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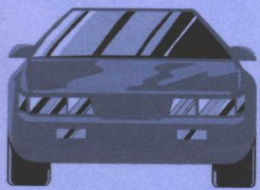
高等学校车辆工程专业教材



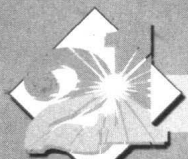
汽车专业英语

Qiche Zhuanye Yingyu

◎ 黄韶炯 / 栾志强 主编



人民交通出版社
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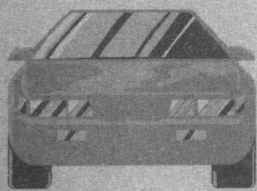
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内 容 提 要

本书内容以汽车构造为主,并选编了一些有关汽车使用、维修以及汽车新技术等方面的文章。共16单元,包括课文、词汇、注释、练习和阅读材料等,并附有汽车专业常用英文缩写和汽车主要零件词汇表。

本书可作为高等工科院校汽车及其相关专业的英语教材,也可供从事汽车工程及相关专业的管理人员和技术人员自学参考。

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前 言



“汽车专业英语”是基础英语和汽车专业基础课的后续课程,学生在具备了较好的英语阅读能力后,通过专业汽车英文文献的阅读,一方面可以巩固已经掌握的词汇和语法知识;另一方面可以扩大专业词汇量,掌握科技文章的语法结构及文体方面的知识,提高阅读理解和翻译英文专业书刊的能力,使学生能以英语为工具,获得所需要的专业信息。本书为高等院校车辆工程及其相关专业学生学习专业英语课程而编写,也可供从事汽车工程及相关专业的管理人员和技术人员使用。

本书课文和阅读材料选自国外有关汽车的英文原版书刊,课文内容以汽车构造为主,并选编了一些有关汽车使用、维修以及汽车新技术等方面的文章。在内容的编排上,以汽车发动机构造和汽车底盘构造以及汽车新技术为主线,尽可能使汽车专业知识具有系统性和完整性,取材时考虑难度适中,既注意英语语言的训练,又重视专业领域当代最新知识的传递。

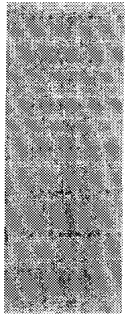
本书以单元为基本构件,共 16 单元。每个单元包括课文、词汇、注释、练习和阅读材料,一些课文和阅读材料配有相关的插图和表格,长句和难点句加注了注释和翻译。书后附有汽车专业常用英文缩写(English Abbreviation of the Automobile Speciality)和汽车主要零件词汇表(Main Constant Automobile Parts),供学生阅读时参考。

本书由中国农业大学车辆与交通工程系黄韶炯、栾志强主编。书中第 8~11 单元由栾志强编写;第 4~7 单元由李真芳编写;黄韶炯编写了第 1~3 单元和第 12~16 单元,并进行统稿。张红副教授校阅了课文、注释和翻译材料。

在编写中参阅了国内外有关的书籍和资料,并得到了曹正清教授的许多帮助,在此一并表示感谢。

由于作者水平所限,错误和不当之处在所难免,敬请读者指正。

编者



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UNIT 1 AUTOMOTIVE BASICS

Automobiles, trucks, and buses are essential forms of transportation. They are complex machines made up of many parts. These parts can be grouped into a number of systems. An understanding of how the systems work will help you understand how the automobile works.

An automobile can be divided into two basic parts—a body and a chassis. The body is the enclosure that houses the engine, passengers, and cargo. It is the part of the automobile that you see. The chassis is that part of the automobile beneath the body. Figure 1-1.

1.1 The Body

An automobile body is a sheet metal shell with windows, doors, a hood, and a trunk deck built into it. It provides a protective covering for the engine, passengers, and cargo. The body is designed to keep passengers safe and comfortable. For example, insulation in the body reduces noise and protects against heat and cold. The body styling provides an attractive, colorful, modern appearance for the vehicle. It is streamlined to lessen wind resistance and to keep the car from swaying at driving speeds.

The automobile body has two basic parts—the upper body and the under body.

