“十二五”普通高等教育汽车服务工程专业规划教材

交通运输专业英语

Jiaotong Yunshu Zhuanye Yingyu

杨志发　刘艳莉　主编
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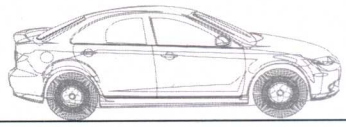

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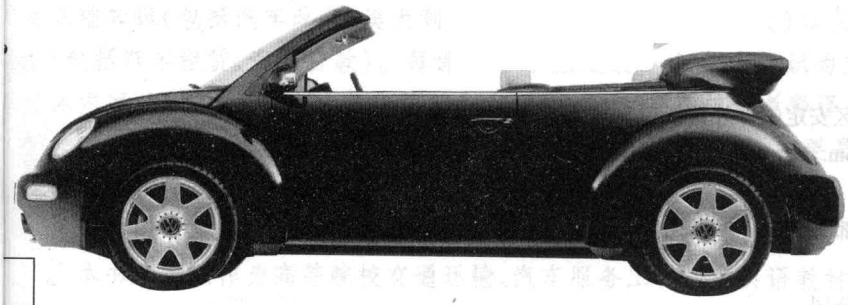

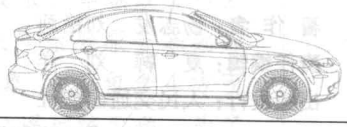

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内 容 提 要

本书根据交通运输(汽车运用工程)、汽车服务工程专业课程内容,系统地选编了汽车结构和汽车服务两大类基本知识共6单元21课。其中汽车结构方面包括发动机、底盘、车身和电气系统等,汽车服务工程方面包括车辆维修与检测、车辆改装与回收以及汽车金融服务等。为了方便学生自学,本书每课中均有专业词汇术语表、重难点句参考释译、练习题等,为扩大学生知识面,每单元配备有1~2篇扩展阅读,最后还配备有词汇表和常用缩略词汇表。

本书为"十二五"普通高等教育汽车服务工程专业规划教材,既可作为高等院校交通运输(汽车运用工程)和汽车服务工程专业"专业英语"课程的教材,也可供具有一定英语基础的汽车全生命周期内生产、售后、维修、管理等部门的技术和管理人员参考。

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前　言

Qianyan

随着我国汽车和交通运输业的快速发展，国际上先进技术和理念越来越多地融入我国交通运输和汽车服务行业的发展中，因而广大消费者对交通运输和汽车服务行业也提出了越来越高的要求。为了满足这种需求，广大交通运输和汽车服务从业人员需要了解更多国际上该行业的技术及产品的发展状况，因此，也对从业人员的专业英语水平提出了更高的要求。

为了适应这种新形势发展的需要，给广大交通运输和汽车服务专业的学生和从业人员提供更加专业和符合该专业发展形势的专业外语学习材料，在人民交通出版社主持下，根据高等院校交通运输和汽车服务专业学生培养目标和要求，在参阅大量国内外交通运输、汽车服务专业文献基础上，我们组织编写了《交通运输专业英语》，使学生对能从专业英语的角度对专业基本知识有更加系统的了解。

本书共分成两部分6个单元21课教学内容。第一部分共3个单元，涵盖汽车构造基础知识（包括汽车发动机总体构造、燃油系统、点火系统、冷却系统、润滑系统、气体供给系统）、汽车底盘基础知识（包括动力传动系统、自动变速器、转向系统、制动系统、悬架和轮胎系统）、以及车身和电器系统（包括车身、汽车电气系统等）；第二部分共3个单元，涵盖车辆维护和检测基础知识（包括汽车维修和检测技术、OBD技术、车载传感技术）、车辆改装和回收基础知识（包括汽车改装、澳大利亚汽车改装法规、车辆回收）以及汽车金融服务基础知识（包括汽车租赁、汽车贷款）。每课以一个主题或一个专业知识为对象，主要包含4方面基本内容：1）专业知识；2）专业词汇和术语表；3）重难点句参考释译；4）课后练习题。为了扩大读者的知识面，在每单元后面附有1~2篇扩展阅读材料，主要是每单元知识点中较前沿的内容和知识。

