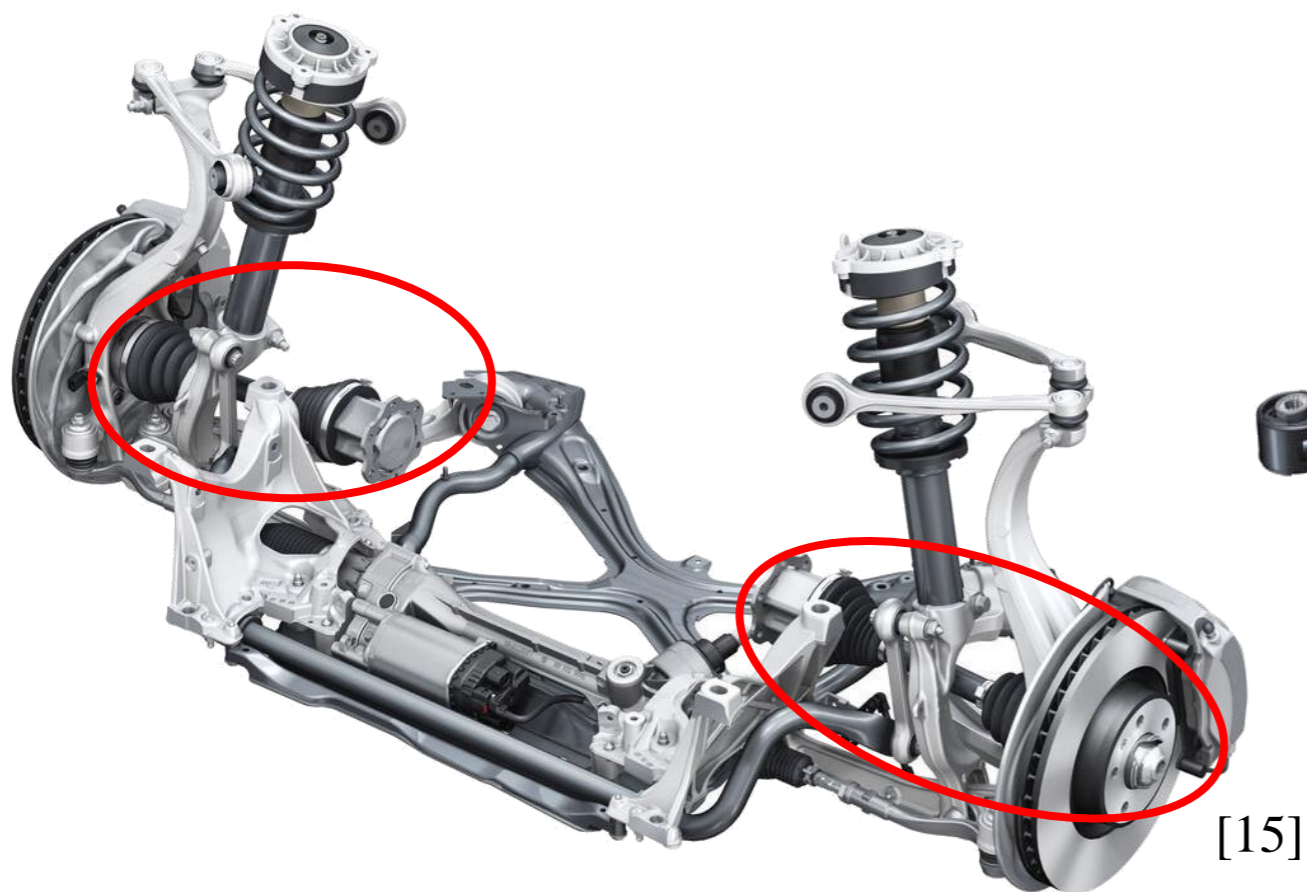
Old g 'ildirak o 'qining sharnirli birikmasi.



