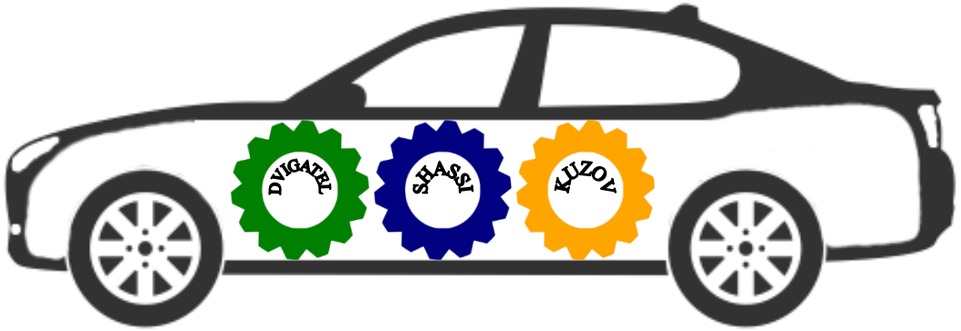
VEHICLES CONSTRUCTION

AVTOMOBILLAR KONSTRUKSIYASI



5th Topic: Cooling System

(5-Mavzu: Sovutish tizimi)

Part 2

Associate Professor: Yusupov Sarvarbek

5-Mavzu: Sovutish tizimi

(5th Topic: Cooling System)

O‘quv rejasi:

5.1. Sovutish tizimining vazifasi va tasnifi.

5.2. Suyuqlik bilan sovutish tizimining konstruksiyasi.

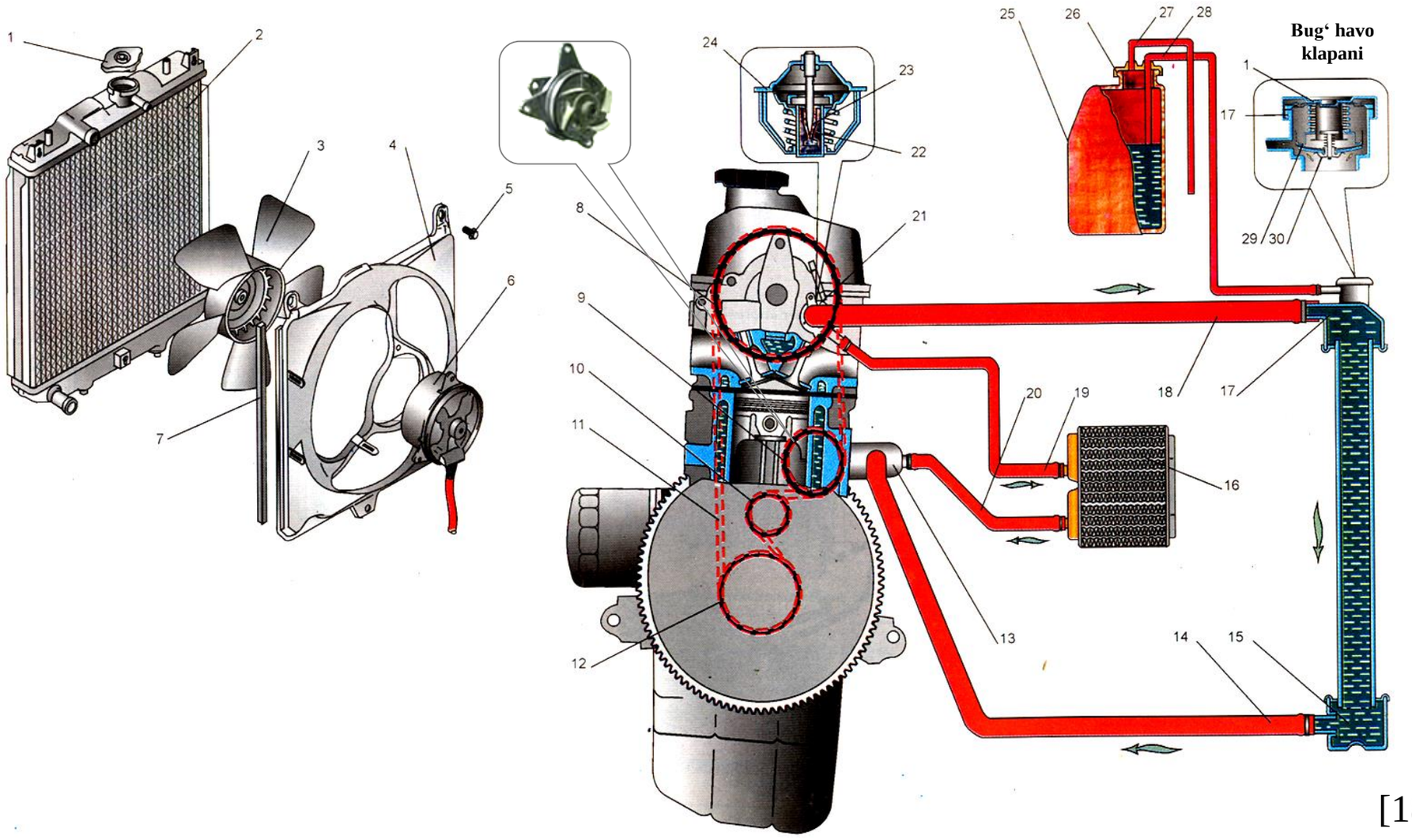
5.3. Sovutish suyuqliklarining xususiyati.

5.4. Suyuqlik bilan sovutish tizimi qismlarining konstruksiyasi.

5.5. Havo bilan sovutish tizimi.

5.4. Suyuqlik bilan sovutish tizimi qismlarining konstruksiyasi.

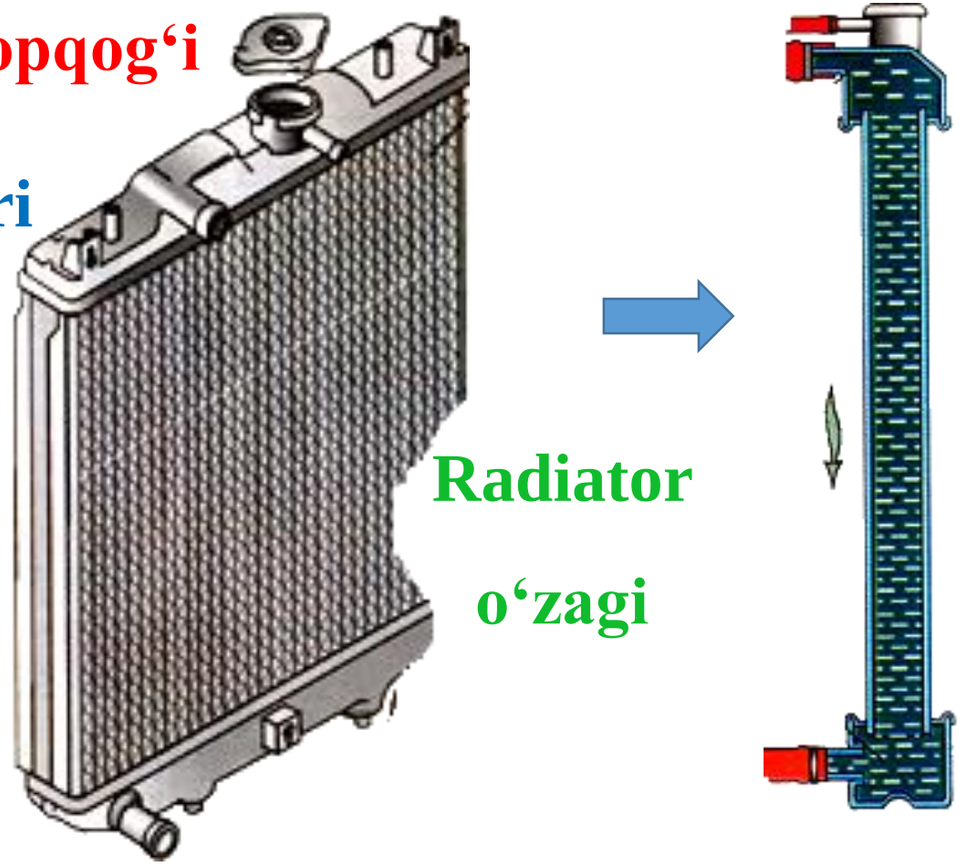
1-radiator qopqog‘i, 2-radiator, 3-ventilyator, 4-ventilyatorning yo‘naltiruvchi qobig‘i, 5-ventilyatorning yo‘naltiruvchi qobig‘ini mahkamlovchi bolti, 6-ventilyatorning elektr dvigateli, 7-ventilyator qobig’ining zichlagichi, 8-taqsimlash valining tishli g‘ildiragi, 9-suv nasosining tishli g‘ildiragi, 10-taranglovchi surilma, 11-tishli tasma, 12-tirsakli valning tishli g‘ildiragi, 13-qopqoq, 14-radiatorning pastki shlangi, 15-radiatorning pastki bachogi, 16-isitgichning o‘zagi, 17-radiatorning yuqori bachogi, 18-radiatorning yuqori shlangi, 19-isitgichning kiritish shlangi, 20-isitgichning chiqarish shlangi, 21-termostat, 22-qattiq jismli to’ldirgich (serezin), 23-rezinali zichlagich, 24-termostatning korpusi, 25-kengaytiruvchi bachok, 26-kengaytiruvchi bachokning qopqog‘i, 27-shamollatish shlangi, 28-radiator bilan to‘ldiruvchi bachokni tutashtiruvchi shlang, 29-qopqoqning chiqaruvchi (bug‘) klapani, 30-qopqog‘ning havo klapani.



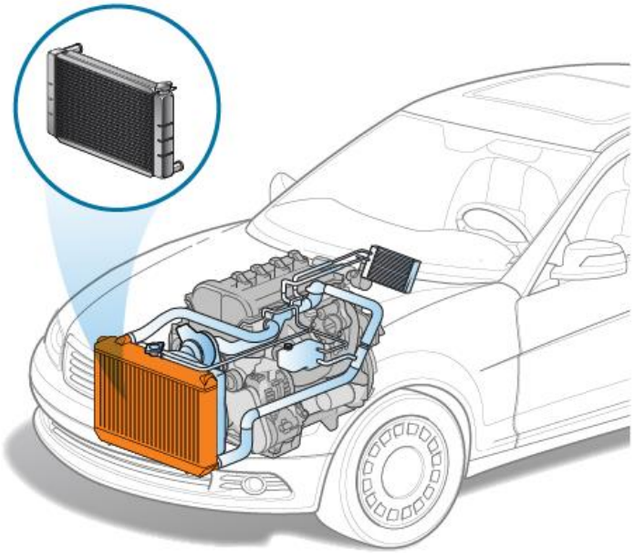
[18]

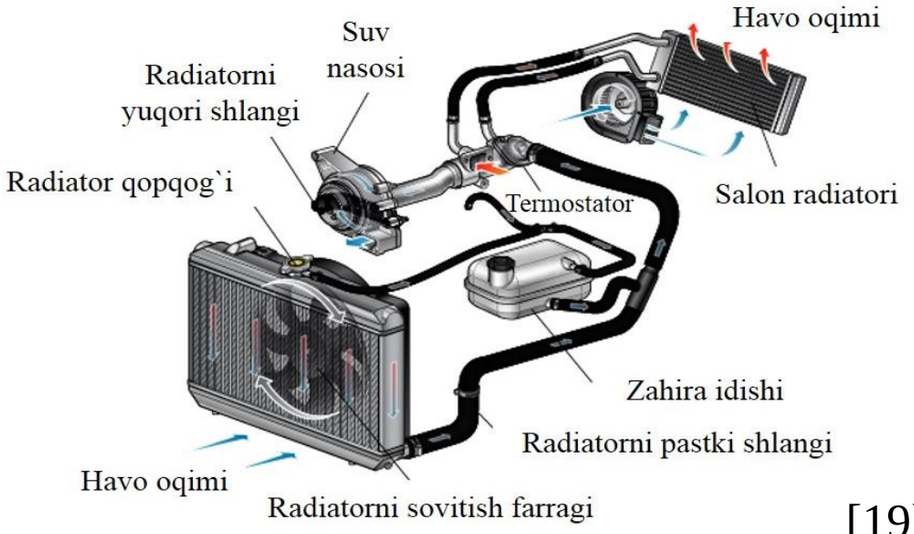
Sovutish tizimining radiatori:

Radiator blokda isigan suyuqlikning issiqligini tashqi muhitga tarqatish uchun xizmat qiladi.



