

UNIT

6

Air Conditioning of Motor Vehicles**Structure**

- 6.1 Necessity of automobiles air conditioning
- 6.2 Construction and working of passenger car air conditioning.

Learning Objectives

After studying this unit, the student will be able to understand

- The necessity of automobile air conditioning
- Constructional details and working of it

6.1 Necessity of Automobiles Air Conditioning

The air conditioning of automobiles is very essential to maintain human comfort and improve internal atmosphere of an automobile in an enclosed space. It is required for proper control of freshness, temperature, humidity and cleanliness of air which is done by automobile air conditioning.

Working Principle

In an automobile air conditioning system, three main processes of heating, cooling and dehumidification are involved.

The heat required to warm the automobile is derived from the engine coolant or circulating warm water after passing through a heating coil. For

producing cooling effect an evaporator coil is placed inside the chamber of automobile. The air to be circulated inside the passenger compartment is cooled by the evaporator coil. The dust particles are entrapped by the wet surfaces of the evaporator core and are drained off with the condensed moisture. This provides clean and pure air for breathing.

6.2 Construction and working of passenger car air conditioning

The automobile air conditioning system includes compressor magnetic clutch condenser, receiver-drier-strainer, expansion valve, evaporator, blower and the air distributor system.

Compressor : It is driven by a belt from the crankshaft pulley. A magnetic clutch engages the compressor shaft. The applied voltage to compressor clutch coil, the clutch plate is locked by the magnetic force and the compressor shaft is turned with the pulley. When the voltage is interrupted the springs in the clutch plate and hub assembly automatically moves the plate away from the pulley which causes the compressor to stop. The compressor compresses the refrigerant to a maximum of about 20 kgf/cm^2 at 100°C .

Magnetic clutch : It is essentially controlled and is housed in pulley assembly. Its controlling switch is provided in the controlling panel. In the off or vent position the compressor and its clutch are off. In other four positions of the selector switch, the clutch is engaged or disengaged depending upon the temperature of air.

Condenser : Condenser is basically a fin and tube radiator. It is usually placed in front of radiator. It receives heated and compressed refrigerant vapour from the compressor and is cooled by the air passing across the condensers.

Receiver - driver (or Dehydrator)

The refrigerant is stored under pressure in the receiver-driver. The pressure in the receiver lies in between 5 kg/cm^2 to 20 kg f/cm^2 depending upon the compressor speed and surrounding air temperature. The drier removes any traces of moisture present in the system to avoid freezing of moisture at low temperature. Drier is usually a silica gel filter that absorbs any water.

Expansion valve : The refrigerant goes from dehydrator to expansion valve where a sudden expansion to a much lower pressure occurs. The refrigerant changes back to vapour state and this causes cooling effect. It is operated by opposing pressures on either side of the diaphragm.

Evaporator : It is located inside the passenger compartment. It gives cooling effect . A high capacity blower circulates the air in the interior part of the vehicle across the evaporator coils and this drops the temperature. The heat picked up by the refrigerant goes back to the compressor in the form of vapour where the refrigerant is again compressed to a high pressure.

Suction throttling valve : It ensures that the refrigerant in the evaporator stays at such a pressure that the evaporator core surface temperature does not fall below the freezing point of water (0°C), thus preventing ice formation in the evaporator.

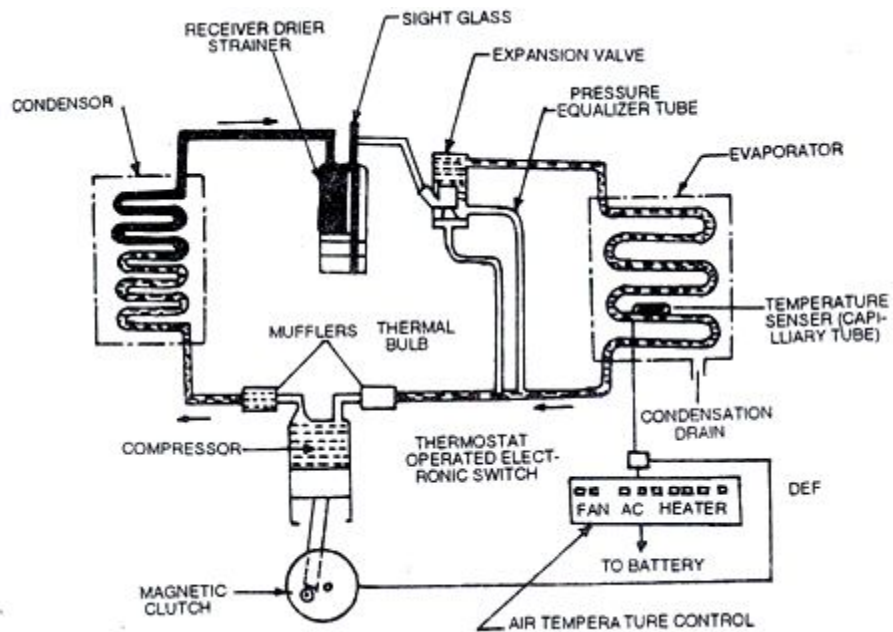


Fig 6.1 Automobile air-conditioning system

Summary

The air conditioning of automobiles is very essential to maintain comfort and improve internal atmosphere of an automobile in an enclosed space.

In automobile air conditioning, there main processes of heating, cooling and dehumidification are involved.

Main parts of Automobile air conditioning are compressor, magnetic clutch, condenser, receiver - drier, strainer, expansion valves, evaporation, blower and air distributor system.

Short Answer Type Questions

1. What is the necessity of Automobile air conditioning?
2. What is the working principle of automobile air conditioning?

Long Answer Type Questions

1. Briefly explain the construction and working of Automobile air conditioning with neat sketch.