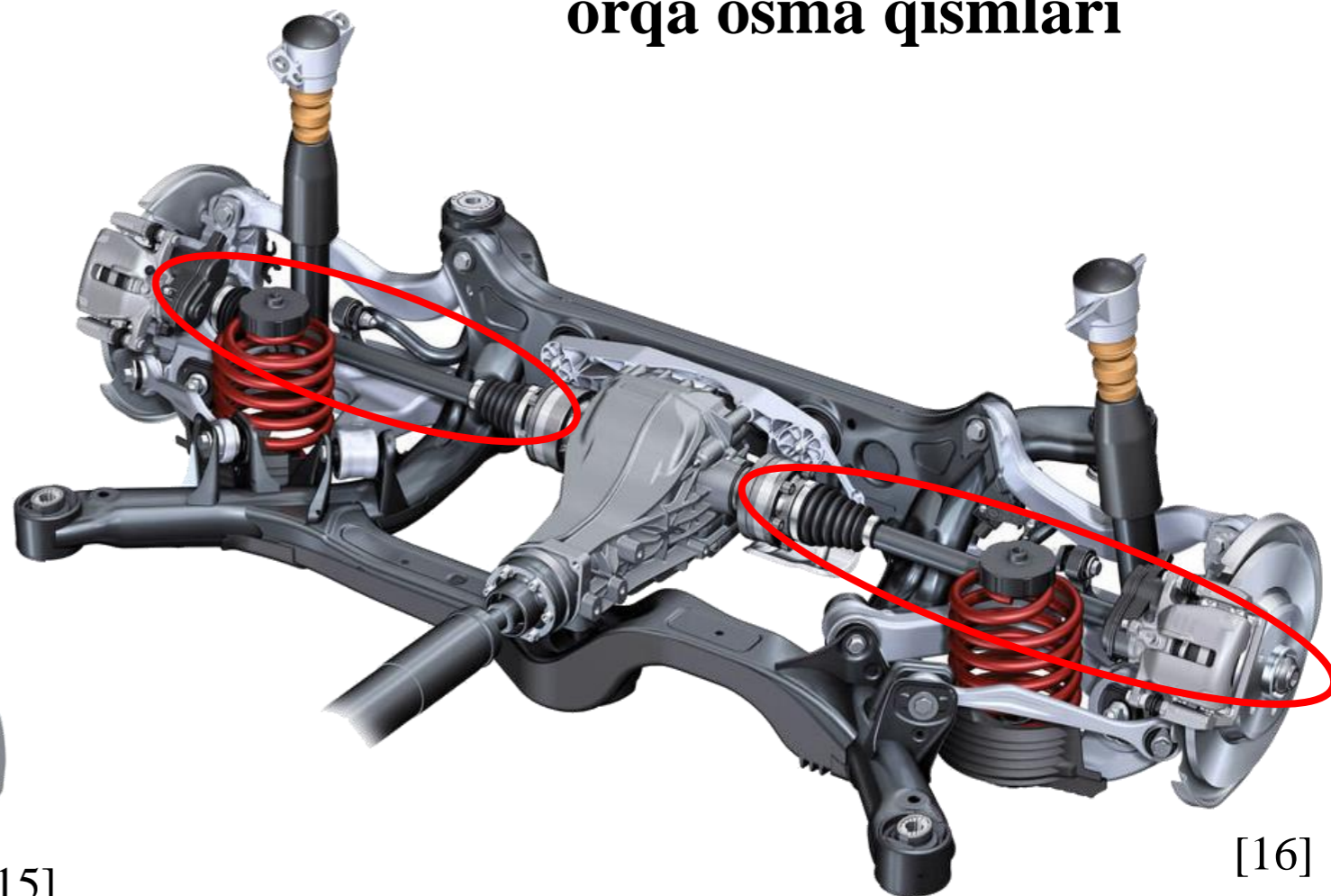
1 и 11 — корпус; 2 и 8— кольца; 3 — обойма; 4 — шарик;
 5 — хомут; 6— кожух; 7 — сепаратор; 9 - чехол; 10 — вал.

[14]

Audi Q5 avtomobilining old osma qismlari



Audi Q5 avtomobilining orqa osma qismlari



✓ **Burchak tezligi bir xil (teng) bo‘lmagan:**

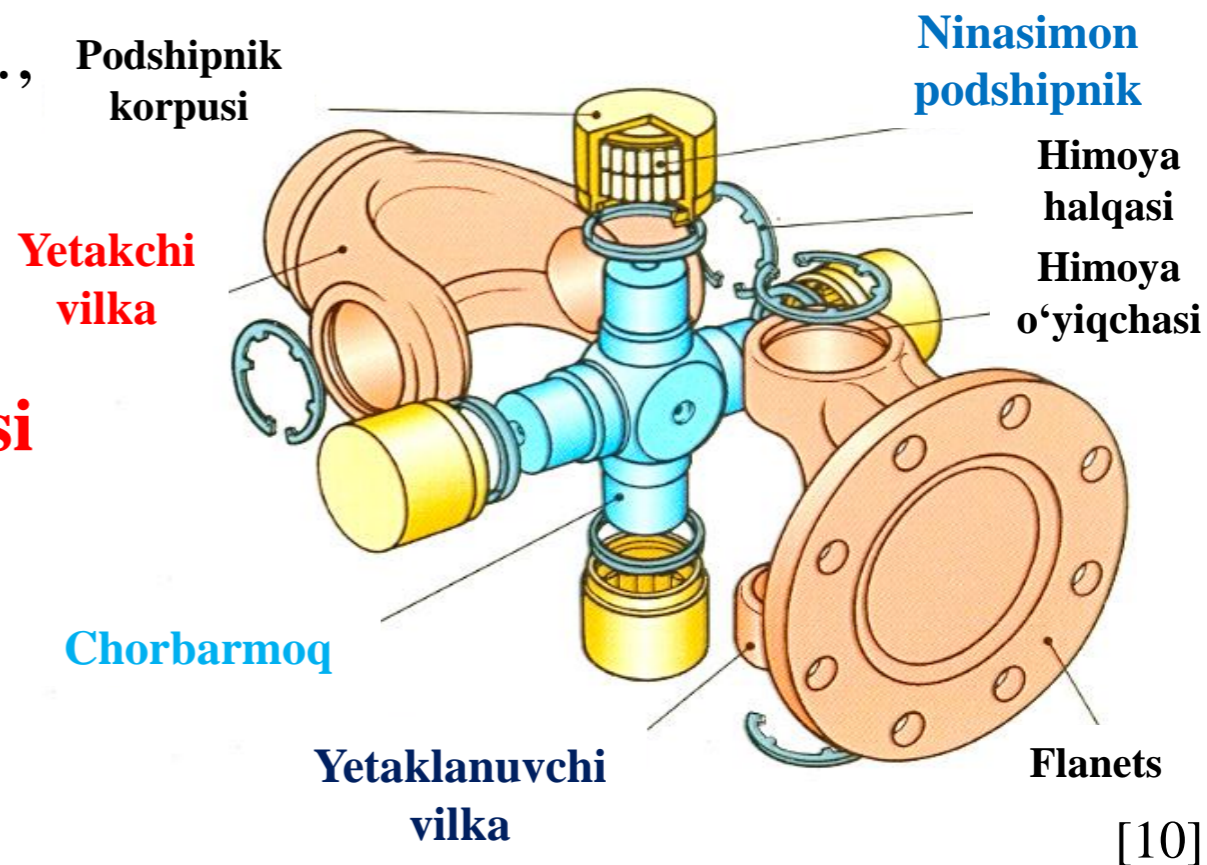
Bu turdagi kardan sharniri biki elementlardan...