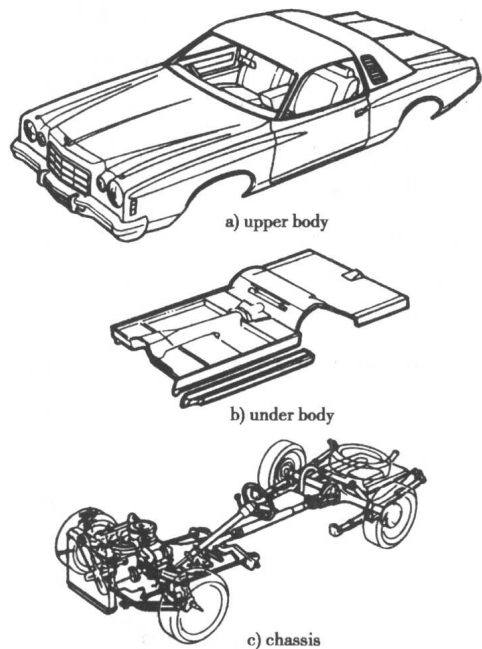


Figure 1-1 The part of the automobile

1.2 The Chassis

The chassis is an assembly of those systems that are the major operating parts of a vehicle. The





chassis includes everything except the body. The three important parts of the chassis are the frame, the engine, and the power train (also called the drive train). Each of these three parts is made up of a number of systems. A system is a mechanical or electrical unit that performs a specific function. Thus, each system (such as steering, brake, or fuel) has a certain job to do in running a vehicle. We shall look at each of these parts and systems to see how they fit together to form the automobile chassis.

1.2.1 The Frame

The first major part of the chassis is the frame. It is made from tough steel sections welded, riveted, or bolted together. The frame looks like a steel ladder, though it sometimes has an X shape for extra strength. It forms a foundation for the car body and the parts of the several systems. The body is joined to the frame with bolts. Rubber shock mounts or washers are used at each joint. These reduce vibration and road noise. In most modern cars the frame is built into the body. A car with the frame built into the body has a unitized body or unibody. The frame supports the suspension system, steering system, and braking system.

The front and rear wheels are attached to the chassis by a suspension system. This system is made up of springs, shock absorbers, control arms, and stabilizers. These support the vehicle and cushion it from road bumps for better ride and handling.

The steering system (Figure 1-2), controls the car's direction of travel. It includes a wheel and column, steering gears, rods, and linkages. As the steering wheel is turned, its motion is trans-

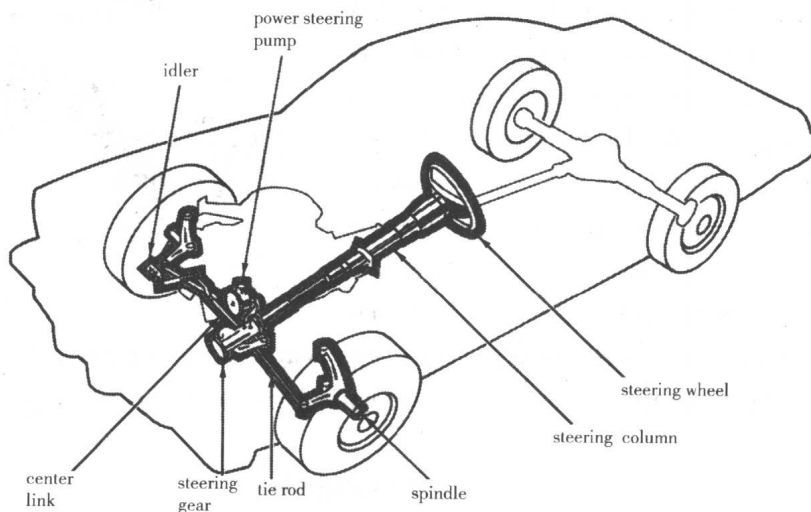


Figure 1-2 The steering system



ferred to the idler arm and tie rods. These cause the front wheels to turn to the right or left. On some cars, a power unit (called power steering) makes steering easier.