书末附有单词表和专业缩略词汇表，以方便使用者查阅。

本书既可以作为高等院校交通运输、汽车服务工程专业英语教材，也可以作为高等教育自学考试、成人教育等交通运输和汽车服务相关专业本、专科学生的专业英语教材，还可以作为行业从业人员自学参考用书。

本书由吉林大学杨志发副教授、刘艳莉讲师主编，长安大学陈焕江教授、吉林大学李世武教授主审。编写过程中孙文财讲师、王琳虹讲师、金立生教授、徐艺博士、郭梦竹硕士和于晓东硕士在资料收集、材料组织、文字排版等方面做了大量的工作。具体分工如下：

杨志发撰写 Part I Introduction，Part II Introduction，Unit 1，Unit 3，Unit 5，Unit 6，Abbreviation；

刘艳莉撰写 Unit 2，Unit 4，Glossary；

孙文财参与了 Extension 的撰写，王琳虹参与了 Glossary 的撰写，金立生参与了 Introduction 的撰写。

本书编写过程中，参考了大量的国内外书籍、教材、资料以及相关网站，部分内容引自其中，在此对其原作者表示衷心的感谢！

由于编者水平有限，书中难免存在一些错误和缺点，恳请广大读者、各位专家不吝指教，以使本书更加完善。

编　者

2014 年 3 月于长春

目 录

Mulu

Part I Introduction: Structure of Automobile

The automobile is one of the most fascinating devices that we can own. Automobile is also one of the most pervasive devices.

An automobile contains dozens of different technologies. Everything from engine to tires is its own special universe of design and engineering. But any automobile is made up of four basic sections: engine, chassis, body and electrical system (Fig. 0-1).

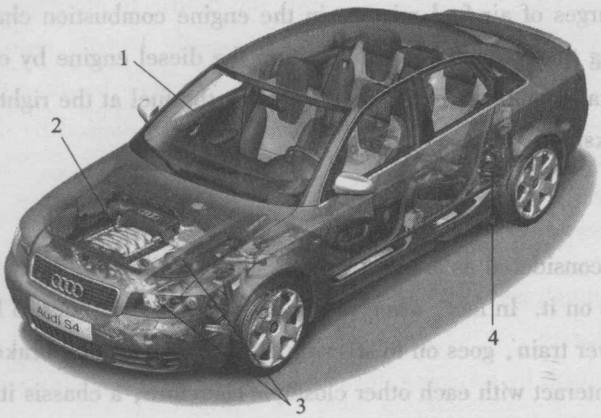

Fig. 0-1 Structure of Automobile

1-Body; 2-Engine; 3-Electrical System; 4-Chassis

Engine

The automobile engine is an internal combustion engine which converts the heat energy of fuel into mechanical energy to make automobile move. In the internal combustion engine, combustible mixture is compressed and then burned inside the engine cylinders. The burning of air-fuel mixture produces high pressure which forces piston to move downward. The movement is transmitted to the crankshaft by the connecting rod. Then the crankshaft is made to rotate. The rotary motion is carried through the power train to the wheels so that they run and the automobile moves.

As the source of power, the engine requires a fuel system to supply with fuel or the mixture of air and fuel. It plays a vital role in the power-producing process. Suppose the engine is a gasoline engine, the fuel system pumps liquid gasoline from a tank into the carburetor where the gasoline can be mixed with air. The mixture is delivered to the cylinder where it is burned. If the engine is EFI engine, fuel is delivered from the tank to the injector by means of an electric fuel pump. The fuel injectors, which directly controls fuel metering to the intake manifold, is pulsed

by ECU. ECU determines the air/fuel ratio according to engine condition.

Engine also needs a cooling system, because the combustion of the air-fuel mixture in the cylinder creates a very high temperature (as high as 2000K to 2700K). The cooling system takes heat away from engine by either circulating liquid coolant (water mixed with antifreeze) between the engine and a radiator, or passing air through the radiator. Today, liquid-cooled engines are common. It cools off as it goes through the radiator. Thus, the coolant continually takes heat away from the engine, where it could do damage and delivers it to the radiator.

Engine also includes a lubricating system. The purpose of lubricating system is to supply all moving parts inside the engine with lubricating oil; the oil keeps the moving parts from wearing excessively.