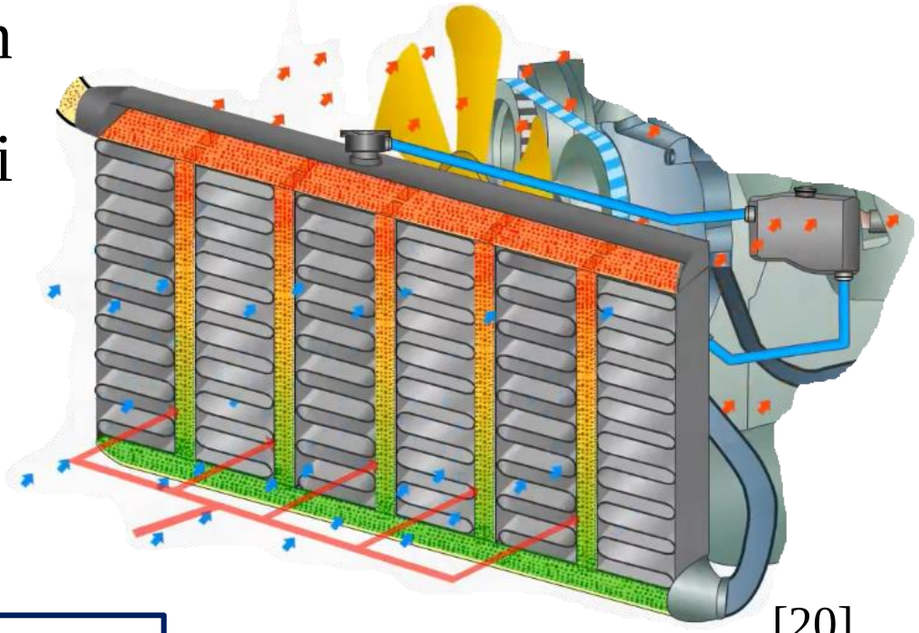
[18]



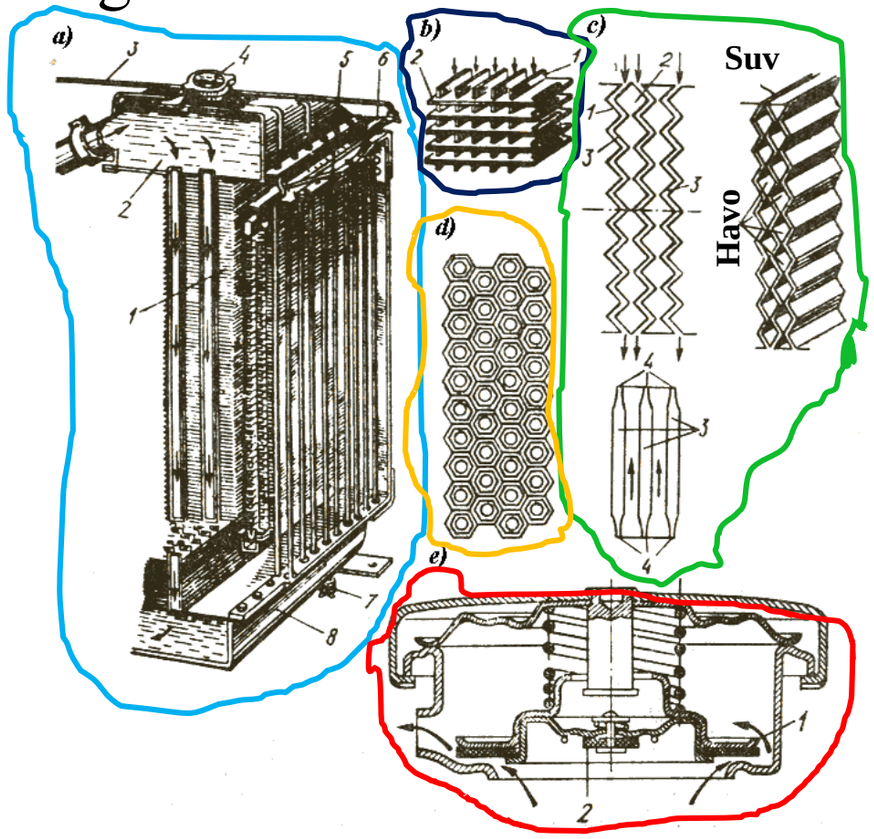


[19]

Dvigatelning optimal harorat rejimini saqlash, asosan radiatordan o‘tayotgan havo oqimining jadalligini o‘zgartirish bilan erishiladi.



[20]



[21]

a) 1-o‘zak, 2-yuqorigi bak, 3-bug‘ o‘tkazish naychasi, 4-qopqoq, 5-to‘sgich, 6-richag, 7-kran, 8-pastki bak.

b) 1-naychalar, 2-plastinkalar.

c) 1-to‘lqinsimon plastinkalar, 2-havo teshikchalari, 3-suv teshikchalari, 4-plastinkalar uchlari.

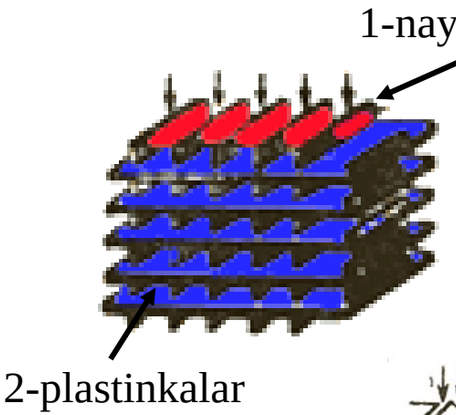
d) arisimon o‘zak.

e) qopqoq, 1-bug‘ (chiqarish) klapani, 2-havo (kiritish) klapani.

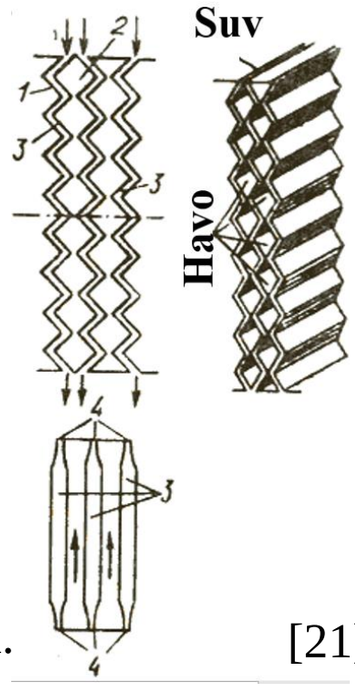
Radiator o‘zaklarining turlari:

- **Naycha-plastinkali;**
- **Naycha-lentali.**

Naycha-plastinkali bo‘lganda, naychalari gorizontal joylashtirilgan qator yupqa plastinkalar orasidan o‘tkazilib, uchlari yuqoriga va pastki bakchalarga kavsharlanadi.



Naycha-lentali bo‘lganda naychalari oralig‘iga, sovutish yuzasini oshirish maqsadida to‘lqinsimon shaklda ishlangan lentalar joylashtiriladi.



1-to‘lqinsimon plastinkalar, 2-havo teshikchalari, 3-suv teshikchalari, 4-plastinkalar uchlari.

[21]

Radiator o‘zagining ikkala turida ham qo‘llaniladigan naychalar asosan yassi oval kesimli bo‘ladi.

Naychalar, radiator o‘zagida **vertikal** yoki **gorizontal** o‘rnatilgan bo‘lishi mumkin.

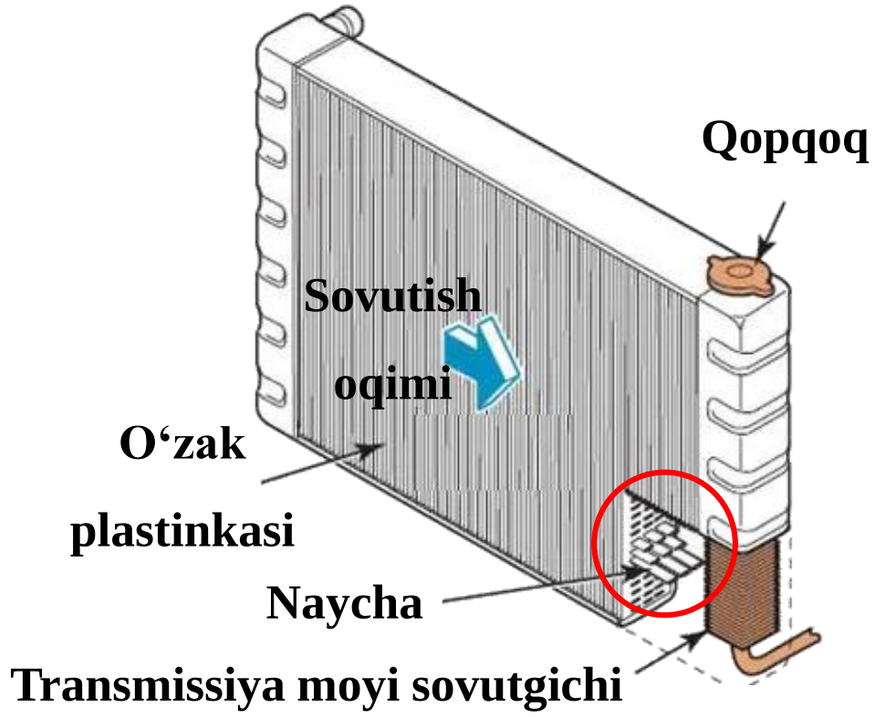
Ko‘pchilik avtomobillarda **vertikal** o‘rnatilgan bo‘lsa,

ayrim yengil avtomobillarda naychalari **gorizontal** joylashtirilgan.

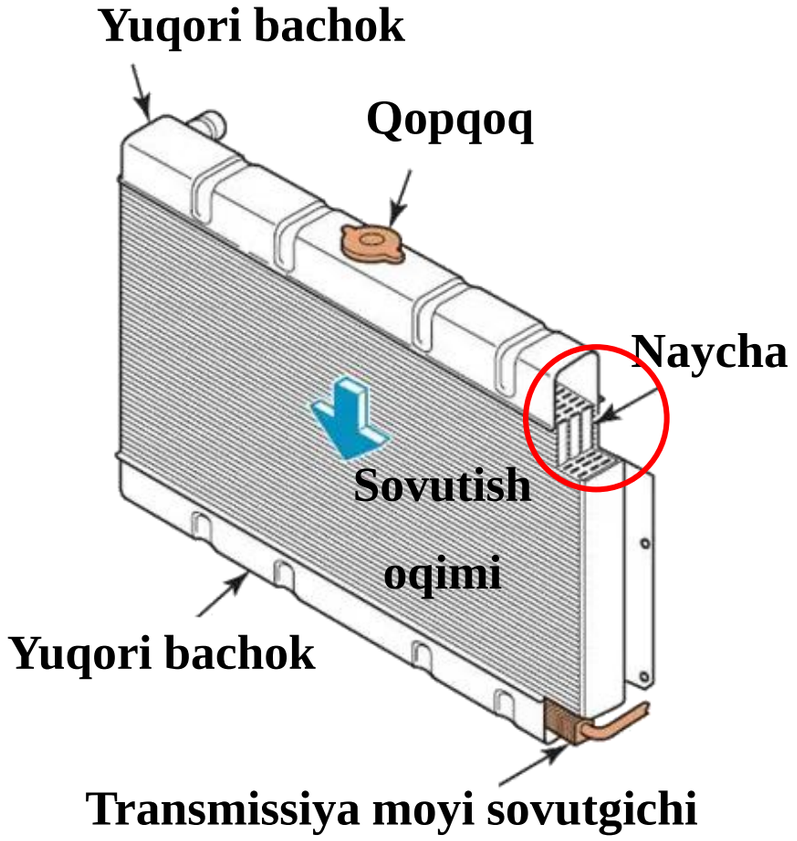
Radiator o‘zagining detallari, **issiqlikni tez tarqatuvchan xususiyatga** ega bo‘lgan **latundan** tayyorlanadi.