The brake system gives the automobile its stopping power. Figure 1-3. Hydraulic brakes are found on all modern cars. As the brake pedal is pushed with the foot, brake fluid is forced through brake lines into cylinders that press the brake shoes against a drum. This stops the motion of the car. Power units (power brakes) are used to make braking easier. Most modern cars have disc brakes on the front wheels. (Some have them on both the front and rear wheels.) Disc brakes work like a pair of pliers squeezing a rotating disc. Drum brakes are also used.

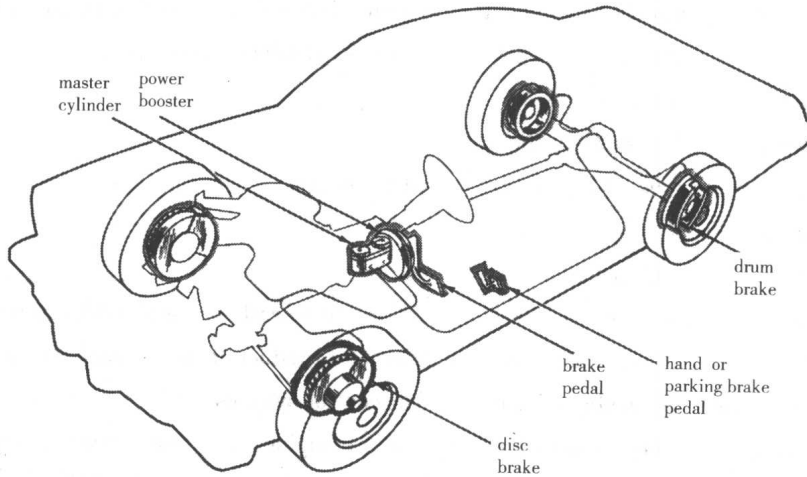


Figure 1-3 The brake system

1.2.2 The Engine

The engine provides power to move the automobile. The most common type of automotive engine is the gasoline-burning piston engine. It is found in most automobiles. Diesel-fuel burning engines are also used in modern passenger cars, as well as in large trucks. All engines have fuel, exhaust, cooling, and lubrication systems. Gasoline engines also have an ignition system.

The ignition system supplies the electric spark needed to ignite the air-fuel mixture in the cylinders. When the ignition switch is turned on, current flows from the 12-volt storage battery to the ignition coil. The coil boosts the voltage to produce the strong spark of 20,000 V needed to ignite the engine fuel. The distributor directs the electrical current to the right spark plug at the right time. Diesel engines use the heat caused by engine compression to ignite the fuel charge. These engines are called compression ignition engines.

The automobile supplies all the electricity it needs through its electrical system. For example,



the electrical system supplies electricity for the ignition, horn, lights, heater, and starter. The electricity level is maintained by a charging circuit. This circuit consists of the battery, alternator (or generator), and the regulator. The battery stores electricity. The alternator changes the engine's mechanical energy into electrical energy and recharges the battery. The regulator prevents damage to the system by regulating the maximum voltage in the circuit.

The fuel system stores liquid fuel and delivers it to the engine. The fuel is stored in the tank, which is connected to a fuel pump by a fuel line. The fuel is pumped from the fuel tank through the fuel lines. It is forced through a filter (which removes moisture and dirt) into the carburetor, where it is mixed with air, or into the fuel injection system. The fuel is mixed with air to form a combustible mixture in the carburetor, the manifold, or the cylinders themselves.

The exhaust system has four jobs:

1. To collect burned gases from the engine.
2. To remove dangerous emissions that pollutes the air.
3. To reduce exhaust noises.
4. To get rid of the exhaust gases.

Exhaust gases contain carbon monoxide, unburned hydrocarbons, and oxides of nitrogen. Since all of these are harmful, the exhaust system is designed to reduce them as much as possible. In the United States all modern automobiles have emission control systems.

The cooling system removes excessive heat from the engine. The temperature in engine combustion chambers is about $2,000^{\circ}\text{F}$ ($1,094^{\circ}\text{C}$). Since steel melts at around $2,500^{\circ}\text{F}$ ($1,354^{\circ}\text{C}$), this heat must be carried away to prevent engine damage. Air and a coolant are used to carry away the heat. The radiator is filled with a coolant. The water pump circulates this coolant through the hollow walls of the engine block and head. Constant circulation of the coolant through the engine and the radiator removes heat from the engine. Heat also is removed by the radiator fan, which draws air through the narrow fins of the radiator. This system also supplies heat to the passenger compartment and the window defrosters.