Aylantiruvchi moment ayridan ayrida krestovina orqali uzatiladi.

Bunday konstruksiyada, **yetaklovchi val ayrisi bir tekis aylanganda, yetaklanuvchi ayrining burchak tezligi har bir to‘liq aylanishda**

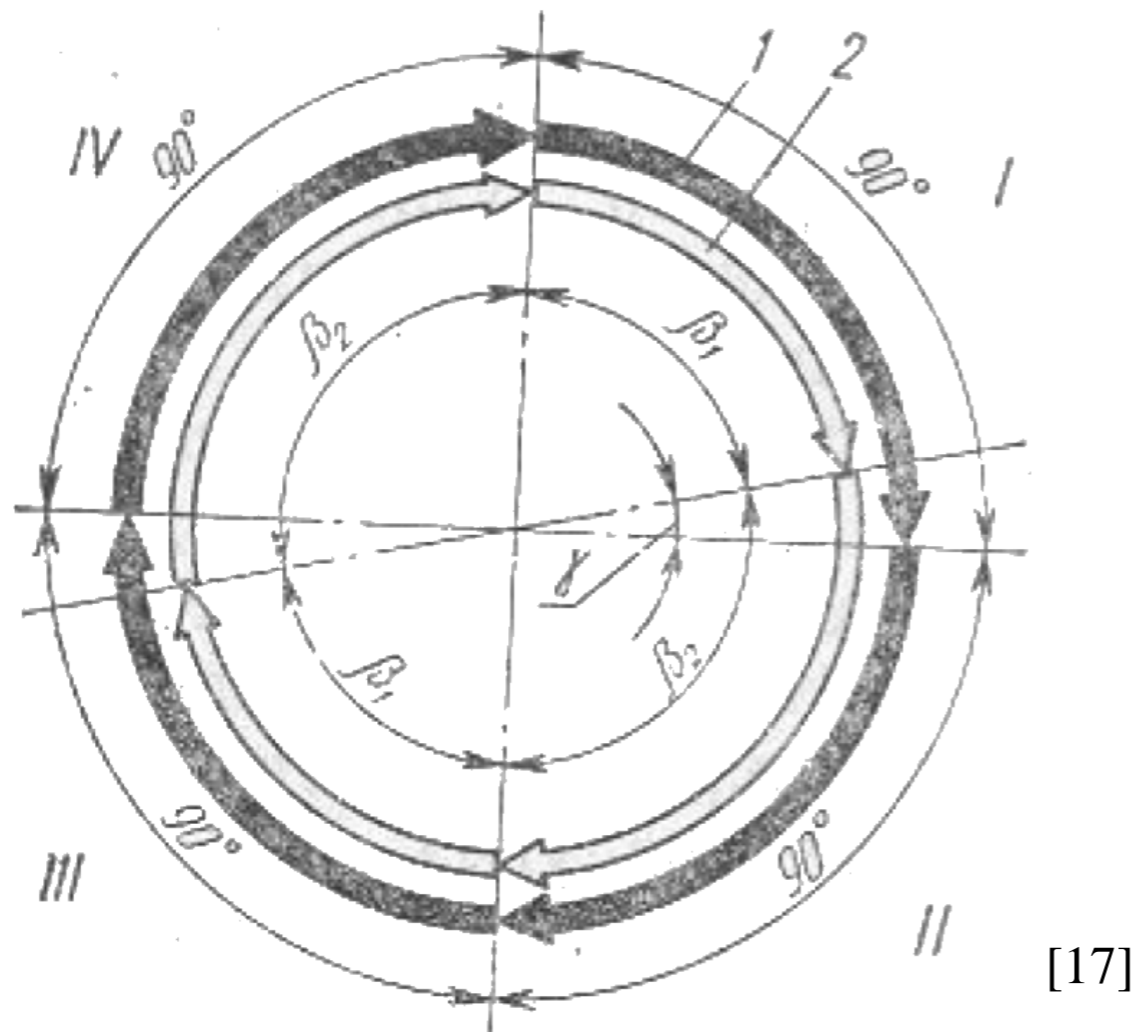
ikki marta, ham ↓, ham ↑, o‘zgarib turadi.

Shuning uchun bunday sharnir **burchak tezliklari bir xil bo‘lmagan** sharnir deb ataladi.