Radiator naychasini joylashuv turi:

➢ Gorizontal



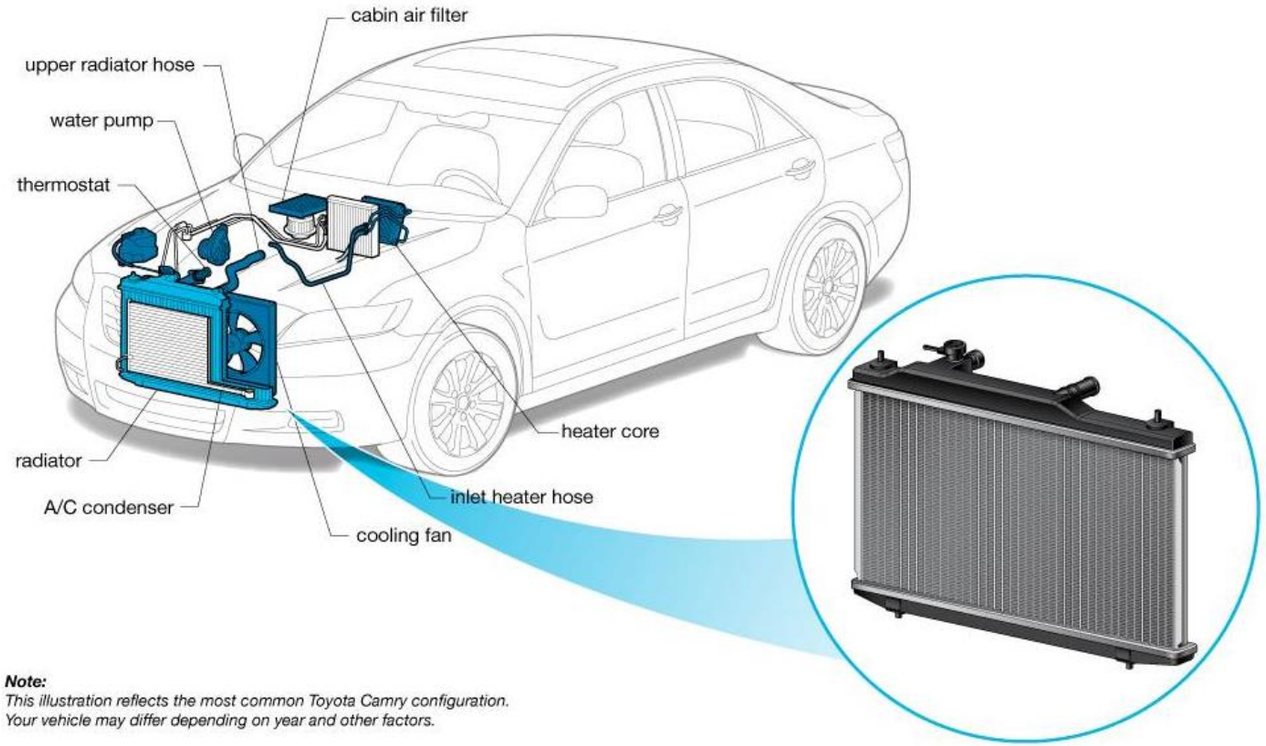
➢ Vertikal



[22]

Naychalari gorizontal joylashgan radiatorlarda o‘zak detallari aluminiydan, bakchalari esa **plastmassadan** tayyorlangan.

Radiator, dvigatel oldida ramaga rezina yostiqchaga o‘rnatilgan holda mahkamlanadi.

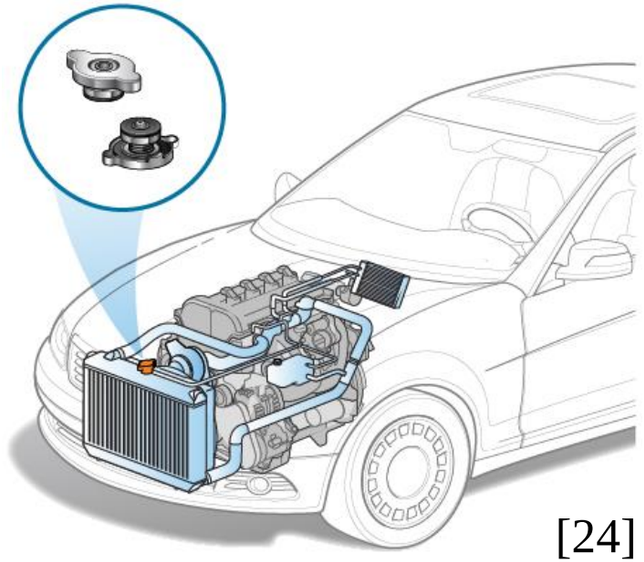


[23]

Radiator qopqog‘i:

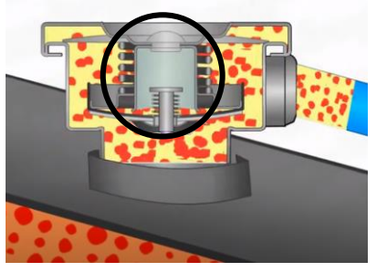
Qopqoq radiator bo‘g‘zini zich berkitadi.

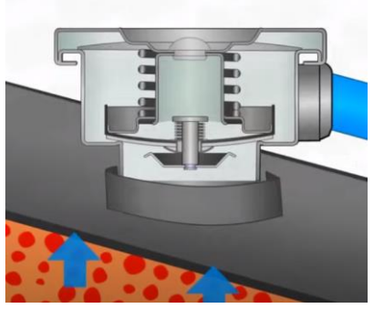
Qopqoqda **bug‘-havo klapanlari** o‘rnatilgan bo‘lib, radiatorning ichki bo‘shlig‘i atmosfera bilan shu klapanlar orqali tutashadi.



[24]

Radiator bo‘g‘zini yopib turuvchi bug‘ klapani kuchli prujinaga ega bo‘lib, tizimdagi bosim, suyuqlikning bug‘lanishi natijasida, atmosfera bosimidan **45-55 kPa** ga ortganda ochiladi.



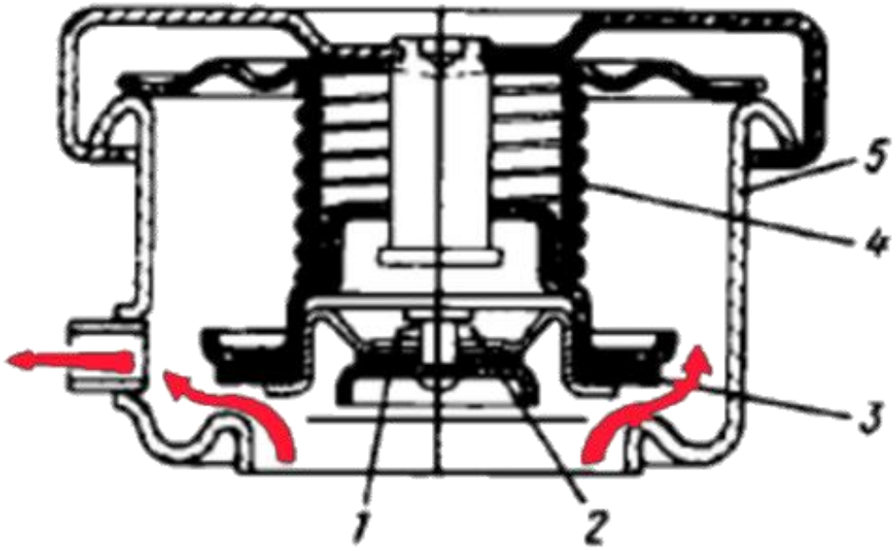


[25]

Radiator qopqog‘i :

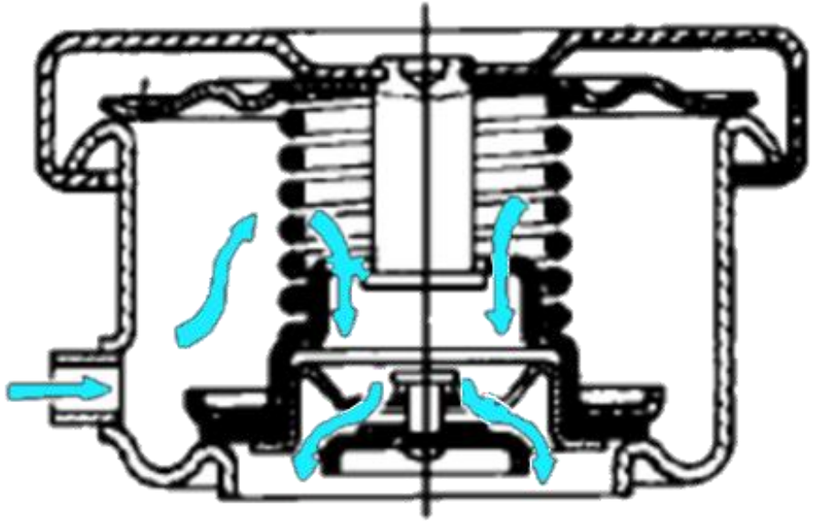
Bug‘ klapani ochiq, havo klapani yopiq

Havo klapani, sovutuvchi suyuqlik sovib, tizimdagi bosim siyraklashganda (*bug‘larning suv tomchisiga aylanishi hisobiga*) radiator naychalarining puchqayib qolishidan saqlaydi.



Havo klapani ochiq, bug‘ klapani yopiq

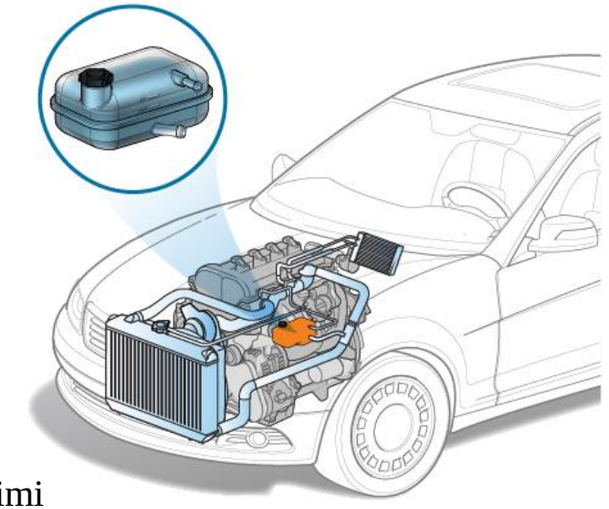
Havo klapani kuchsiz prujinaga ega bo‘lib, tizimdagi bosim atmosfera bosimidan **10 kPa** ga pasayganda ochiladi va radiator bo‘shlig‘ini tashqi muhit bilan bog‘lab siyraklanishni yo‘qotadi.



