

Unit 2 Introduction to Automobile Engine

Passage A Engine Construction (I) (发动机构造)

The automobile is designed to travel on roads. The typical automobile has just an internal combustion engine (内燃机) that operates by burning its fuel inside the engine and makes the automobile move. So an engine is the heart of an automobile. See figure 2-1.

A typical automobile engine consists of cylinder block, cylinder head, camshaft, valves, spark plug, piston and piston rings, connecting rod, crankshaft, flywheel and oil pan. (气缸体, 缸盖, 凸轮轴, 气门, 火花塞, 活塞, 活塞环, 连杆, 曲轴, 飞轮, 油底壳) See figure 2-2.

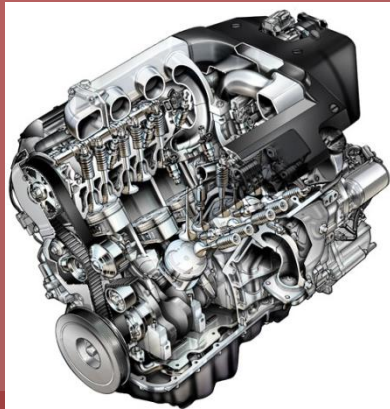


Figure 2-1 Engine

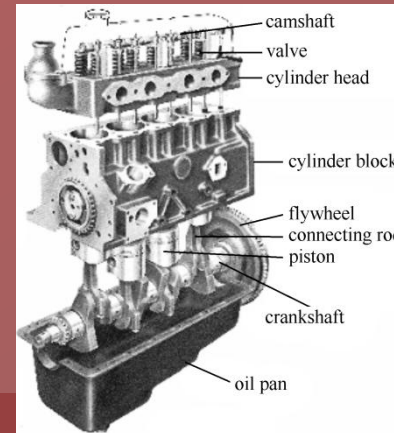


Figure 2-2 Main parts of an engine

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Passage A Engine Construction (I)

Cylinder Block (气缸体)

Cylinder block or **engine block**, as shown in Figure 2-3, is a **single machined casting unit**. (经加工而成的单一铸件) It contains the **cylinders and the water coolant and lubricant passages**. (气缸, 冷却液水道, 润滑道) So it is a complicated part at the heart of an engine. Cylinder block is usually **made from cast iron or in modern engines, aluminum and magnesium**. (铸铁, 铝合金, 镁合金)



Figure 2-3a
Inline-engine block



Figure 2-3b V-engine block

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Cylinder Head (缸盖)

A cylinder head is a casting generally made from iron or aluminum (铁铸件或铝铸件) that holds the valves, spark plugs and one or two camshafts (overhead cam engine only). (用于固定气门, 火花塞和一个或两个凸轮轴) The cylinder head has machined surfaces to provide a precision fit to mate parts. Inline four- and six-cylinder engines have one cylinder head. (直列的四缸或六缸发动机有一个缸盖) V6 and V8 engines have two cylinder heads. (六缸和八缸发动机有两个缸盖) The head is essentially a flat plate of metal (金属平板) bolted to the top of the cylinder block with a gasket (密封垫) in between. (用螺栓固定在气缸体顶部)



Figure 2-4a Cylinder head(from bottom)
| Automobile English



Figure 2-4b Cylinder head(from top)

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Camshaft (凸轮轴)

The key parts of any camshaft are the lobes. (凸轮) As the camshaft spins (旋转), the lobes open and close the intake and exhaust valves (进气门和排气门) in time with the motion of the piston. It turns out that there is a direct relationship between the shape of the cam lobes and the way the engine performs in different speed ranges. See figure 2-5.

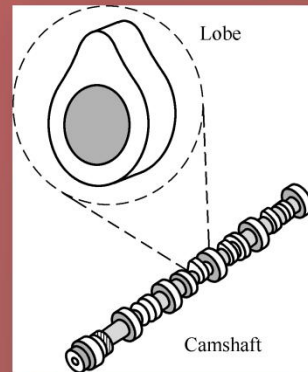


Figure 2-5a Camshaft

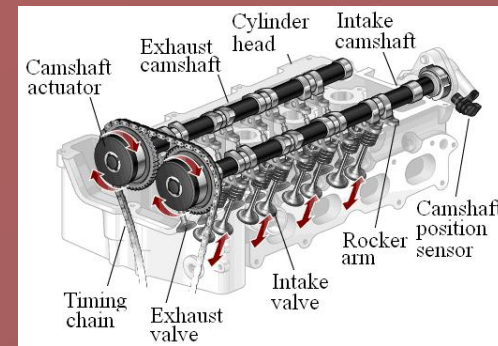


Figure 2-5b Double Camshafts

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Passage A Engine Construction (I)