The lubrication system is important in keeping the engine running smoothly. Motor oil is the lubricant used in the system. The lubrication system has four functions:

1. It cuts down friction by coating moving parts with oil.
2. It produces a seal between the piston rings and the cylinder walls.
3. It carries away sludge, dirt, and acids.
4. It cools the engine by circulating the motor oil.

To keep this system working efficiently, oil filters and motor oil must be changed regularly. All other moving parts in an automobile must also be lubricated. These include the transmission, differ-





ential, wheel bearings, and steering linkage.

1.2.3 The Power Train

The power train, or drive system, delivers power from the engine to the wheels. Figure 1-4. The power from the engine moves through the transmission. Transmissions are either standard, with a manual shift lever and foot clutch, or automatic.

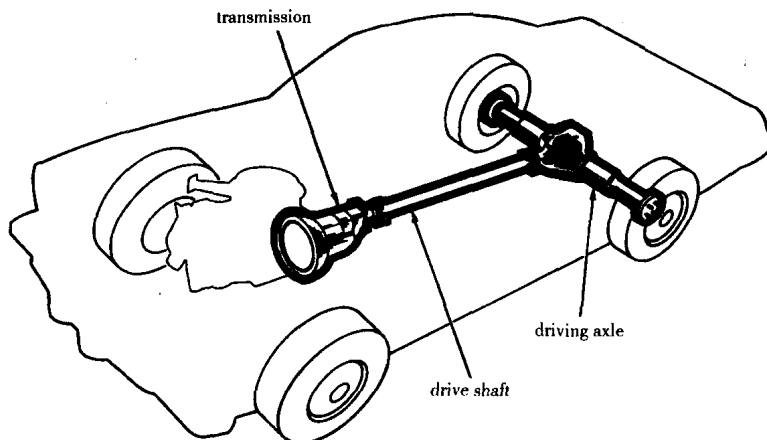


Figure 1-4 The power train, or drive system

The transmission has gears that control the amount of power delivered to the wheels. The transmission increases the power (torque) to start the car moving. This torque is reduced when the transmission changes gears at higher speeds. The transmission also contains a set of gears that can reverse the direction of the wheels. The transmission delivers the power to the differential. A drive (or propeller) shaft with universal joints at either end of the drive shaft allows axle movement on front-engine, rear-wheel drive cars. These flexible universal joints prevent the drive shaft from breaking. The differential delivers power to the wheels through the axle. Certain gears allow one wheel to turn faster than the other wheel when the vehicle is turning a corner.

These are the basic systems of the automobile. Each of the systems is designed for a specific job.

NEW WORDS

- | | |
|--------------|---------------------|
| 1. body | <i>n.</i> 车身 |
| 2. chassis | <i>n.</i> 底盘 |
| 3. enclosure | <i>n.</i> 外壳, 盒子, 套 |





- | | |
|------------------|-----------------------------------|
| 4. hood | <i>n.</i> 发动机罩, 车篷, 车顶 |
| 5. sway | <i>v.</i> 摇摆, 摇动 |
| 6. frame | <i>n.</i> 车架 |
| 7. steering | <i>n.</i> 转向, 操纵 |
| 8. brake | <i>n.</i> 制动 |
| 9. weld | <i>vt.</i> 焊接; <i>n.</i> 焊缝, 焊接 |
| 10. rivet | <i>n.</i> 铆钉; <i>v.</i> 用铆钉铆接 |
| 11. bolt | <i>n.</i> 螺栓, 螺钉; <i>v.</i> 用螺栓联接 |
| 12. washer | <i>n.</i> 垫圈 |
| 13. vibration | <i>n.</i> 振动, 颤动 |
| 14. stabilizer | <i>n.</i> 稳定器, 稳定杆 |
| 15. ride | <i>n.</i> 乘坐舒适性 |
| 16. handling | <i>n.</i> 操作稳定性 |
| 17. linkages | <i>n.</i> 转向传动机构 |
| 18. plier | <i>n.</i> 钳子 |
| 19. distributor | <i>n.</i> 分电器 |
| 20. alternator | <i>n.</i> 交流发电机 |
| 21. regulator | <i>n.</i> (发电机)调节器 |
| 22. carburetor | <i>n.</i> 气化器, 化油器 |
| 23. radiator | <i>n.</i> 散热器, 水箱 |
| 24. defroster | <i>n.</i> 除冰(或霜)装置, 防结冰(或霜)装置 |
| 25. sludge | <i>n.</i> 金属碎屑 |
| 26. transmission | <i>n.</i> 变速器 |
| 27. differential | <i>n.</i> 差速器 |