1-havo klapanining prujinasi; 2-havo klapani; 3-bug‘ klapanining qistirmasi; 4-bug‘ klapanining prujinasi; 5-radiator bo‘g‘zi.

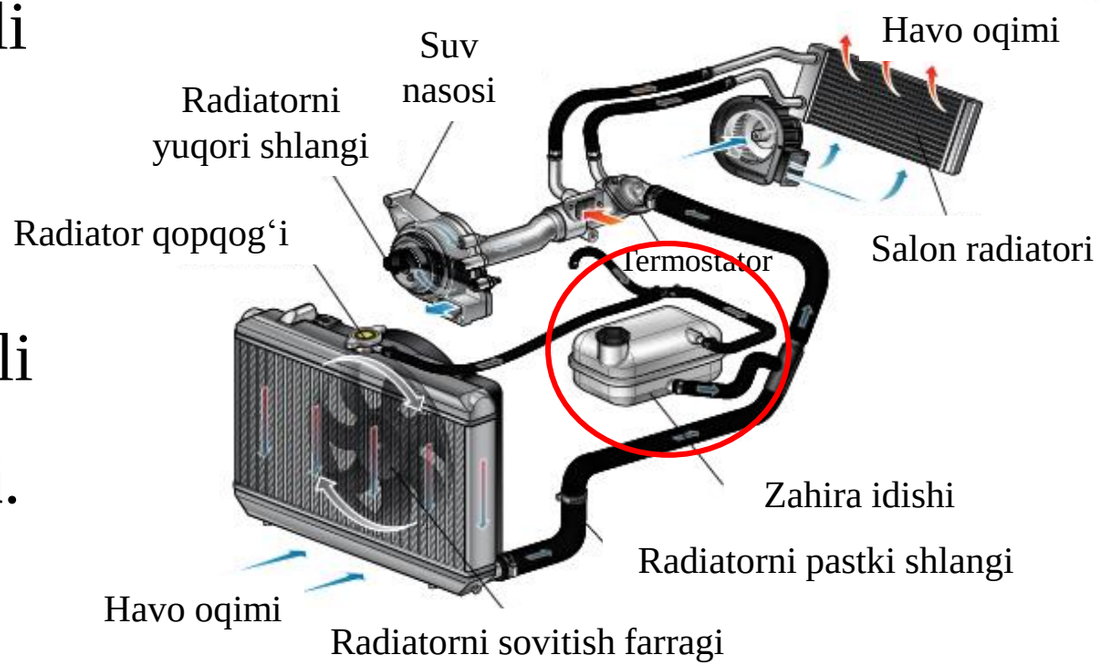
[26]

Sovitish tizimida kengayish bakchasi bo‘lgan ayrim dvigatellarda radiator qopqoqsiz bo‘ladi.



Tizimga suyuqlikni quyish kengayish bakchasi orqali bajariladi.

Uning bug‘-havo klapanli qopqoq bilan **zich berkitiladi**.

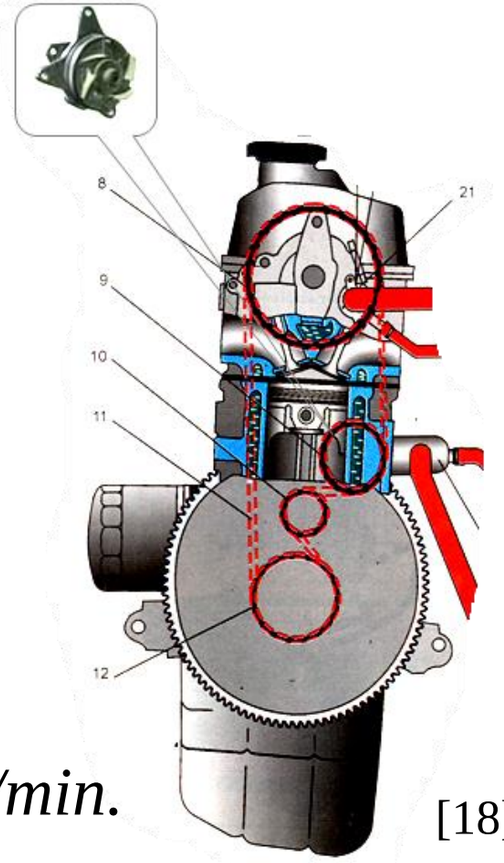


[27]

Suyuqlik nasosi:

Sovutish tizimida suyuqlikning majburiy harakatlanishi nasos yordamida amalga oshiriladi.

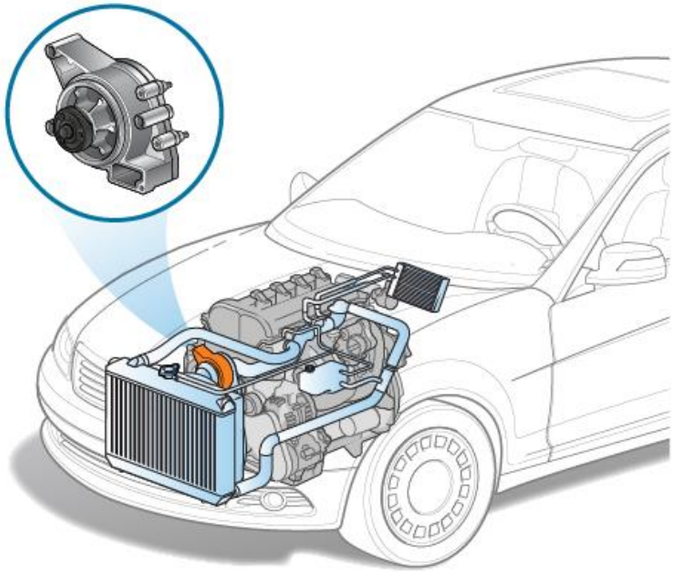
Odatda past bosimli (40-100 kPa) markazdan qochma suyuqlik nasosi ishlatiladi.

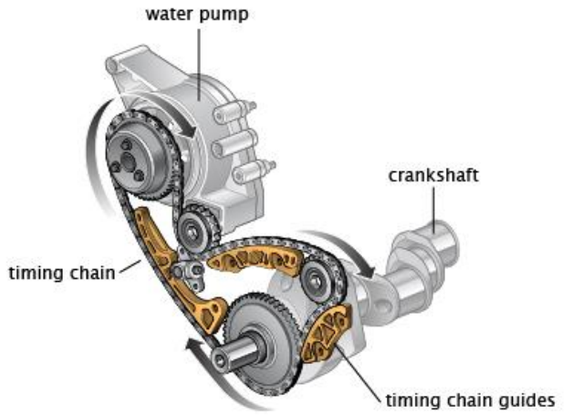


[18]

Dvigatel tirsakli vali - 3000 *ayl/min*.

Nasosning suyuqlikni haydashi 240 *l/min*.

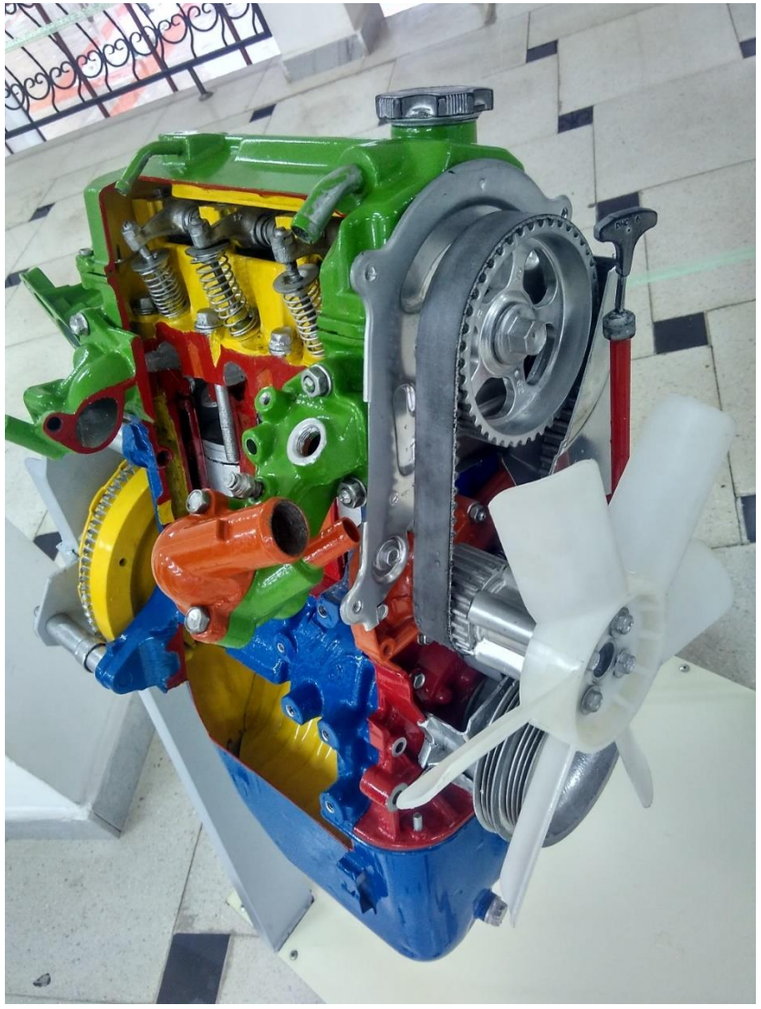




[28]

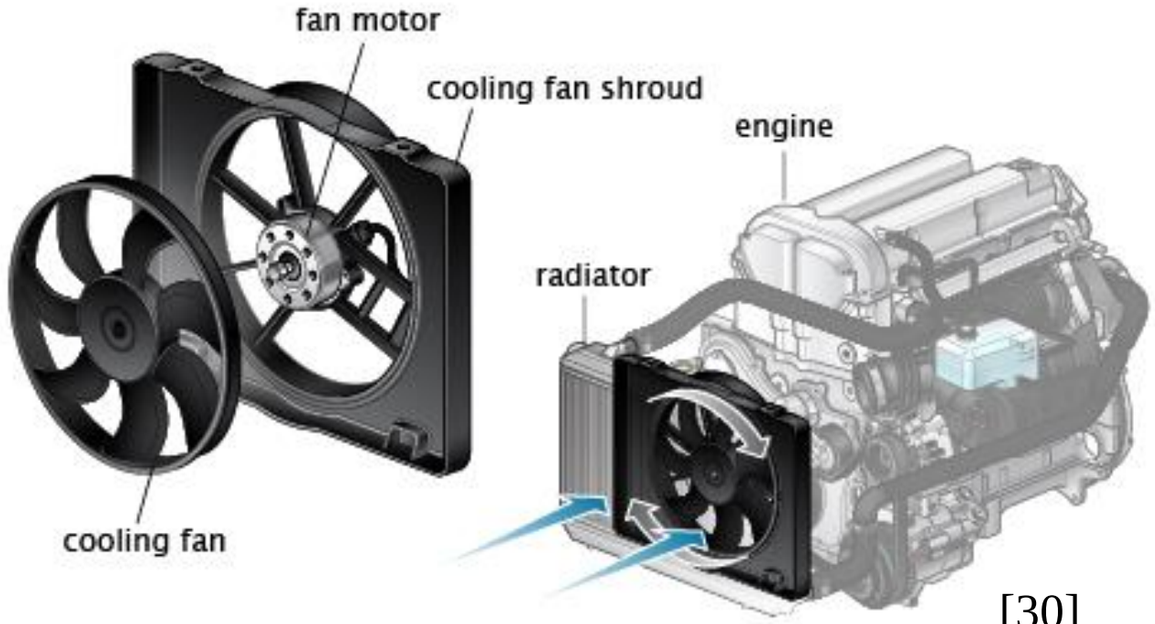
Suv nasosi ventilator bilan birga silindrlar blokining oldingi devoriga mahkamlangan bo‘lib, ponasimon tasma orqali tirsakli val shkividan harakatga keltiriladi.