The fourth is a starting system and its purpose is to change electrical power into mechanical energy to push the crankshaft around. By means of this, the engine can be started.

The way to produce heat energy is different between gasoline and diesel engines; there is only an ignition system in gasoline engine. The ignition system provides high-voltage electric sparks that set fire to the charges of air-fuel mixture in the engine combustion chambers. However, the heat energy for igniting the charges is created within the diesel engine by compressing pure air to a degree that will initiate combustion and then injecting the fuel at the right time in relation to the movement of the crankshaft.

Chassis

Chassis which is considered as a support frame for an automobile body is used to assemble all automobile spare parts on it. In fact, when power from engine continues to be transmitted to chassis, it begins with power train, goes on to steering, wheel suspension, brakes and tires. These individual components interact with each other closely. Therefore, a chassis itself can be divided into the following systems.

Driving system connects the transmission with the driving axle. In effect, the driving system works by transmitting engine power to the driving wheels. The driving system consists of the clutch, transmission, universal joint, driving axle, etc.

Steering system is used to control driving direction of an automobile. It is composed of the steering wheel, steering column, worm gear sector, steering drop arm and worm.

Brake system is a balanced set of mechanical and hydraulic devices used to retard the motion of the vehicle by means of friction. It consists of the drum or disc brake assembly, brake lever assembly, etc.

Body

The automobile body which is regarded as the framework is seated on the chassis. Its function is obvious for occupants to provide comfort, protection and shelter. The automobile body is generally divided into four sections: the front, the upper or top, rear and the underbody. These sections are further divided into small units, such as hood, fenders, roof panel, doors, instrument panel, bumpers and luggage compartment.

Electrical System

The electrical system is considered an auto electric power source supplies lighting power for the automobile. The electrical system contains battery, lights, generator, engine ignition, lighting circuit, and various switches that control their use.

With the rapid development of automobile industry, the new models of automobiles are becoming better and better in design and performance. When automobiles are very popular with people, many negative problems corresponding to the facts have to be considered by scientists, such as energy crisis, air pollution and traffic jam. So scientists and automobile manufacturers are doing their best to improve fuel economy, control exhaust emissions; the governments are taking active measures to resolve traffic problems at the same time.

Unit 1 Engine

Lesson 1
Engine Construction

Engine block (Fig. 1-1) forms the main framework, or foundation, of the engine. The block is cast mainly from gray iron or iron alloyed with other metals such as nickel or chromium. However, some blocks have been made from aluminum. In any case, the block itself has many components cast into it or assembled onto it.

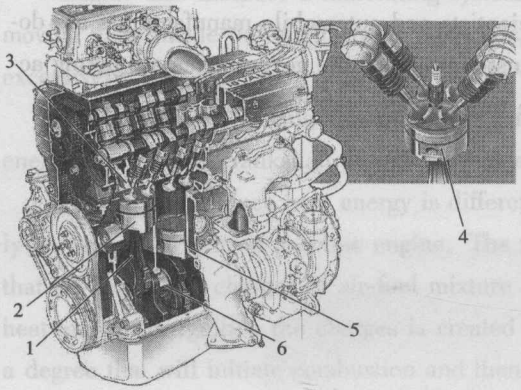

Fig. 1-1 Engine Construction

1- Connecting rod; 2- Piston; 3- Cylinder head; 4- Piston ring; 5- Piston clearance; 6- Crankshaft

Cylinders are cast into the block. The cylinders are circular, tubelike openings in the block, which act as guides for the pistons as they move up and down. In aluminum blocks, the manufacturer usually installs cast-iron or steel cylinder sleeves (liners) because these metals can withstand the wear caused by the moving pistons better than aluminum can. Water jackets are also cast into the block. The water jackets are open spaces between the inner and outer surfaces of the block and cylinders through which the coolant flows. Finally, the block has cast-in bores for both the camshaft and crankshaft.

Many parts also attach by fastening devices to the average engine block. These items include water pump, oil pan, timing gear or chain cover, flywheel or clutch housing, ignition distributor, oil and fuel pump, and cylinder head. Ignition distributor usually attaches to the block via a C-shaped clamp and a cap screw. Oil pump usually mounts to the upper crankcase area of the block.