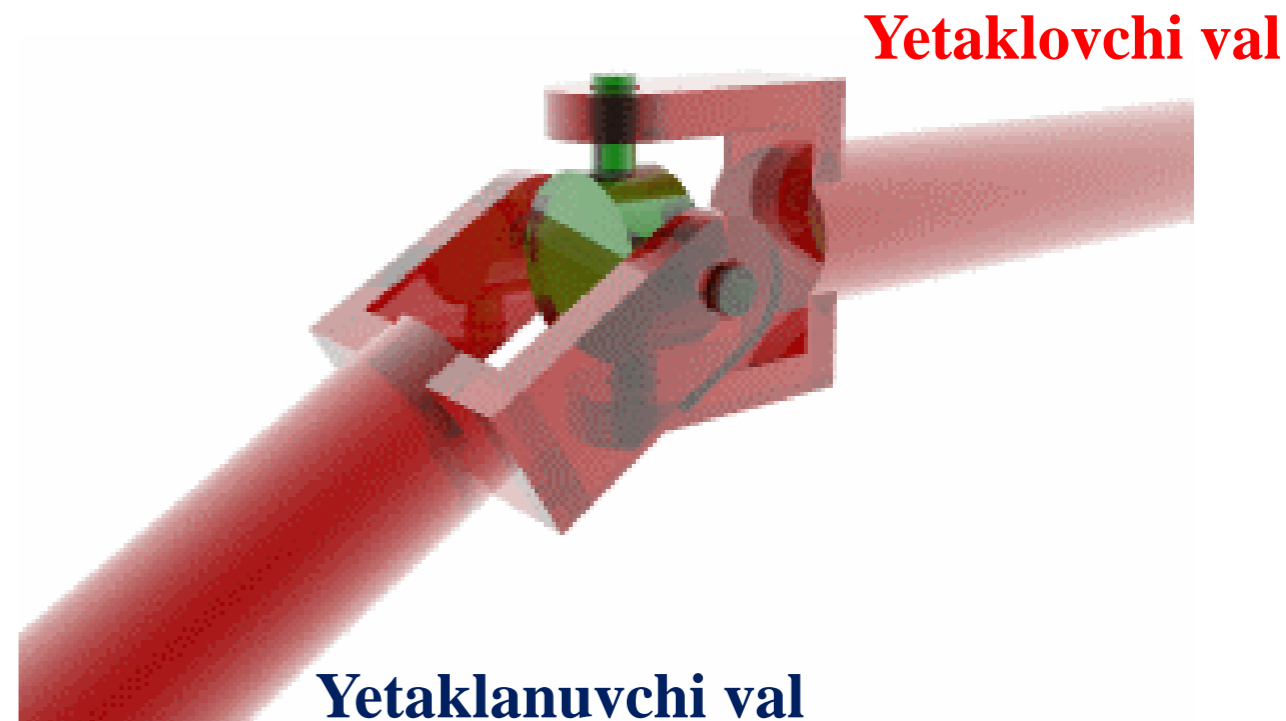


Burchak tezligi bir xil bo'lmagan kardan sharnirining

ishlash diagrammasi.



1-yetaklovchi val; 2-yetaklanuvchi val.



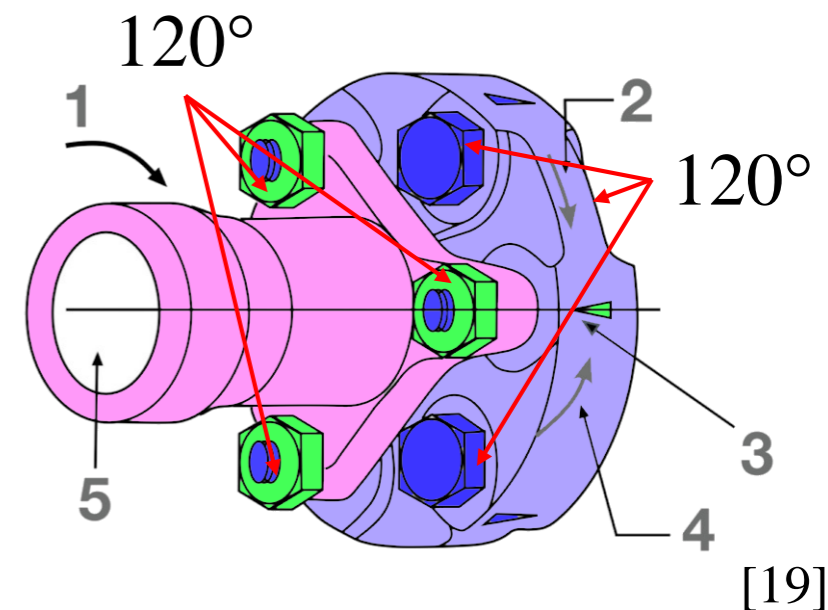
$$\gamma = 4^{\circ} - 20^{\circ}$$

2. Elastik kardan sharnirlari.

Elastik kardan sharnirlari ikkita flanetsdan yoki vilkalardan iborat bo‘lib, kardan vallarining biriktirish joylariga o‘rnatiladi.

Bu turdagi kardan sharnirlari 3° - 5° burchak ostida burovchi moment o‘tkazishga mo‘ljallangan.

Agregatlarni biriktirishdagi va ramaning deformatsiyasi oqibatida o‘qlarni siljishidagi noaniqlikni bartaraf etadi.



1-aylanish yo‘nalishi; 2, 4-elastik qismlarning qarama-qarshi yo‘nalishi; 3-mufta flanetslarini birlashtirish yo‘nalishi; 5-kardan vali.

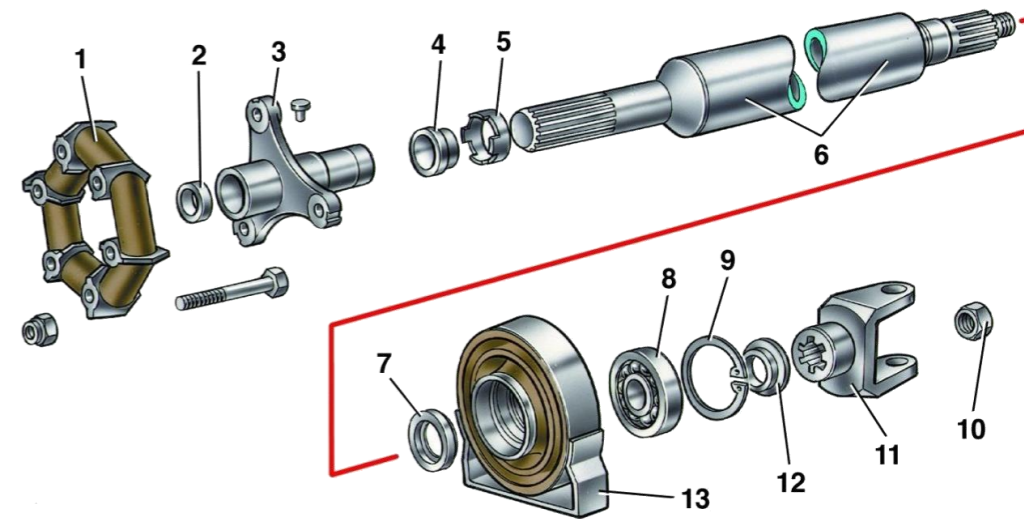
Elastik kardan sharnirlari, qattiq kardan

sharnirlariga nisbatan quyidagi afzalliklarga ega:

- **zarbali yuklanishlarni kamaytiradi;**
- **transmissiyada sodir bo'ladigan burama tebranishlarni qisman so'ndiradi;**
- **moylash talab etilmaydi.**

Elastik sharnirlarning asosiy kamchiligi:

- **burovchi momentning katta burchak ostida uzatish imkoniga ega emasligi;**
- **mustahkamligining yetarli bo'lmashligi.**



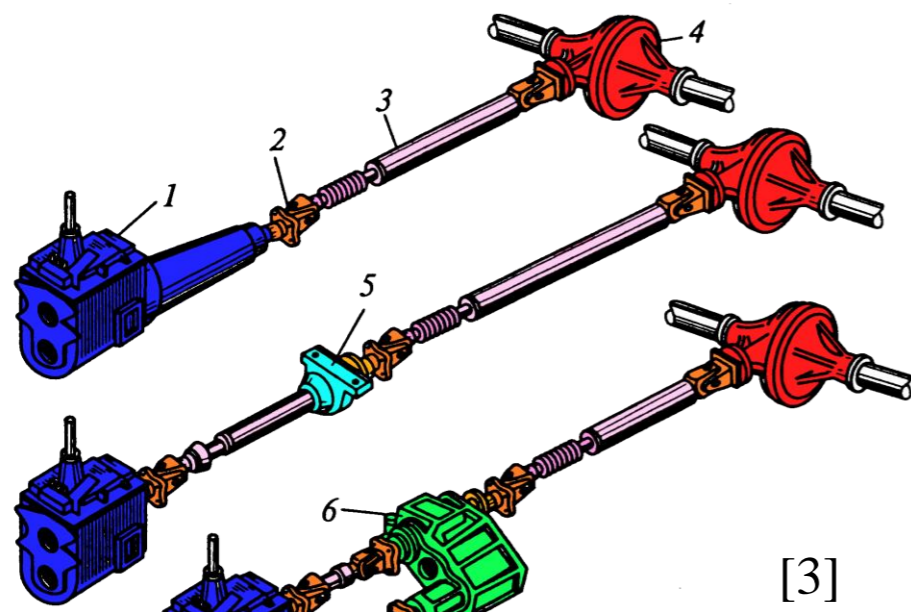
[20]

- 1 — эластичная муфта;
 2 — центрирующая втулка; 3 — фланец эластичной муфты; 4 — сальник;
 5 — обойма сальника; 6 — карданный вал;
 7 — пылеотражатель; 8 — подшипник;
 9 — стопорное кольцо; 10 — гайка;
 11 — вилка карданного шарнира;
 12 — пылеотражатель; 13 — упругая опора.

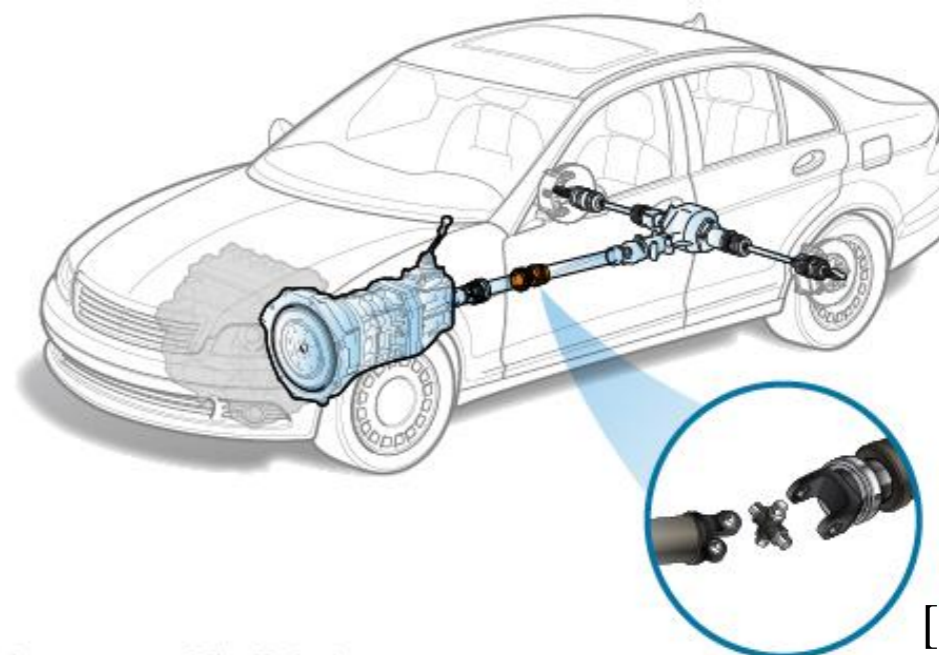
➤ Kardan vallar:

Kardan vallari trubasimon ko‘rinishda bo‘lib, po‘latdan tayyorlanadi va ikki uchiga vilkalar payvandlanadi.

