

Dry type air cleaner

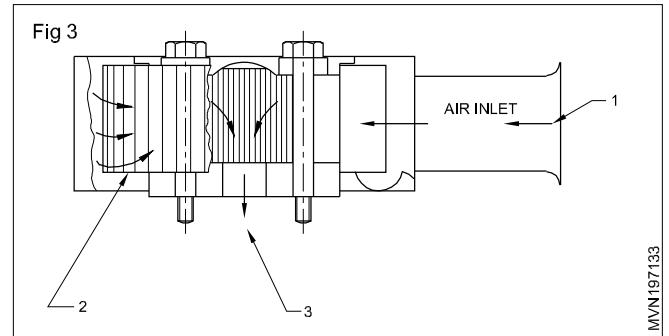
In this type of air cleaner, a specially treated paper element is used to filter the intake air.

Function

The atmospheric air enters the air cleaner (Fig 3) through the air entrance (1) and passes through the paper element (2). The filtered clean air goes to the intake manifold entrance (3).

Intake manifold

The intake manifold is connected with air cleaner and cylinder head intake port of the cylinder head. It allows the fresh air to flow from air cleaner to cylinder through inlet valve. The intake manifold is made of a cast iron or aluminium.



Manifolds and silencer

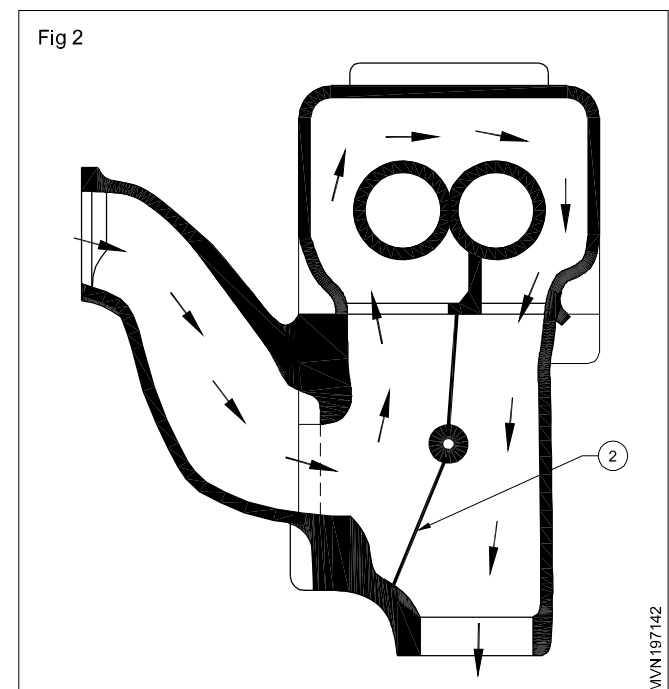
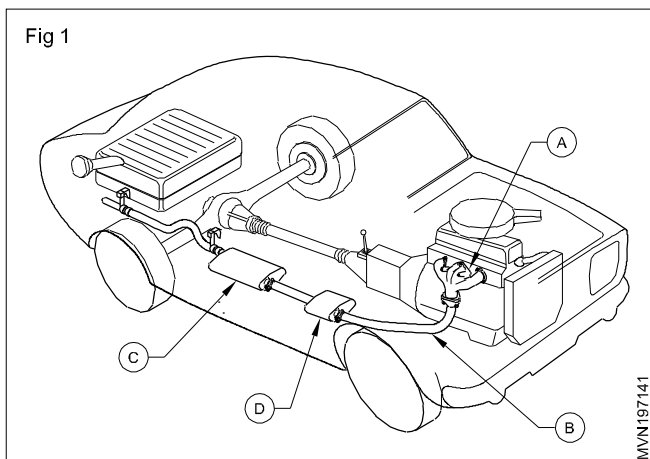
Objectives: At the end of this lesson you shall be able to

- explain the purpose of the inlet manifold
- explain the purpose of the exhaust manifold
- explain the purpose of the muffler and tail pipe
- explain the constructional features of the mufflers
- list out the different types of mufflers.

Manifolds and silencer

The inlet manifold is used to supply the air through from the carburettor to the intake ports in the cylinder head. The inlet manifold is generally made of aluminium alloy or cast iron.

The exhaust manifold (A) (Fig.1) is used to collect the exhaust gases from the different cylinders and send them to the silencer. The exhaust manifold is generally made of cast iron. The exhaust manifold may include a heat control valve (Fig 2) or a heat riser which has a thermostatically operated butterfly valve (2) fitted in exhaust manifold. (Fig 2) When the engine is cold, the valve is closed and hot gases are directed around the inlet manifold. When the engine attains operating temperature the valve opens and



the exhaust gases are directly sent to the muffler.

Exhaust pipes

The exhaust pipe takes the burnt gases from the manifold to the muffler. The pipes are steel tubes, suitably shaped and routed below the chassis to lead the gases away from the vehicle at the rear and to direct the gases down and under the vehicle. It is kept in place by flanges or clamps at either end. In some vehicles, a flexible mounting to the

body or chassis is used.