1.1 Cylinder Head

Cylinder head (Fig. 1-2) is bolted to a very flat surface above the cylinder portion of the block. The manufacturer casts the head in one piece from iron, from iron alloyed with other metals, or from aluminum alloy. Aluminum has the advantage of combining lightness with rather high heat conductivity. This means simply that an aluminum head tends to operate cooler, other factors being equal.

Depending on the style of engine, the cylinder head serves many functions. For example, in all engine types the head forms an upper cover for the cylinders; therefore, the head forms the upper portion of the combustion chamber. All modern heads provide an access point into the combustion chamber for the spark plug.

The final major components attached to the head are the manifolds: one intake and one or

more exhaust.

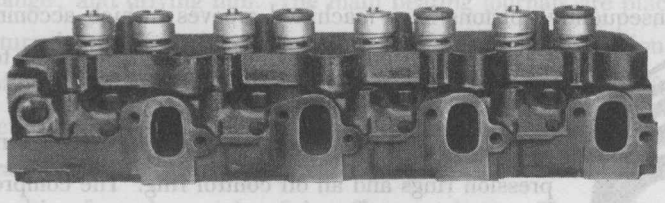

Fig. 1-2 Cylinder head

1.2 Pistons

The engine manufacturer fits a piston into each cylinder of the engine. Piston (Fig. 1-3) is a movable part or plug that receives the pressure from the burning air/fuel mixture and converts this pressure into reciprocating (up-and-down) motion. In other words, a piston will move within the cylinder due to the force exerted on it by the pressure of the ignited air/fuel mixture.

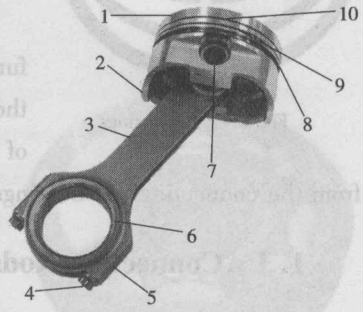

Fig. 1-3 The Piston

1-Piston crown; 2-Piston skirt; 3-Connecting rod shaft; 4-Connecting rod bolt; 5-Connecting rod cap; 6-Bearing; 7-Wrist pin; 8-Oil control ring; 9-Second compression ring; 10-Top compression ring

Manufacturers make most engine pistons from aluminum, which is less than half the weight of iron. Iron pistons were common in early automotive engines. However, aluminum expands faster than iron with increasing temperatures; since the block is iron, in most cases, the manufacturer must provide special provisions in the piston to maintain the proper piston-to-cylinder wall clearance at engine-operating temperature.

1.2.1 Piston Clearance

Piston clearance is the distance between the outer circumference of the piston and the cylinder wall itself. This clearance varies somewhat with different engine designs, but it is usually in the neighborhood of 0.001 to 0.004 inch. In operation, oil fills this clearance so that the piston moves on films of lubricating oil.

If this clearance is too small, for whatever reason, several problems can develop. For instance, the engine will lose power due to excessive friction. Also severe wear and possible seizure of the piston to the cylinder wall can occur in an engine with tight pistons. Of course, piston seizure will result in complete engine failure.

On the other hand, excessively large clearance can result in piston slap-a sudden tilting of the piston in the cylinder as the piston stars down on the power strokes. The piston itself actually shifts from one side of the cylinder to the other, with sufficient force to produce a distinct noise, the piston slap.

1.2.2 Piston Rings

Some operating clearance must exist between the piston and the cylinder wall; however, some form of seal is necessary between the piston and the cylinder wall to prevent blowby. Blowby describes the escape of unburned and burned gases from the combustion chamber, past the pis-

ton, and into the crankcase. The manufacturer cannot fit a piston to a cylinder close enough to prevent blowby. Consequently, pistons have machined grooves, which accommodate piston rings (Fig. 1-4) used to provide the necessary seal to eliminate blowby and to control oil consumption.