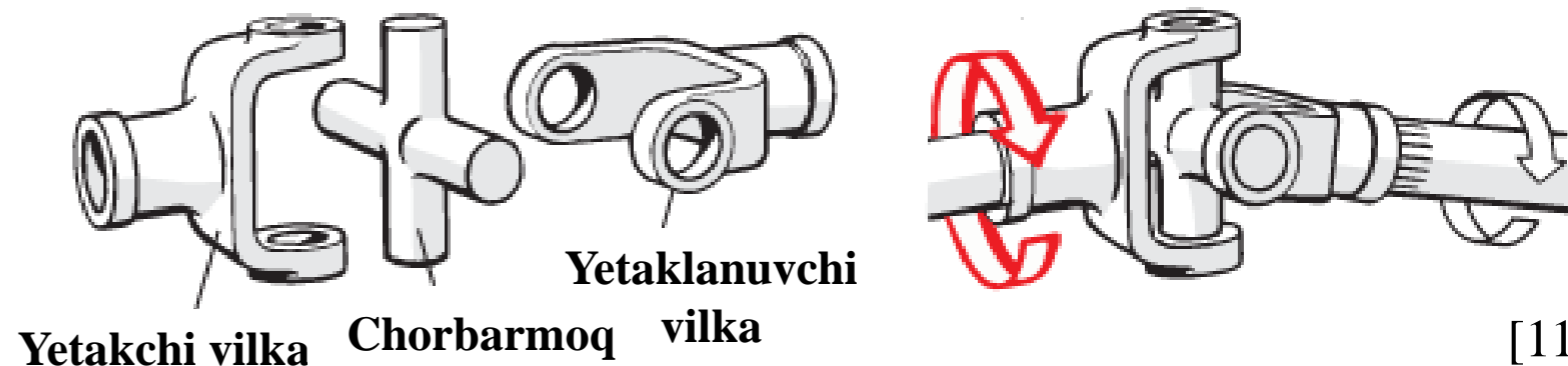
Avtomobillarning transmissiyasida



3 – kardan vali; 5 – oraliq tayanch;

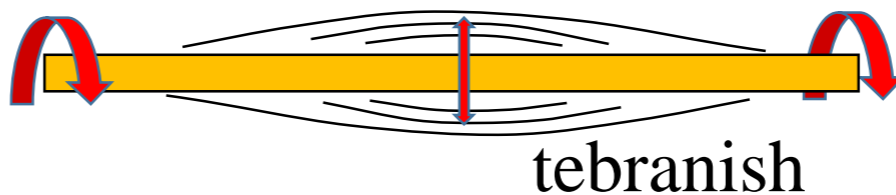
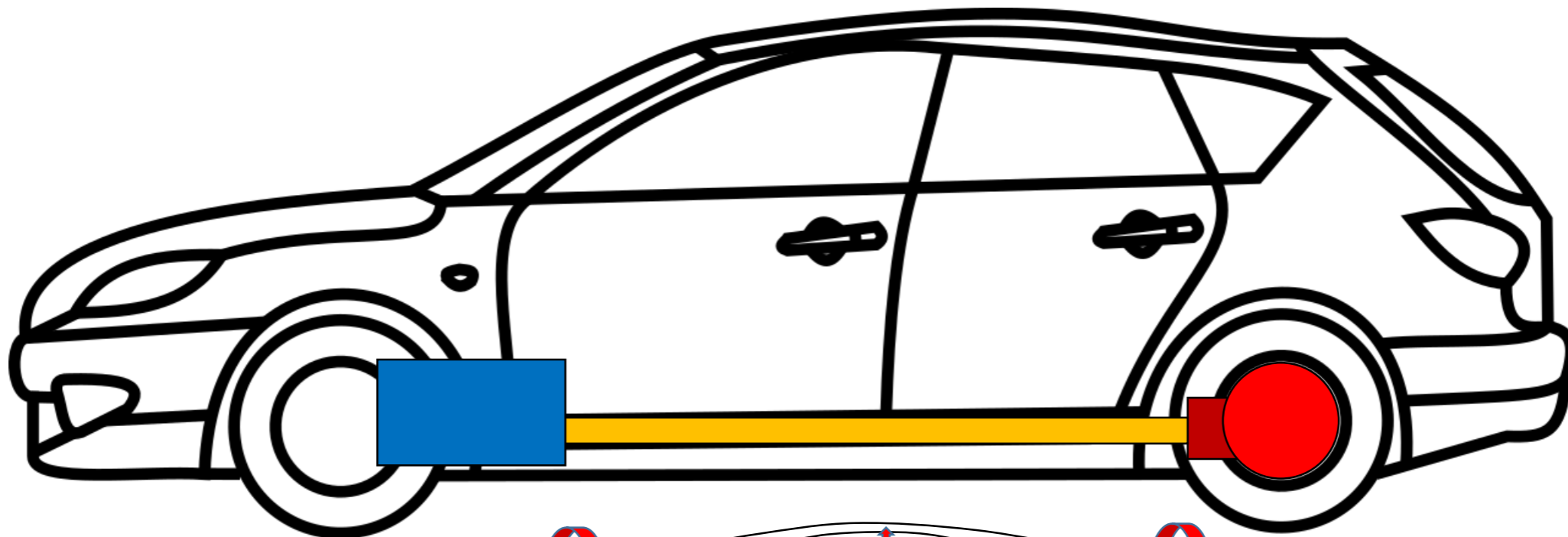


[9]