Ventilator radiator o‘zagidan o‘tayotgan havo oqimini jadallashtirib, undan issiqlikning tashqi muhitga tarqalishini tezlashtiradi.

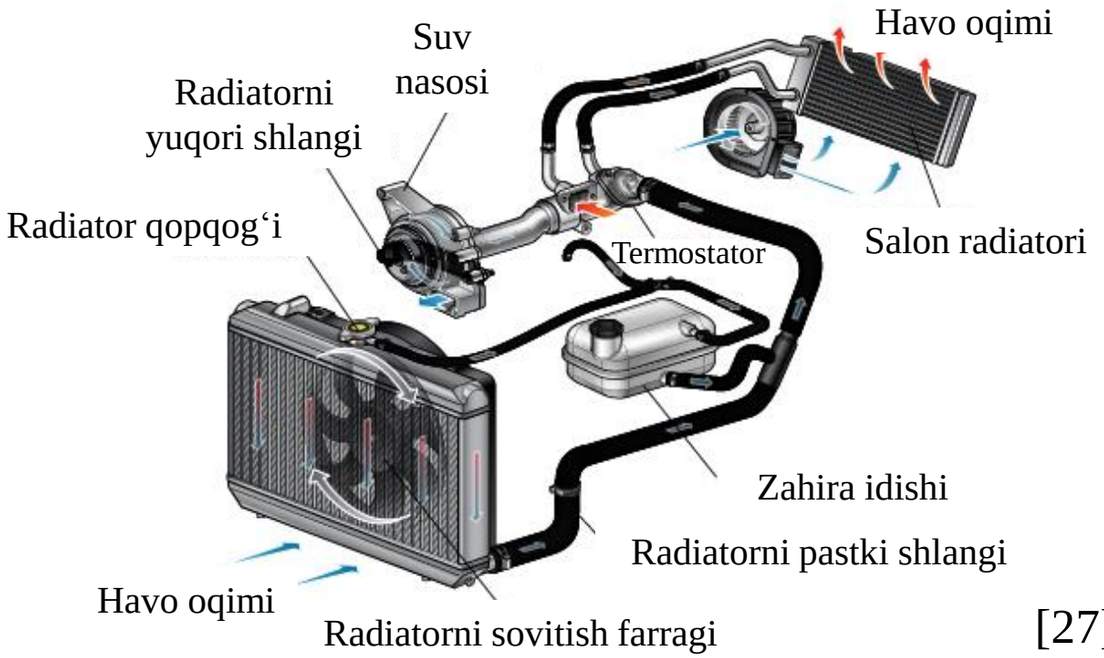


[29]

Ba’zida ventilatorning effektli ishlashi uchun uni yo‘naltiruvchi kojux ichiga joylashtiriladi.



[30]

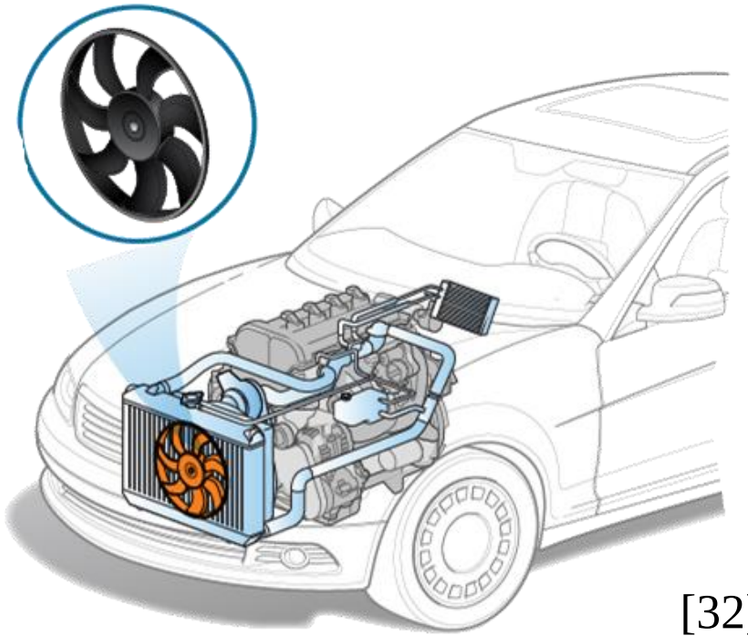


[27]

Ventilator, odatda, radiatorning orqa tomoniga yaqin o‘rnatiladi.

Ventilator parraklari yuk avtomobil dvigatellarida asosan listli po‘latdan shtamplash usuli bilan yasaladi va gupchagiga parchin mixlar bilan biriktiriladi.

[31]



[32]

Yengil avtomobil dvigatellarida ventilator ko‘pincha plastmassadan tayyorlanadi.

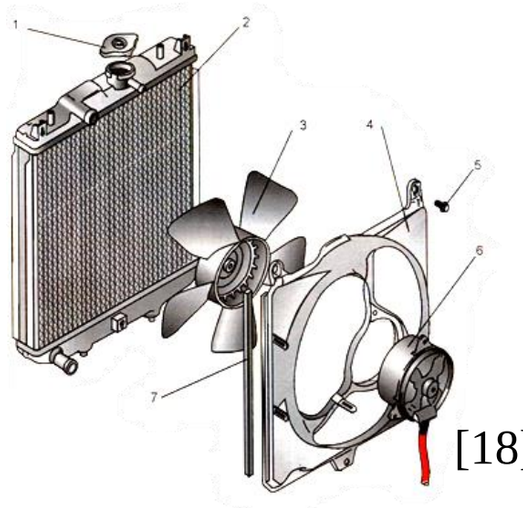
Radiatordagi havo oqimining tezligi:

- **ventilatorning diametriga,**
- **qiyalik burchagiga,**
- **parraklarining soni**
- **aylanishlar chastotasiga bog‘liq.**

Avtomobil dvigatellarida ventilator 4, 5, 6 yoki 8 parrakli bo‘ladi.

Avtomobil dvigatellarida ventilatorni harakatga keltiruvchi yuritma:

- **mexanik** (ponasimon tasma yoki shesternalar bilan);
- **gidravlik** (gidromufta bilan);
- **elektrik** (elektr ventilator) bo‘lishi mumkin.



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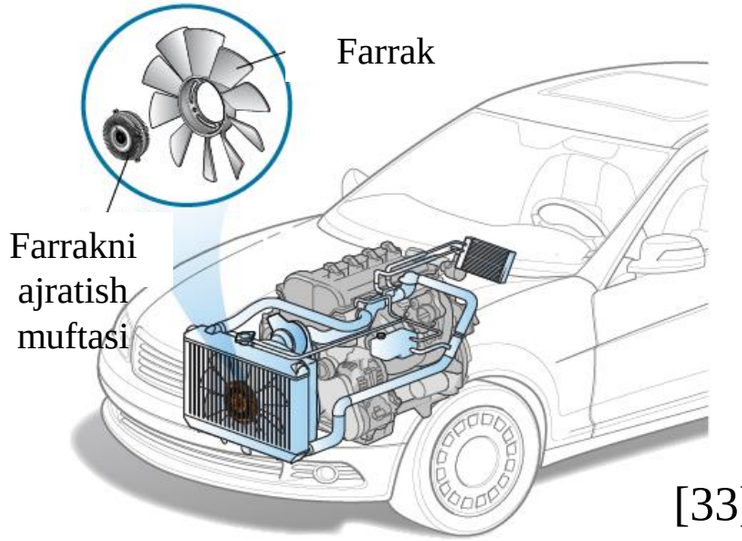
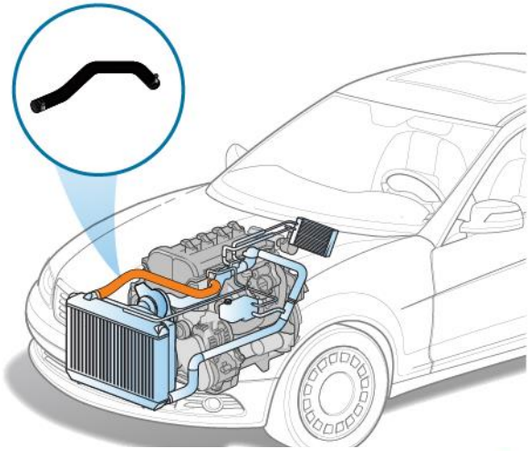
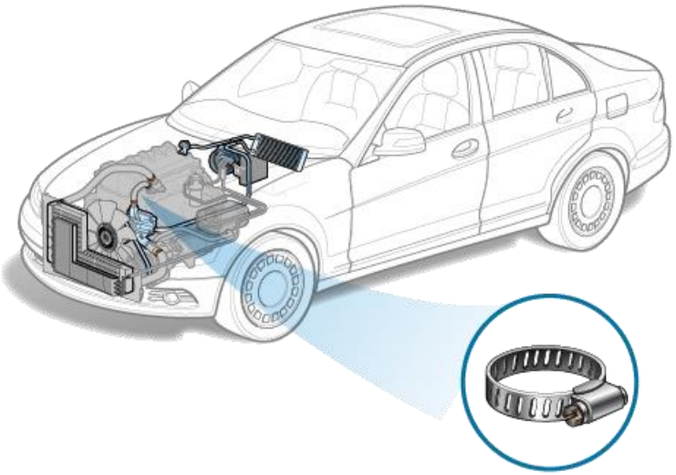


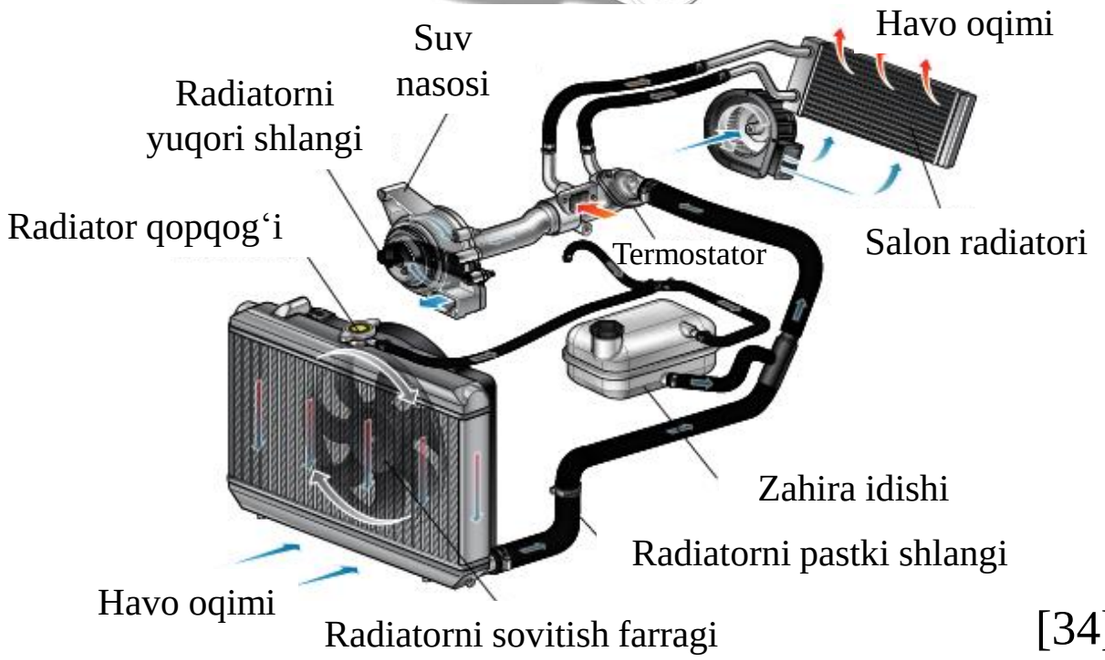
[33]