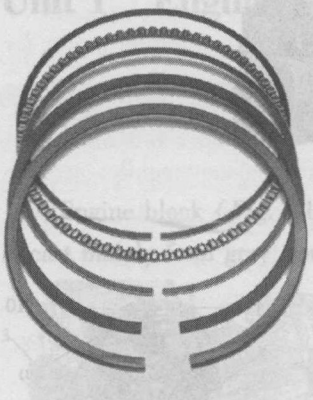

Fig. 1-4 Piston rings

Every automotive-type pistons have two kinds of rings: compression rings and an oil control ring. The compression rings, which fit into the upper two ring grooves, primarily seal against the loss of air/fuel mixture as the piston compresses it and also the combustion pressure as the mixture burns.

The oil control ring usually fits into the lower ring groove. Its function is to prevent excessive amounts of oil from working up into the combustion chamber. When an engine is operating, a great deal of lubricating oil deposits on the cylinder walls due to throw-off of oil from the connecting-rod bearings.

1.3 Connecting Rods

As mentioned earlier, the piston moves up and down in the cylinder, in a reciprocating motion. In order to rotate the drive wheels, a connecting rod (Fig. 1-5) and crankshaft must change reciprocating motion to rotary. The connecting rod itself attaches at one end to the piston and on the other end to the crankpin section of the crankshaft.

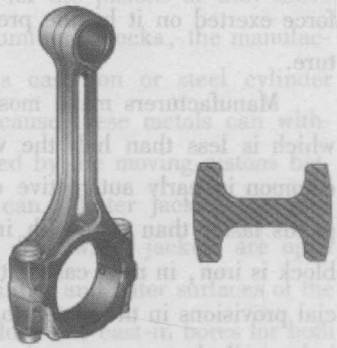

Fig. 1-5 Connecting rod

1.4 Crankshaft

Crankshaft (Fig. 1-6) is the main rotating member, or shaft, of the engine. Its function, along with the connecting rod, is to change the reciprocating motion of the piston to rotary. In addition, the crankshaft is responsible for driving the camshaft through timing gears or a timing chain and sprockets, plus operating the accessories via a system of belts and pulleys. Lastly, the crankshaft carries the total torque-turning or twisting effort-produced by the engine and delivers it to the flywheel. From the flywheel the torque then passes either to the friction clutch assembly or to the torque converter.

In order to perform these functions, the crankshaft must possess considerable mechanical strength, but it also must have a design that permits it to operate in balance. To provide the crankshaft with the required strength to take the downward thrusts of the pistons without excessive distortion, manufacturers cast or forge the crankshaft in one piece from heat-treated alloy steel.

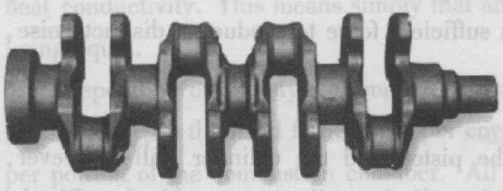

Fig. 1-6 The Crankshaft

Designed into the one-piece crankshaft are areas for main bearing journals, crankpins, counter-

weights, flywheel flange, and driving hub. The main bearing journals are places on the shaft that permit the shaft to turn in the main bearings, supported in the lower section of the block. The crankpin is a part of the crankshaft that is offset from the centerline of the shaft; it is at the crankpins that the connecting rods attach. The counterweights are located on the crankshaft opposite to each of the offset crankpins. These weights provide the crankshaft with balance by eliminating the undue vibration, resulting from the weight of the offset crankpins. The flywheel flange is the area at the rear and of the crankshaft, where the flywheel attaches; and the driving hub is the extended section, at the front end of the crankshaft, where the vibration damper mounts.

1.5 Flywheel

Flywheel (Fig. 1-7) is a comparatively heavy wheel, bolted to the flange on the rear end of the crankshaft. Its function is to keep the engine running smoothly between power strokes. In all engines, even those with overlapping power strokes, there are times when more power is available to the crankshaft than at other times. This tendency makes the crankshaft speed up and then slows down.