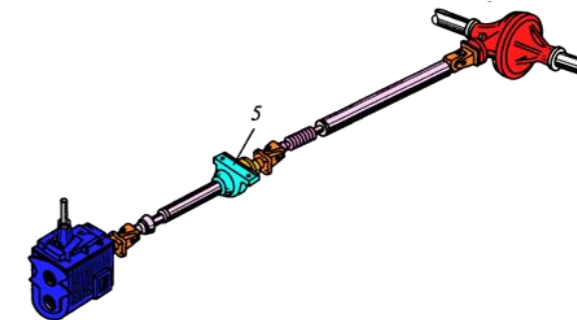
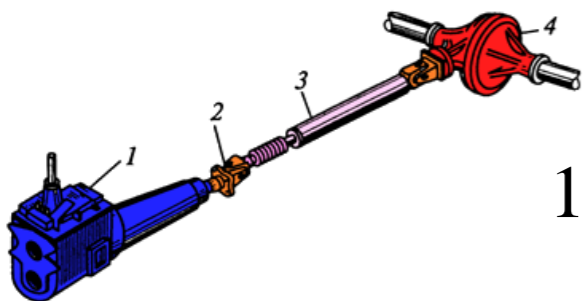


[11]

Kardan valining tebranishini kamaytirish.



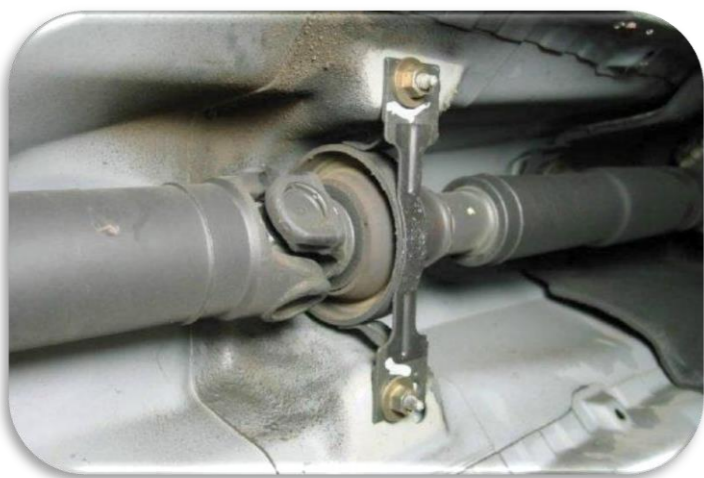
tekis ishlashi **X**
muddati kamayadi. [21]



[3]

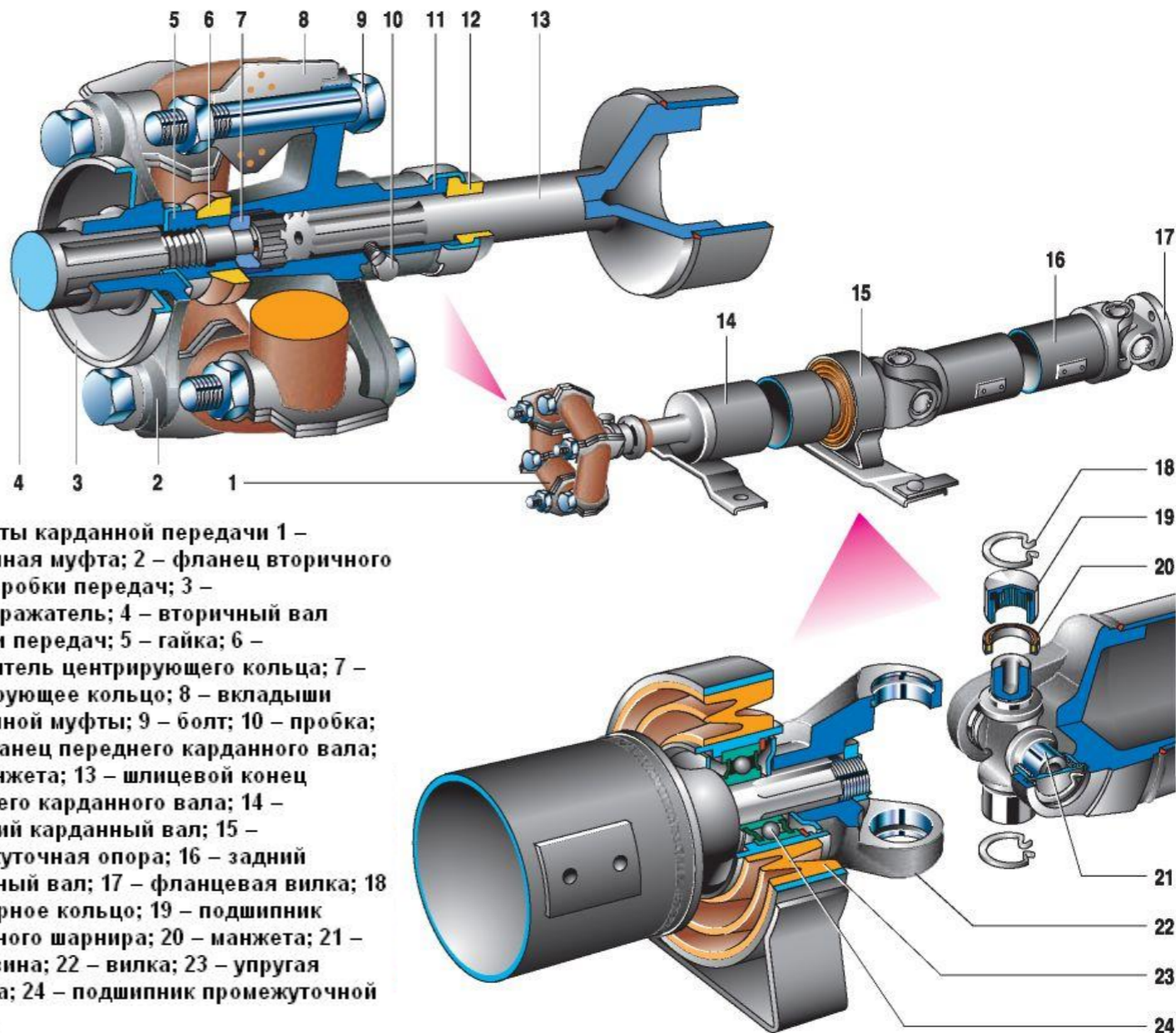
➤ Oraliq tayanch.