PHRASES AND EXPRESSIONS

- | | |
|-------------------------------|--------------|
| 1. power train | 传动系 |
| 2. unitized body (or unibody) | 承载式车身, 无大梁车身 |
| 3. suspension system | 悬架系统 |
| 4. steering system | 转向系 |
| 5. braking system | 制动系 |
| 6. shock absorbers | 减振器 |
| 7. control arms | 控制臂 |



8. steering wheel	转向盘
9. steering column	转向管柱
10. steering gears	转向器
11. tie rod	横拉杆
12. idler arm	随动臂
13. brake shoe	制动蹄(片)
14. disc brake	盘式制动器
15. drum brakes	鼓式制动器
16. ignition system	点火系统
17. exhaust system	排气系统
18. lubrication system	润滑系
19. oil filters	机油滤清器
20. drive (or propeller) shaft	传动轴
21. universal joints	万向节

NOTES TO THE TEXT

1. An understanding of how the systems work will help you understand how the automobile works.

了解各个系统如何工作有助于理解汽车是如何工作的。

2. An automobile body is a sheet metal shell with windows, doors, a hood, and a trunk deck built into it.

车身是一个钣金件壳体,它上面有车窗、车门、发动机罩和行李舱门等部件。

3. These support the vehicle and cushion it from road bumps for better ride and handling.

它们(悬架)支撑着车身,并减缓由于路面不平引起的颠簸,以获得更好的乘坐舒适性和操作稳定性。

EXERCISES

I. Answer the following questions:

1. What is the purpose of the rubber body mounts?
2. Why are car bodies streamlined?
3. List the main parts of the electrical system.





4. List the major functions of the exhaust system.

II. Translate the following passage into Chinese:

1. The automobile's further development will be determined by already existing and steadily increasing requirements, by additional further requirements and by the technical possibilities for meeting these requirements. The following focal points for development and research efforts can be discerned:

2. Further improvements of the automobile through product innovation in all classic functions, i.e., performance, fuel economy, environmental impact, safety, comfort, and reliability.

3. Further development of new technologies such as electrics, alternative materials, new test and production methods.

4. Long-range solutions for traffic problems such as highway congestion, smog in cities and carbon dioxide enrichment of our atmosphere.

Reading material: Layout of an Automobile

The layout of different types of vehicles is different. A private car which is to carry up to eight persons is generally four seater.

A car consists of engine located at the front of the vehicle, followed by a clutch, gear box, propeller shaft, universal joint, differential, back axle etc. The radiator is located in front of the engine. Various other parts of the vehicle shown in the layout are dynamo, horn, steering box, fan, timing gear, carburetor, air filter, gear control, steering wheel, cylinder, petrol tank, rear axle. The drive from the gear box is conveyed through a short shaft to the front universal joint of the propeller shaft. From the propeller shaft it is conveyed to the rear universal joint through a sliding splined type of joint. The bevel gear of the short shaft is driven by the rear universal joint. This bevel gear meshes with a larger bevel gear which drives the two rear axle shafts through a differential gear.

The layout also consists of independent front-wheel springing with quarter-elliptic leaf springs, steering column bevel-gear control and hydraulic braking system.

The wheels which are four in number are fitted below the car chassis to support the load of the vehicle and passengers as well as to run the car. They are fitted with hollow rubber tyres filled with air in rubber tubes under sufficient pressure necessary for carrying the load. The shocks caused by





road irregularities are absorbed by them. By fitting springs between the wheels and the vehicle allowing the vertical movement of wheels in relation to vehicle, greater part of unevenness of road surfaces is taken care of.