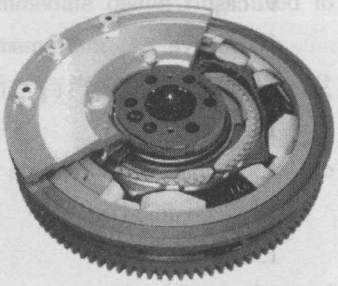

Fig. 1-7 The Flywheel

However, the flywheel combats this tendency. Its inertia tends to keep the flywheel rotating at a constant speed. In other words, the flywheel absorbs energy as the crankshaft tries to accelerate and returns energy back as it attempts to slow down.

The flywheel also has several other functions. For example, the flywheel has gear teeth around its outer circumference. These teeth mesh with teeth located on the starting motor drive pinion in order to crank the engine over. In addition, the rear surface of the flywheel serves as the driving member of the clutch assembly on vehicles so equipped.

1.6 Vibration Damper

Manufacturers usually install a combination vibration damper and fan-pulley assembly onto the drive end of the crankshaft. This damping device controls torsional vibrations. When a piston moves down on its power stroke, it thrusts through the connecting rod against the crankpin with a force that may exceed 3 tons. This force tends to twist or drive the crankpin ahead of the rest of the crankshaft. Then, in a moment, the termination of the power stroke relieves the force on the crankpin. The pin now tends to untwist or snap back into its original relationship with the rest of the crankshaft. This twist-untwist tendency repeated with every power stroke can set up an oscillating motion in the crankshaft, known commonly as torsional vibration. If not controlled, these oscillations can build up so much that a crankshaft may actually break at certain speeds.

A typical vibration damper consists basically of two parts—a damper flywheels and a pulley-bonded to one another by a rubber insert.

Technical Words and Terms

1. cylinder	*n.* 汽缸
2. crankshaft	*n.* 曲轴
3. flywheel	*n.* 飞轮
4. piston	*n.* 活塞
5. framework	*n.* 架构,框架,结构
6. foundation	*n.* 基础,根本
7. nickel	*n.* [化]镍
8. aluminum	*n.* [化]铝
9. cast	*n.* 铸件;*v.* 浇铸
10. sleeve	*n.* 套管,轴套,衬套,缸套
11. coolant	*n.* 冷冻剂,冷却液,散热剂
12. bore	*n.* 枪膛,孔;*v.* 钻孔
13. camshaft	*n.* 凸轮轴
14. accommodate	*vt.* 供给,容纳
15. attach	*vt.* 系上,贴上,使依附
16. crankcase	*n.* 曲轴箱
17. chain	*n.* 链(条)
18. clamp	*n.* 夹子,夹具,夹钳;*vt.* 夹住
19. bolt	*n.* 螺栓;*v.* 用螺栓紧固
20. reciprocating	*adj.* 往复的
21. circumference	*n.* 圆周,周围
22. seizure	*n.* 卡死,卡住,咬住
23. slap	*vt.* 拍,拍击;*n.* 拍
24. tilt	*v.* (使)倾斜,翘起
25. blowby	*n.* 曲轴箱窜气
26. sprocket	*n.* 链轮齿
27. crankpin	*n.* 曲柄销
28. flange	*n.* 边缘,轮缘,凸缘
29. inertia	*n.* 惯性,惯量
30. untwist	*n.* 拆开,解开
31. cylinder head	*n.* 汽缸盖
32. connecting rod	*n.* 连杆
33. oil control ring	*n.* 油环
34. piston clearance	*n.* 活塞间隙

Notes

1. The engine block forms the main framework, or foundation, of the engine.
发动机汽缸体是发动机的主要框架或基础。

2. The water jackets are open spaces between the inner and outer surfaces of the block and cylinders through which the coolant flows.

汽缸体和汽缸的内、外表面之间具有一个连通的空隙,冷却液在此空间内循环流动,此即为水套。

3. The piston is a movable part or plug that receives the pressure from the burning air/fuel mixture and converts this pressure into reciprocating (up-and-down) motion.

活塞是运动部件,可燃混合气燃烧时对活塞产生强大的压力,使活塞上下往复运动。

4. Piston clearance is the distance between the outer circumference of the piston and the cylinder wall itself.

活塞间隙是指活塞外表面与汽缸壁之间的间隙。

5. Consequently, pistons have machined grooves, which accommodate piston rings used to provide the necessary seal to eliminate blowby and to control oil consumption.