Suyuqlik quvurlari va mahkamlagich:

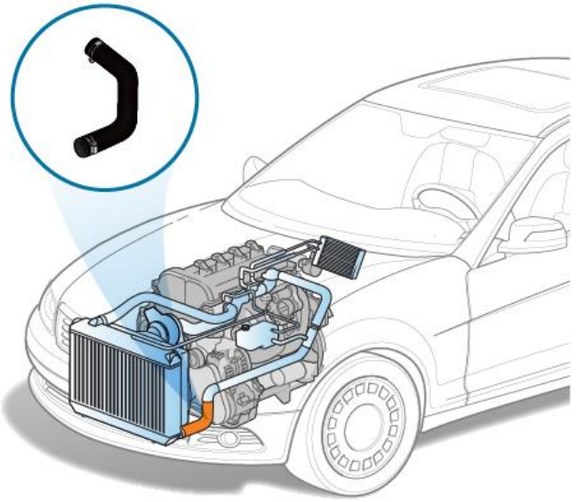




[36]



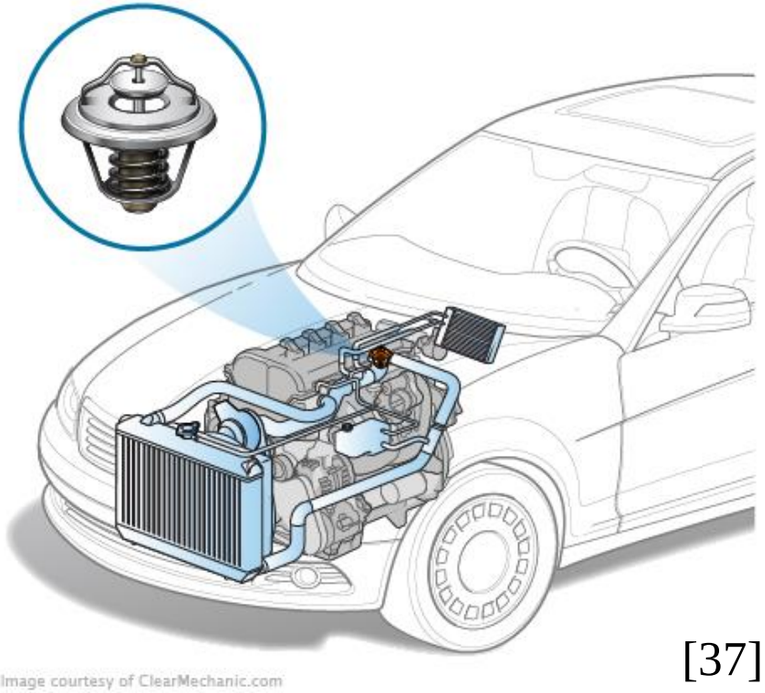
[34]



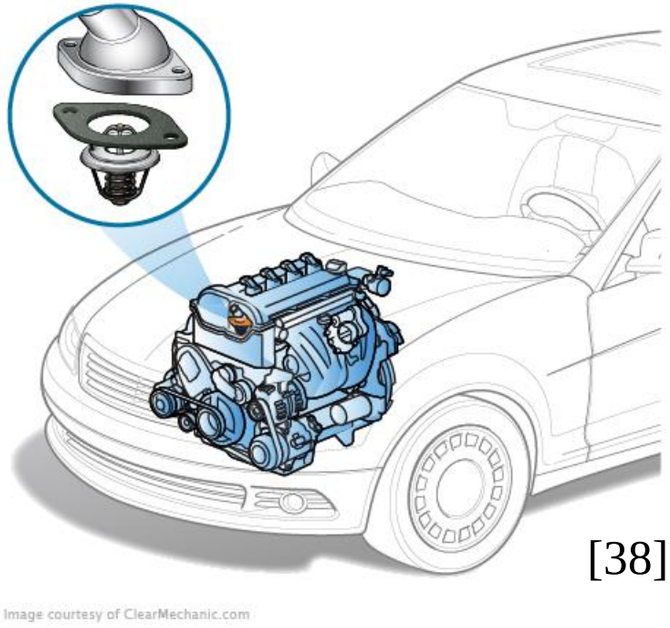
[35]

Termostat

Bu avtomatik klapan bo‘lib, **sovuq dvigatel yurgazilganda**, uning **tez qizishiga** imkon yaratish bilan radiatordan o‘tayotgan suyuqlik miqdorini rostlab, sovutish tizimida **optimal haroratni** saqlash uchun xizmat qiladi.



[37]



[38]

Qo‘llaniladigan termostatlar ikki xil bo‘ladi:

- **Suyuqlik;**

Tez bug‘lanadigan **etil spirtning suvli aralashmasi** to‘ldiriladi tizimdagi harorat **70±2°C** dan past bolganligi sababli ballondagi bosim kichik bo‘lib, qovurg‘ali silindri qisilgan holatda klapanni yopib turadi.

Tizimdagi harorat **70-80°C** dan ko‘tarilganda, ballondagi aralashmaning bug‘lanishi natijasida bosim ortib, qovurg‘ali silindr bo‘yiga uzayib klapan ochila boshlaydi.

90-95°C ga yetishi bilan klapan to‘la ochiladi.

Suyuqlik to‘ldirgichli termostatning ishlashi

1-suyuqlik nasosi korusi,

2-ballon, 3-tirgak, 4-qistirma,

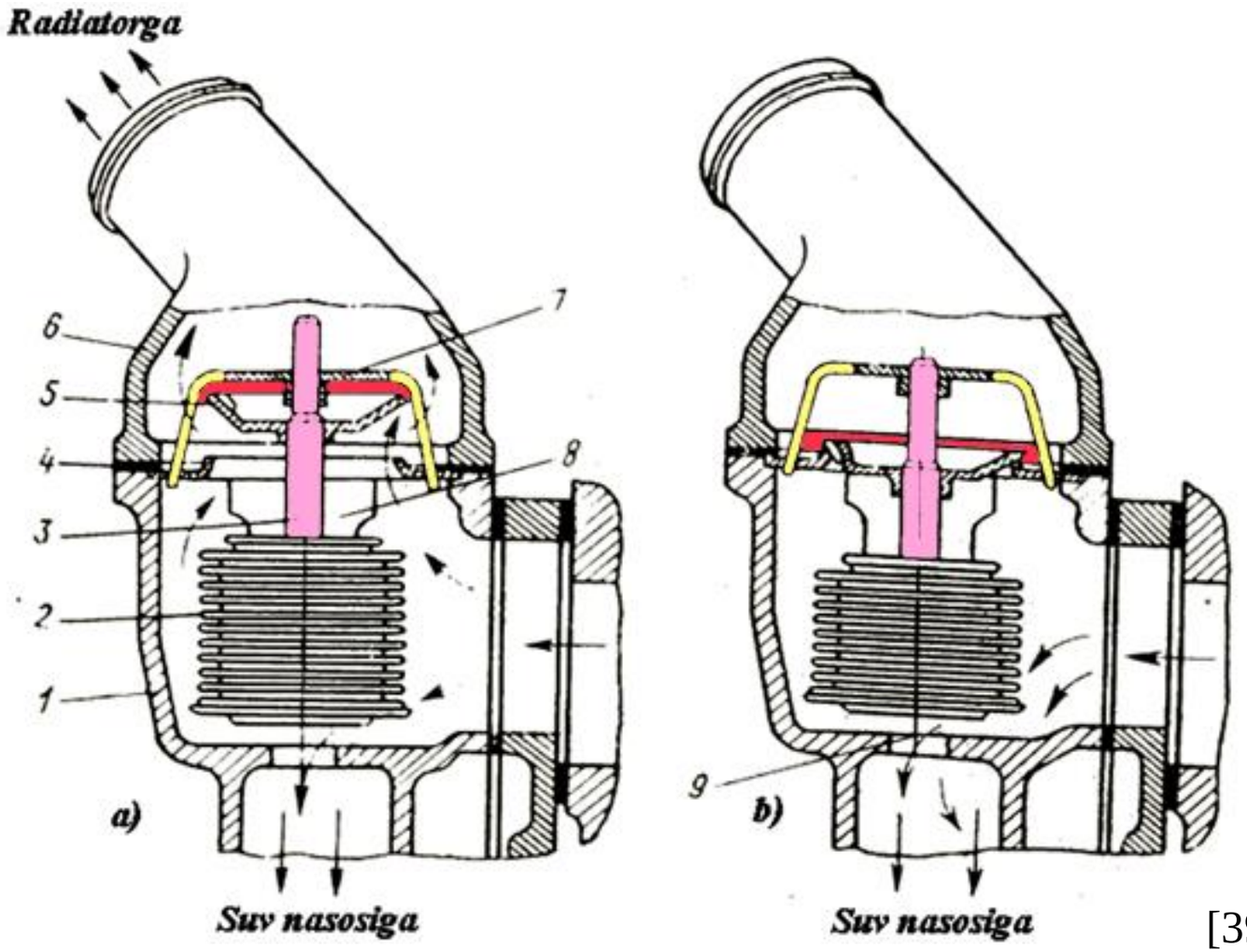
5-klapan, 6-suyuqlik o‘tkazuvchi

bo‘g‘iz (patrubok),

7-termostat korpusi, 8-changak,

9-nasosga suyuqlik o‘tkazuvchi

teshikcha.



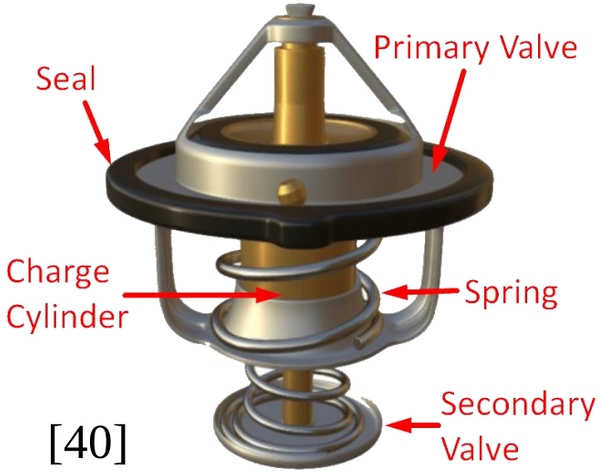
[39]

Termostat klapani ochiq **Termostat klapani yopiq**

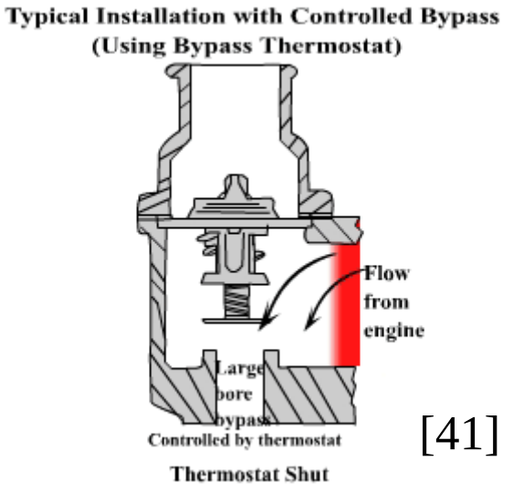
➢ Qattiq to‘ldirgichli termostatlar.

Kengayish hajmi katta bo‘lgan **serezin** aralashtirilgan **mis kukuni to‘ldiriladi.**

Harorat **70±2°C** klapan ochilishi boshlanadi **83±2°C** ga yetganda esa klapan to‘la ochiladi.