Front axle is used for steering front wheels carried on stub axles swivelling upon king pins at the axle extremities.

Steering arms and a track rod link the two stub axles together for swivelling them by a steering wheel about the king pins. The steering wheel linked to one of the stub axles by a shaft, a gear box and a suitable linkage is operated by the driver's hand wheel. Previously the axle-a one-piece beam was used to support the vehicle through springs. An arrangement known as independent front suspension has replaced the axle and spring arrangement. Under the control of springs, the wheels are free to rise and fall vertically independently of each other.

For fixing rear wheels, a tube like shaft enclosing driving shafts with suitable bearings for rotating the wheels is used. It is enlarged at the center for enclosing the final-drive gears used for providing main speed reduction between the engine and the driving wheels. The change of direction of the drive from the fore and aft line of the propeller shaft to the transverse line of the axle shafts is also provided by this tube known as rear axle.

When going round a curve, the inner wheel has to travel a smaller distance in comparison to the outer wheel. But both the rear wheels would rotate at the same speed if they are connected by a shaft. This rotation of both the wheels would result in slipping of one or both of them on the road surface causing excessive tyre wear as well as severe twisting loads on the shaft. Moreover, the two wheels of the exactly similar diameter (which is not usually so) can only turn at the same speed without slip on the straight road. Tyres fitted on the opposite sides may be of different states of wear and even tyre of same nominal diameter made by different or same manufacturer may differ in actual dimensions or may not be exactly similar. Due to change of rolling radius (the distance from the wheel center to the ground) the effective size of the tyre may be altered by different inflation pressure also.

Each wheel is provided with its own separate half-shaft connected by a differential gear and meeting at about the center of the axle. The wheels are free to rotate at different speeds although they are provided with equal drive by the differential gear.

For preventing the transmission of shock from uneven road surfaces to the vehicle, springs are used to support the vehicle on the axle.

In order to allow for the vertical movements of the wheels relative to the frame as well as to allow the parts of the shaft to operate at different angle, another increasingly used arrangement is used. It consists of mounting the final-drive gears and the differential gear in a casing attached to

the frame with independently sprung wheels attached to them by means of shafts through devices called universal joints.

Power unit consists of an internal combustion engine. It is usually mounted at the point end of the car. The clutch and the gear box are placed immediately behind it. The three components, engine, clutch and gear box are assembled into a single unit.

For connecting the output shaft of the gear box to the rear axle, a long shaft known as propeller shaft is used. This shaft is either enclosed in a tubular casing or kept exposed or opened with a universal joint fitted at each end for allowing the changes in the shaft alignment with the rise and fall of the rear axle due to road surface variations. Universal joints cannot be eliminated even if the final drive gears are fixed to the frame with the wheel springing independently. Neither the misalignment resulting from the flexing of the vehicle structure over bumpy road surfaces can be avoided nor the precise alignment of shaft can be ensured without them.

For controlling the movement of the vehicles or to stop them, efficient braking system is a necessity for a vehicle. Brakes attached to each of the four wheels are of two types. In the initial type, a pair of shoes carried on a stationary plate is expanded in contact with a rotating drum mounted on the wheels to arrest the motion of the drum. In the modern type of brakes, one or more pairs of pads are carried in a caliper attached to the axle or wheel supporting linkage. The sides of the disk mounted on the wheel are gripped by these pads. By applying pressure on a pedal, the brakes are applied. A hand lever acting through a separate linkage and locked in the on position is used.

For operating the brake, either mechanical or hydraulic system is used. Mechanical system requiring gearing system for mechanical and hydraulic fluid for the hydraulic brakes are used.

NEW WORDS

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|-----------|---------------|
| 1. dynamo | <i>n.</i> 发电机 |
| 2. horn | <i>n.</i> 喇叭 |
| 3. swivel | <i>v.</i> 旋转 |

PHRASES AND EXPRESSIONS

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|-----------------|----------|
| 1. steering box | 转向器 |
| 2. timing gear | 正时齿轮 |
| 3. bevel gear | 锥齿轮, 伞齿轮 |
| 4. mesh with | 与啮合 |