Valves (气门)

Valves (Figure 2-6) are usually made from a steel alloy (钢铁合金). Exhaust valves must withstand extremely high temperatures up to 815 degrees Celsius without damaging the valve. The valve face must seat evenly against the valve seat in the cylinder head to prevent leaks from the cylinder during the compression and power strokes. Many valve faces and seats have an angle of 45 degrees.

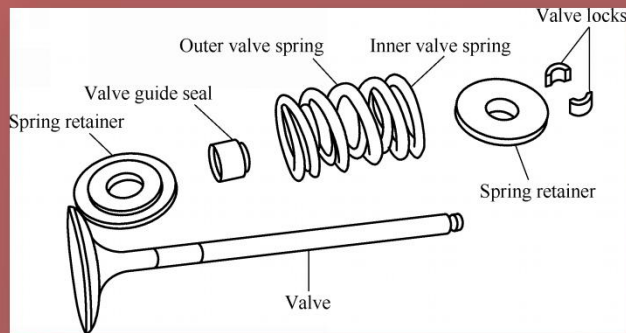


Figure 2-6a Valve Assembly

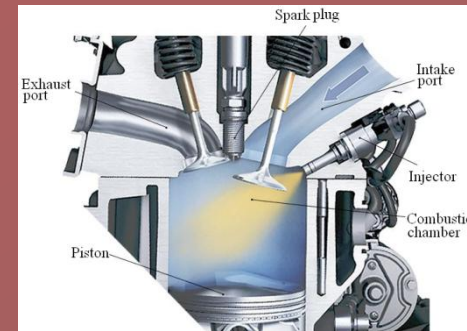


Figure 2-6b Camshaft Valve

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Passage A Engine Construction (I)

There are intake valves and exhaust valves. (进气门和排气门) On the intake side, the intake valve opens which lets the air-fuel mixture into the combustion chamber. At some point, the intake valve closes, the air-fuel mixture is compressed and ignited by the spark plug. Then the exhaust gas exits the cylinder when the exhaust valve opens (Figure 2-6b). **There are always at least one intake and one exhaust valve. Some cylinder heads have 2 intake and 2 exhaust valves.** (气门至少有一个进气门和一个排气门, 有些气缸盖有两个进气门和两个排气门)

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Spark Plug (火花塞)

A spark plug is an electrical device that fits into the cylinder head of some internal combustion engines and ignites compressed air-fuel mixture by means of an electric spark. (火花塞是一个电器装置, 装配在一些内燃机气缸盖中, 用电火花点燃空气燃油混合气。) Spark plugs have an insulated center electrode which is connected by a heavily insulated wire to an ignition coil on the outside. See figure 2-7. **The spark plug forces electricity to arc across a gap.** (火花塞使电产生电弧, 击穿火花塞间隙) The electricity must be at a very high voltage in order to travel across the gap and create a good spark. **Voltage at the spark plug can be anywhere from 40,000 to 100,000 volts.** (火花塞产生的电压可以在40000-100000V之间)



Figure 2-7 Spark plug

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Notes

1. A cylinder head is a casting generally made from iron or aluminum that holds the valves, valve springs and one or two camshafts (overhead cam engine only). 汽缸盖通常是铁铸件或是铝铸件，用于固定气门、气门弹簧和一个或两个凸轮轴（顶置凸轮轴发动机）。

2. The head is essentially a flat plate of metal bolted to the top of the cylinder block with a gasket in between. 基本来说，缸盖是个金属平板，用螺栓固定在汽缸体的顶部，两者之间有个密封垫。

3. It turns out that there is a direct relationship between the shape of the cam lobes and the way the engine performs in different speed ranges. 原来凸轮凸角的形状和发动机在不同转速的运行方式有着直接的关系。

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Notes

4. The valve face must seat evenly against the valve seat in the cylinder head to prevent leaks from the cylinder during the compression and power strokes. 气门锥面必须平稳地安装在缸盖的气门座上，以防止在压缩冲程和工作冲程时（空气燃油混合气）从汽缸泄露。