[40]



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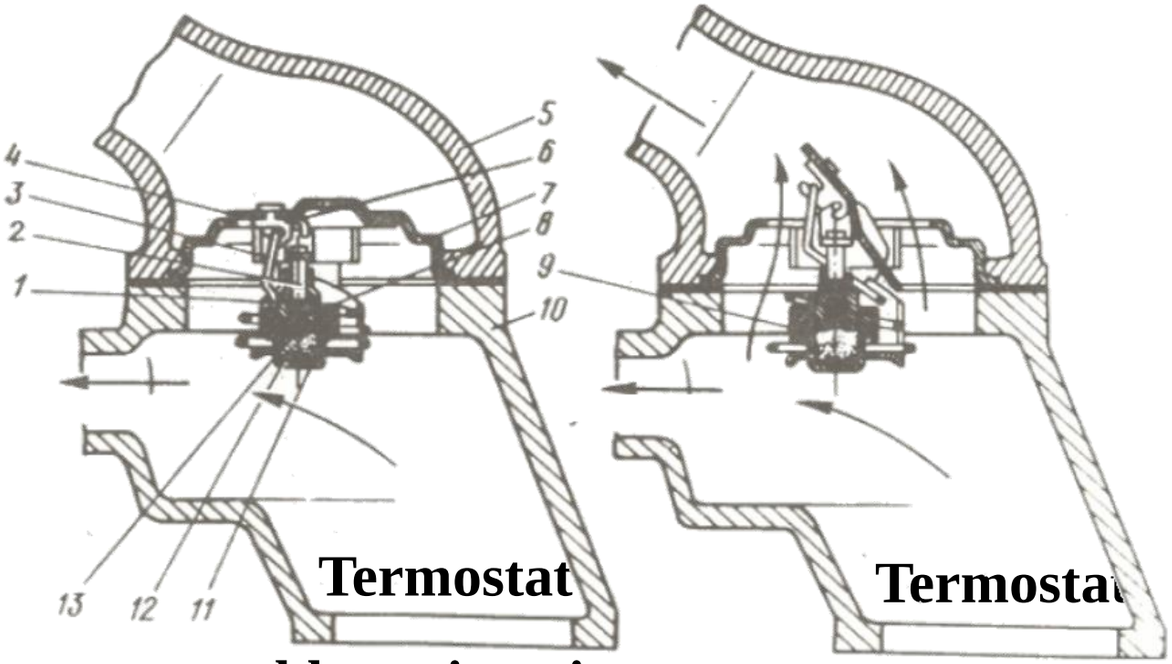


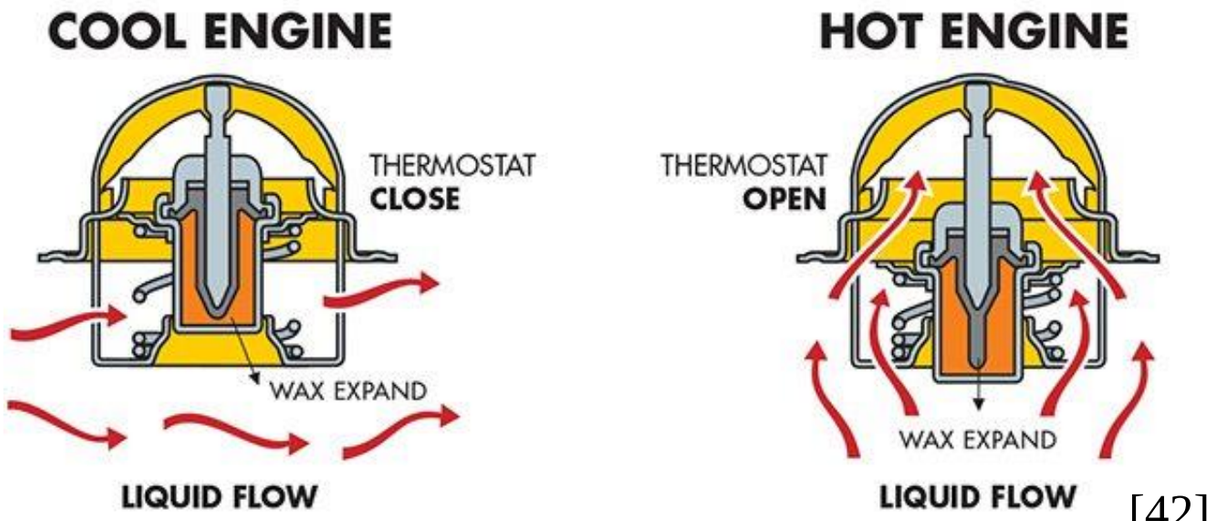
Termostat klapani yopiq

Termostat klapani ochiq

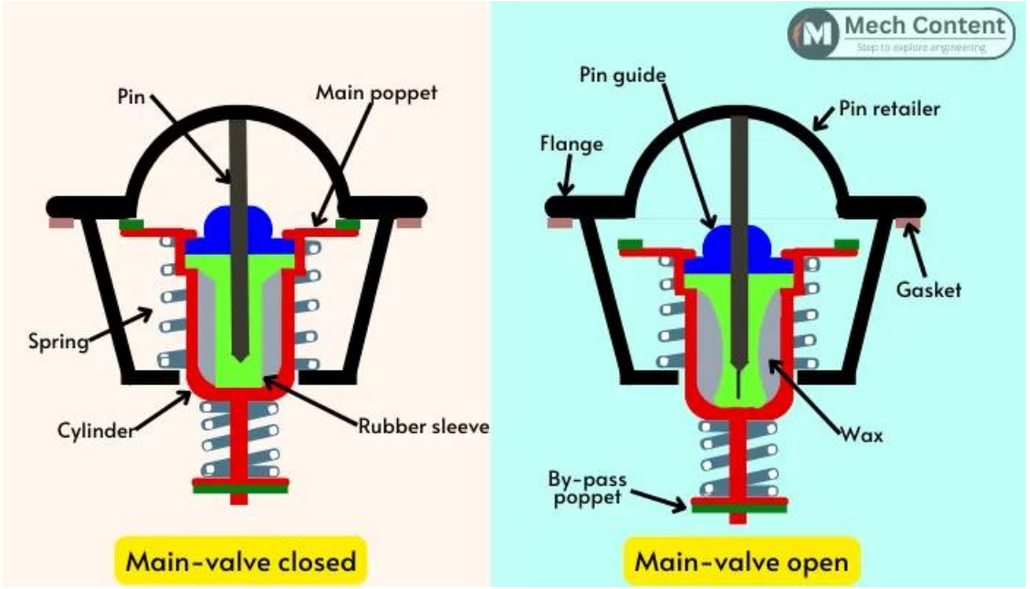
[39]

1-yo‘naltirgich; 2-shtok; 3-qaytargich prujina; 4-termostat klapani; 5-issiq suyuqlikni chiqarush trubasi; 6-qaytarish prujinasi; 7-termostat korpusi; 8-changak; 9-ballondagi qattiq aralashma; 10-suyuqlikni kiritish trubasi; 11-termostat balloni; 12-diafragma; 13-yo‘naltiruvchi vtulka.

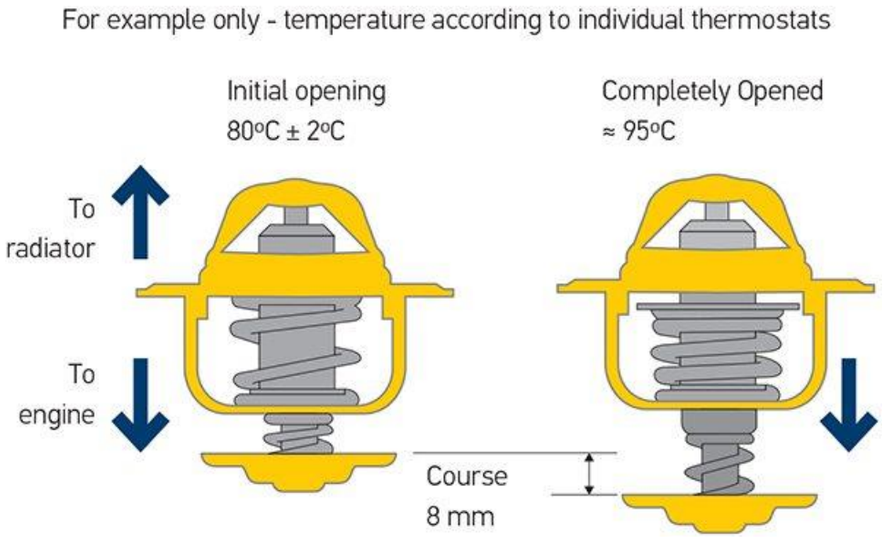
Termostatning ishlash sxemasi



[42]



[44]

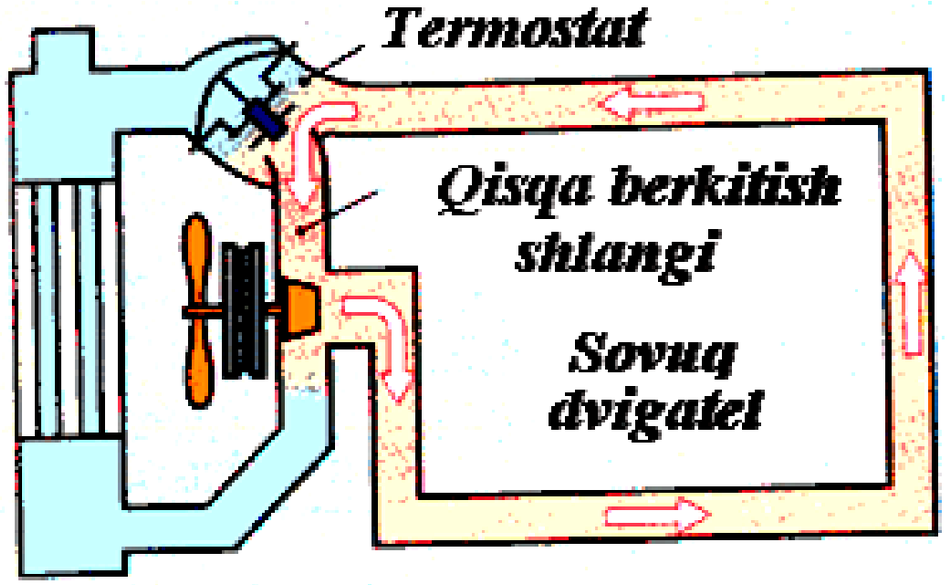


[43]

Qattiq to‘ldirgichli termostatlar suyuqlikli termostatlarga nisbatan yetarli mexanik mustahkamlikka ega bo‘lgani uchun ular tizimdagi suyuqlik bosimining o‘zgarishidan qat’i nazar ishlashi barqaror bo‘ladi.