Oraliq val tayanadigan osma avtomobilning ramasiga biriktirilib, uning kronshteyniga rezina halqalar orqali sharikli podshipnik mahkamlangan.



[22]

Kardan valining detallari:



[23]

1. Трансмиссия автомобиля. [Online image] [Accessed in 2014]. <https://www.razbor-vektor.ru/images/four-wheel-drive-2014.jpg>
2. Автомобиль мечты. [Online image] [Accessed on 17 October 2019]. https://www.zr.ru/d/story/33/510259/201301242001_4.jpg
3. Назначение, классификация и общее устройство карданных передач. [Online image] [Accessed on 17 November 2019]. https://studfile.net/html/2706/960/html_rFdIbP_E1I.EkS0/htmlconvd-r32Rps_html_f9a943606716ff07.jpg
4. A.Muxitdinov va boshqalar. Transport vositalarining tuzilishi. Design of vehicles.-T.: “Ta’lim” nashriyoti. 2014. 84 b.
5. Double Cardan Shaft. By Ahmed Afifi. [Online gif] [Accessed on 28 September 2014]. <https://d2t1xqejof9utc.cloudfront.net/screenshots/pics/be9d4627908f30cc888ec533ff8c039e/large.gif>
6. Double Cardan Shaft. By Ahmed Afifi. [Online gif] [Accessed on 28 September 2014]. <https://d2t1xqejof9utc.cloudfront.net/screenshots/pics/f0381b7d471dc5980d5aac22b2bf00f5/large.gif>
7. Drive Shaft. [Online image] [Accessed in 2016]. <https://storage.googleapis.com/rp-production-public-content/frnbRdshWtwWCkrXrELu6w5>
8. A.Muxitdinov va boshqalar. Transport vositalarining tuzilishi. Design of vehicles.-T.: “Ta’lim” nashriyoti. 2014. 85 b.
9. Universal Joint. By Alex Palmeri. [Online image] [Accessed on 26 April 2018]. <https://storage.googleapis.com/rp-production-public-content/o3VPYapGtqiZHuXZKVAs7tL6>
10. Yusupov S. “Avtomobillar konstruksiyasi” 1-qism. O‘quv-uslubiy majmua. A.: AndMI. 2019 yil, -b. 195.
11. Drive shaft. [Online image] [Accessed in 2015]. <https://cdn.britannica.com/48/104148-004-03902F3A.gif>
12. Half Shaft. By Alex Palmeri. [Online image] [Accessed on 13 April 2018]. <https://storage.googleapis.com/rp-production-public-content/AMXyVA3s7938B8jcuVvVPSbe>
13. Назначение, классификация и общее устройство карданных передач. [Online image] [Accessed on 17 November 2019]. https://studfile.net/html/2706/960/html_rFdIbP_E1I.EkS0/htmlconvd-r32Rps_html_4f8f877a42cd0447.jpg
14. Назначение, классификация и общее устройство карданных передач. [Online image] [Accessed on 17 November 2019]. https://studfile.net/html/2706/960/html_rFdIbP_E1I.EkS0/htmlconvd-r32Rps_html_a2b2ea5e0fd1b68f.png
15. Audi Q5 avtomobilining old osma qismlari. [Online image] [Accessed on 09 October 2021]. <https://s.auto.drom.ru/i24262/com/700/699109.jpg>
16. Audi Q5 avtomobilining orqa osma qismlari. [Online image] [Accessed on 09 October 2021]. <https://s.auto.drom.ru/i24262/com/700/699110.jpg>
17. X.Mamatov. “Avtomobillar” 2-qism. –T.: “O‘zbekiston” nashriyoti. 1998 yil, -b. 84.
18. Карданная передача. [Online gif] [Accessed on 03 October 2023]. https://upload.wikimedia.org/wikipedia/commons/3/31/Universal_joint_transparant.gif
19. Замена муфты кардана на Febi (bmw ag oem) Диагностика муфты. Инструкция по замене. [Online image] [Accessed in 2018]. https://a.d-cd.net/P49_UEEYVrrSa9Y5IVS2CUDS4g0-960.jpg
20. Сборка карданной передачи. [Online image] [Accessed in 2018]. <https://vazila-2107.ru/sfera/169.jpg>
21. Yusupov S. “Avtomobillar konstruksiyasi” 1-qism. O‘quv-uslubiy majmua. A.: AndMI. 2019 yil, -b. 196.
22. Карданный вал Рено Дастер 4x4: ремонт, замена крестовины, подвесного подшипника Duster. [Online image] [Accessed on 09 November 2021]. <https://autonissancar.ru/wp-content/uploads/2021/09/11-11-600x400.jpg>
23. Особенности конструкции и эксплуатации кардана ВАЗ-2107. [Online image] [Accessed in 2014]. <https://avtomechanic.ru/images/stories/2101/trans/kardan.JPG>



*E'TIBORINGIZ
UCHUN
RAHMAT!!!*