5. A spark plug is an electrical device that fits into the cylinder head of some internal combustion engines and ignites compressed air-fuel mixture by means of an electric spark. 火花塞是一种电气装置，装配在一些内燃机汽缸盖中，用电火花点燃空气燃油混合气。

6. The spark plug forces electricity to arc across a gap. 火花塞使电产生电弧，击穿火花塞间隙。

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New Words

combustion [kəm'brʌstʃən] n. 燃烧
cylinder ['silində] n. 汽缸, 圆筒, 圆柱体
camshaft ['kæmʃɑ:ft] n. 凸轮轴
valve [vælv] n. 阀门, 气门
piston ['pistən] n. 活塞
crankshaft ['kræŋkʃɑ:ft] n. 曲轴
flywheel ['flaiwi:l] n. 飞轮
casting ['kɑ:stɪŋ] n. 铸件
contain [kən'tein] v. 包含, 容纳, 含有
coolant ['ku:lənt] n. 冷冻剂, 冷却液
passage ['pæsɪdʒ] n. 通道
complicated ['kɒmplikeɪtɪd] a. 复杂的
aluminium [ælju'mɪniəm] n. 铝

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New Words

magnesium [mæg'ni:zjəm] n. 镁
surface ['sə:fis] n. 表面, 平面
precision [pri'si ən] a. 精确的
mate [meit] v. 使.....配对, 使.....一致
bolt [bɒlt] v. 用螺栓连接, 用螺栓固定 n. 螺栓
gasket ['gæskit] n. 衬垫, 垫圈
lobe [ləub] n. 圆突, 凸起部
withstand [wið'stænd] v. 经得起
device [di'vais] n. 装置, 设备
ignite [ig'nait] v. 点燃, 使燃烧
insulated ['insjuleitid] a. 绝缘的
electrode [i'lektroʊd] n. 电极
ignition [ig'nifən] n. 点火, 着火
voltage ['vəʊltidʒ] n. 电压
volt [vɒlt] n. 伏特

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Phrases and Expressions

internal combustion engine 内燃机
consists of 由.....组成
cylinder block 汽缸体
cylinder head 汽缸盖
spark plug 火花塞
piston ring 活塞环
oil pan 油底壳
valve spring 气门弹簧
overhead cam engine 顶置凸轮轴发动机
flat plate 平板
connecting rod 连杆
cam lobe 凸轮凸角
intake valve 进气门
exhaust valve 排气门

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Phrases and Expressions

intake and exhaust valve 进排气门

steel alloy 合金钢

valve seat 气门座

compression stroke 压缩冲程

air-fuel mixture 空气燃油混合气

by means of 用，凭借

insulated wire 绝缘线

ignition coil 点火线圈

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EXERCISE 1

Mark the following statements with T (True) or F (False) according to the passage.

1. By burning its fuel, the engine makes the automobile travel on road. **T**
2. An automobile engine includes cylinder block, cylinder head, camshaft, valves, spark plug, piston and piston rings, connecting rod, crankshaft, flywheel and oil pan. **T**
3. Cylinder block or engine block is actually a complex machined casting unit. **F**
4. A cylinder head is a casting only made from iron. **F**
5. The electricity must be at a very low voltage in order to travel across the gap and create a good spark. **F**

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EXERCISE 2

Translate the following phrases into Chinese or English.

1. internal combustion engine
2. **ignition coil**
3. power stroke
4. **intake and exhaust valve**
5. valve seat
6. **oil pan**
7. cylinder block
8. **compression stroke**
9. piston ring
10. **spark plug**

内燃机

点火线圈

做功冲程

进排气门

气门座

油底壳

气缸体

压缩冲程



活塞环

火花塞

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EXERCISE 3

The following are some expressions for the famous brands. Match the following brands in Column A with their Chinese equivalents in Column B.

A		B
1. 	C	A. Lincoln 
2. 	I	B. MG 
3. 	A	C. Land Rover 




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EXERCISE 3

4.		H	D. Maybach	
5.		B	E. Mazda	
6.		J	F. Mercedes-Benz	
7.		D	G. Mega	
8.		E	H. Lotus	

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EXERCISE 3

9.		G	I. Lexus	
10.			F	J. Maserati