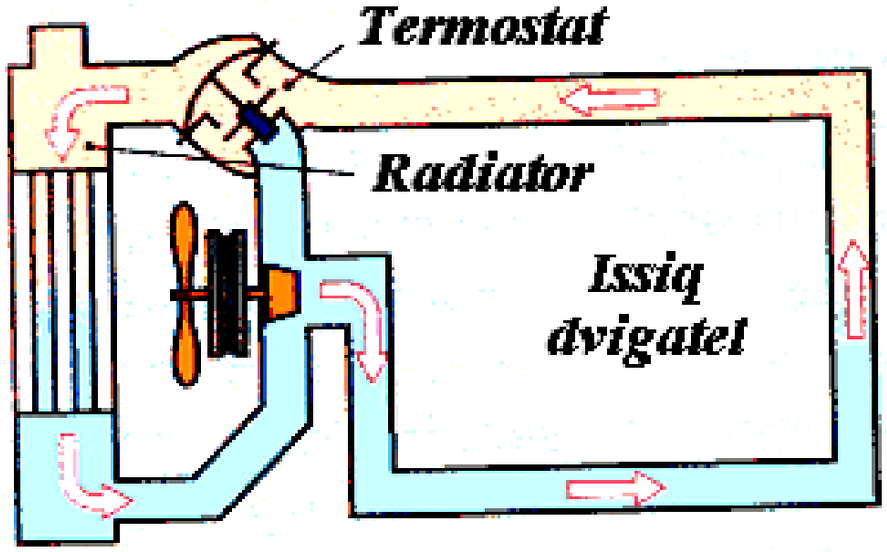
Termostatning ishlash uslubi

>70±2°C



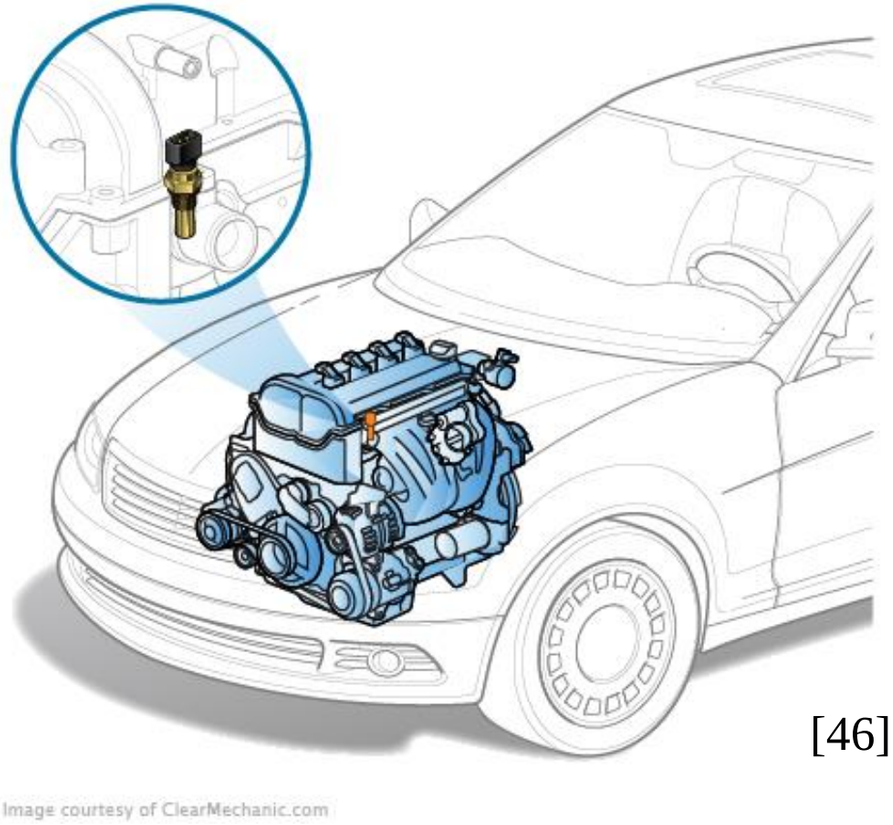
Qisqa sovutish yo'li

< 83±2°C

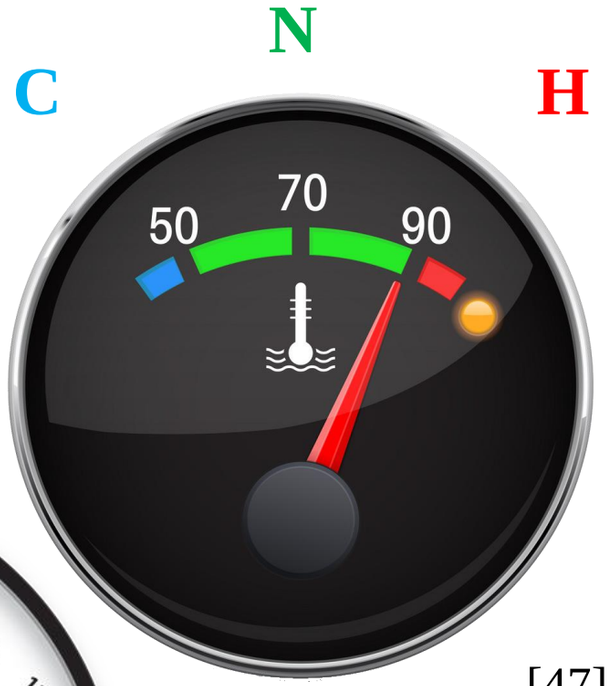


Tarmoq bo'yicha sovutish yo'li [45]

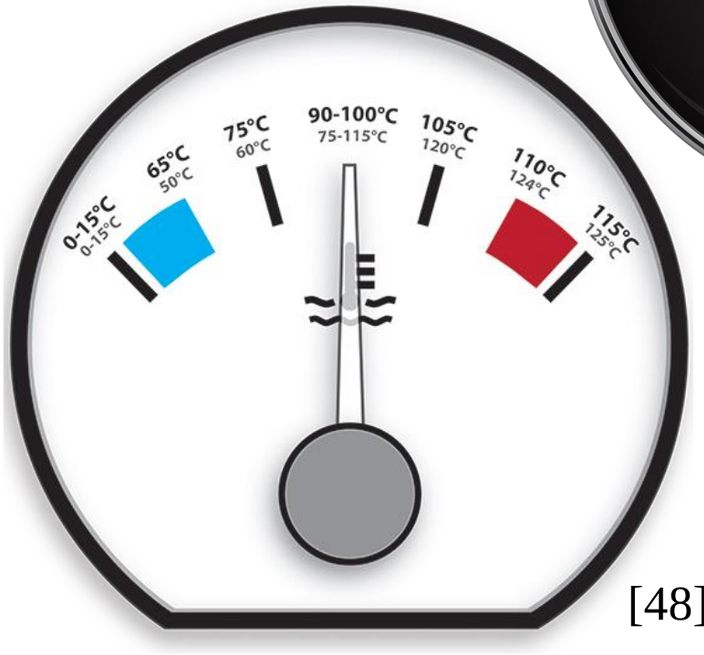
Sovutish tizimi datchigi



[46]



[47]



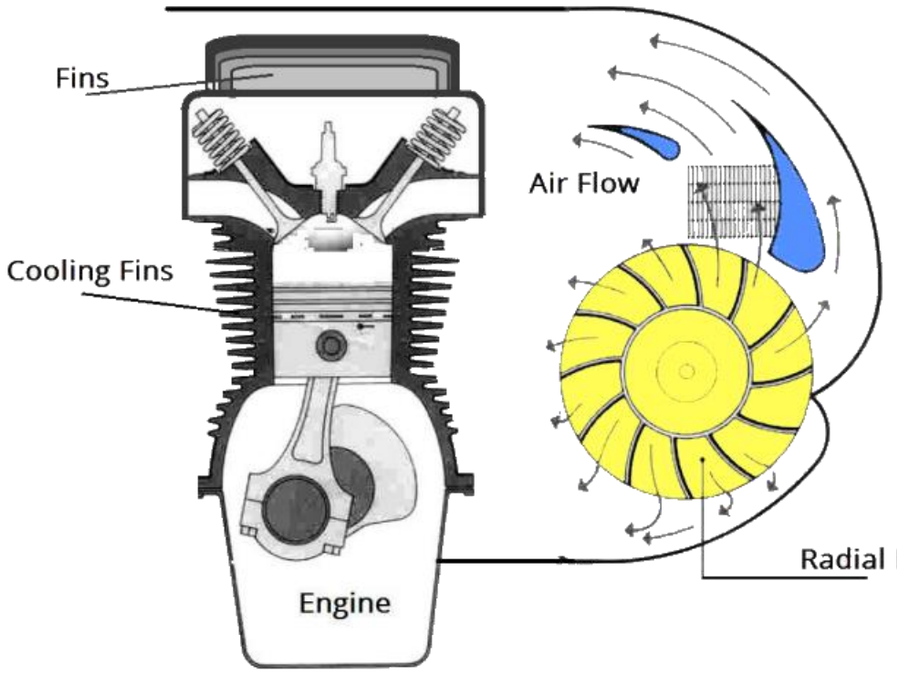
[48]

5.5. Havo bilan sovutish tizimi.

Havo bilan sovutiladigan avtomobil motorlarida asosan havo oqimini majburiy yo‘naltirish usuli qo‘llaniladi.

Motorning silindr va kallaklaridan issiqlik tarqatishni tezlatish maqsadida ularning tashqi devorlariga qovurg‘alar yasalgan.

Havo

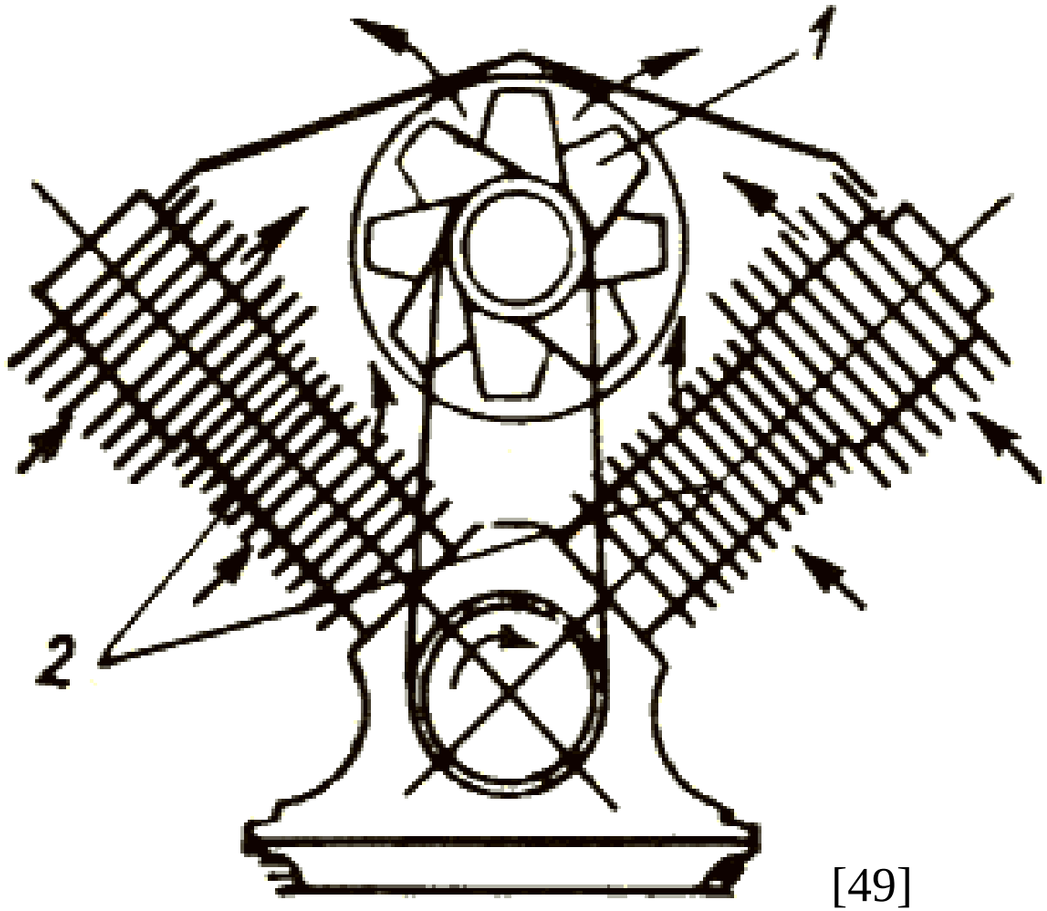


[9]

Bu hol motorning umumiy joylanishiga va uning ba’zi qismlarining konstruksiyasiga ta’sir etadi.

Havo bilan sovutiluvchi avtomobil motorlarining sovutilishi havo oqimining tezligiga, bu oqimning silindr va kallak atrofidan aylanib o‘tishiga bog‘liq.

Motor eng katta quvvat bilan ishlaganda ventilyator uning **8%** iga yaqin quvvatini sarflaydi.



[49]

1 – parrak, 2 – silindr qovurg‘alari.

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