因此,在活塞上加工出多个环槽,环槽中安装活塞环,实现活塞与汽缸壁间密封,防止发动机窜气,减少润滑油消耗。

6. The connecting rod itself attaches at one end to the piston and on the other end to the crankpin section of the crankshaft.

连杆的一端与活塞相连,另一端与曲柄销相连。

7. In order to perform these functions, the crankshaft must possess considerable mechanical strength, but it also must have a design that permits it to operate in balance.

要实现这些功能,曲轴必须具有足够的机械强度,同时在设计上要求曲轴运转平稳。

8. In addition, the rear surface of the flywheel serves as the driving member of the clutch assembly on vehicles so equipped.

另外,在安装了离合器的车辆上,飞轮后端也是离合器总成的主动件。

9. This twist-untwist tendency repeated with every power stroke can set up an oscillating motion in the crankshaft, known commonly as torsional vibration.

多汽缸做功行程对曲轴产生的重复扭曲和反向扭曲形成了曲轴扭转摆动,即为常说的曲轴扭转振动。

Exercises

Questions for discussion

1. What's the main framework of an engine?
2. What are the two types of piston rings? What are their functions?
3. What's the purpose of the connecting rod?
4. What is the function of the flywheel?

Fill in the blank according to the text

1. In aluminum blocks, the _____ usually installs cast-iron or steel cylinder sleeves (liners) because these metals can withstand the wear caused by the moving pistons better than _____ can.
2. For instance, the engine will lose power due to _____ _____.
3. Blowby describes the escape of unburned and burned gases from the _____ _____,

past the _____, and into the _____.

4. Automotive-type pistons have two kinds of rings; _____ and _____ control.

5. Its function, along with the connecting rod, is to change the _____ _____ of the piston to rotary.

6. Lastly, the crankshaft carries the total torque-turning or twisting effort-produced by the engine and delivers it to the _____.

Lesson 2
Engine Fuel System

The function of fuel system is to store and supply fuel to the cylinder chamber where it can be mixed with air, vaporized, and burned to produce energy. Different components are used in a fuel system (Fig. 1-8).

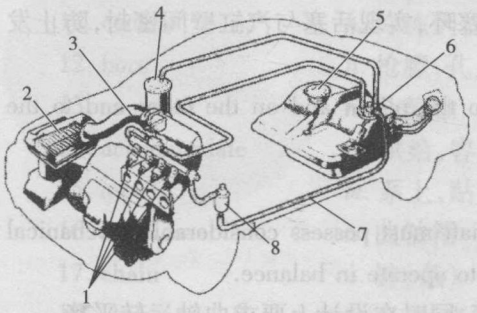

Fig. 1-8 Engine Fuel System

1-Fuel injectors; 2-Air cleaner; 3-Fuel pressure regulator; 4-Evaporative emission control canister; 5-Fuel gauge sending unit; 6-Fuel pump; 7-Fuel line; 8-Fuel filter

2.1 Fuel Tank

Fuel tank is used to store the fuel needed by the engine. It is usually located at the rear of the vehicle and is attached to the vehicle frame with metal traps. In order to strengthen the tank as well as to prevent surging of fuel when the vehicle rounds a curve, rapidly starts or suddenly stops, baffle plates are attached to the inside of the tank.

The fuel cap on the fuel tank is used to keep the fuel from splashing out, release the vacuum created by the fuel removing, and prevent vapors from escaping directly into the atmosphere.

2.2 Fuel Line

Fuel lines are metallic tubes or synthetic rubber hoses. They carry the fuel from the tank to the fuel pump, from the pump to the carburetor or a fuel injector, return excess fuel to the tank, and carry fuel vapors.

2.3 Fuel Pump

Fuel pump draws the fuel from the tank through fuel lines and delivers it through a fuel filter to either a carburetor or a fuel injector, then delivers it to the cylinder chamber for combustion.

There are two types of gasoline engine pumps: mechanical fuel pumps and electric fuel pumps. All fuel injected automobiles today use electric fuel pumps, while most carbureted automobiles use mechanical fuel pumps.

The mechanical fuel pump is driven by the camshaft. There is a cam or an eccentric lobe on the camshaft. As the camshaft turns, the lobe lifts a lever up and down, causing a pumping ac-