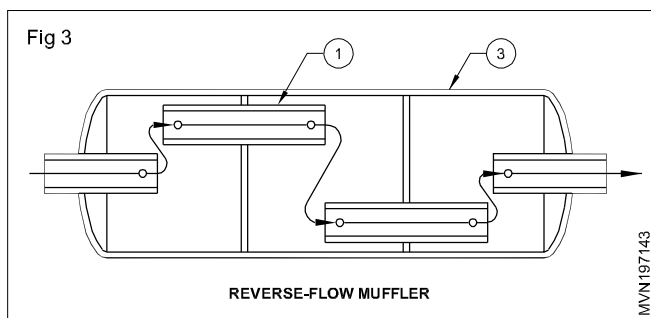
Muffler

The muffler (C) (Fig 1) is normally located under the body of the vehicle and attached to the body or chassis with flexible mountings. In some trucks in which exhaust gases are directed upward, the muffler is mounted at the rear end of the cab and surrounded with a guard to prevent accidental touching. The muffler reduces the engine exhaust noise. It is a large cylindrical shaped container, fitted with passages and chambers that absorb and dampen the noise of the exhaust gases. Often a small or pre-muffler (D) is fitted in the exhaust system between the manifold and the main muffler.

Types of mufflers

i Reverse flow muffler (Fig 3)

In this type, small pipes (1) (Fig 3) are placed in the housing



(3) of the muffler. Exhaust gases flow in a zigzag way, thus reducing the sound, by travelling through a longer length.

ii Straight through muffler

In this type a straight perforated tube (1) (Fig 4) is placed throughout the length of the muffler. Glass wool or steel

exhaust gases, thereby reducing the sound of the exhaust gases.

Mufflers

Objectives: At the end of this lesson you shall be able to

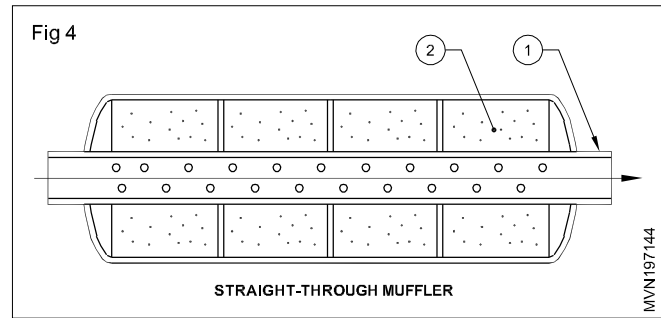
- describe the back pressure
- describe the back pressure muffler
- describe the electronic muffler.

Back pressure

Any restriction to exhaust flow in the exhaust system creates back-pressure. Some back-pressure can be beneficial, excessive back-pressure reduces volumetric efficiency and reduces engine efficiency.

Variable flow exhaust/Back pressure muffler

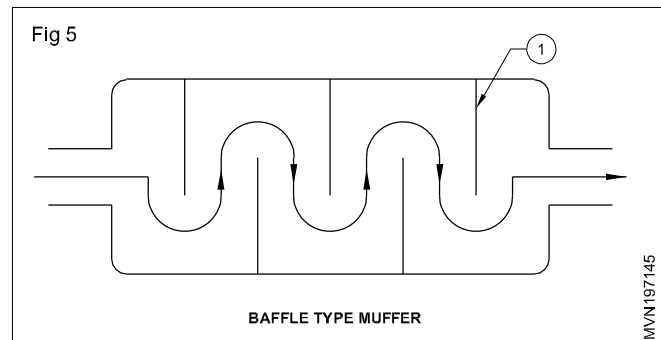
A movable valve fitted within the exhaust system is used to change the amount of exhaust back-pressure. At higher engine speeds when exhaust noise levels are unacceptable, the valve is closed, thus reducing the bore of the exhaust. This enables greater back-pressure and



wool (2) is filled in between the perforated tube and the muffler housing, which acts as a sound absorbent.

iii Baffle type

In this type, a series of baffles (1) (Fig 5) are placed in the muffler which causes restriction and back pressure to the



noise reduction is the result. The valve can be operated by

- Pneumatics - exhaust gas pressure
- Electronics - a computer

When a variable flow exhaust is added to the baffle and chamber system, quieter noise emissions are the result. This is because the system can partially respond to changes in engine speed and load.

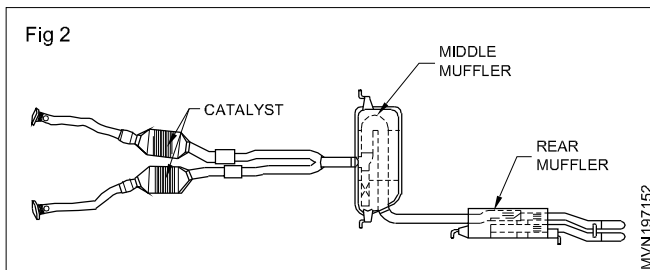
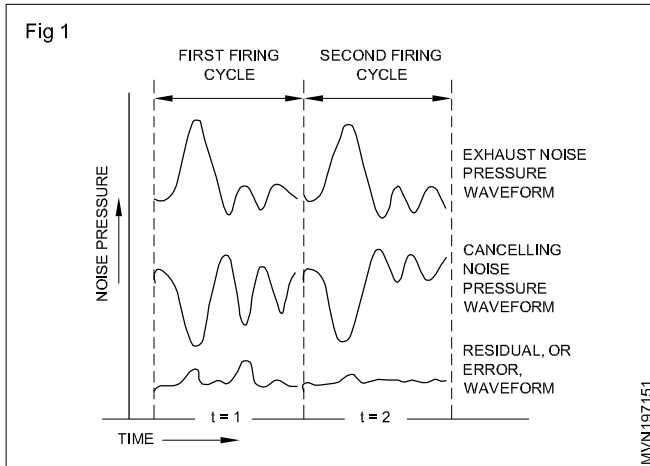
Electronic mufflers

Electronic mufflers are designed to produce anti noise without restricting exhaust flow. This computer-controlled system uses a microphone to detect the sound waves produced within the exhaust system. As the exhaust gas

leaves the tail pipe, computer driven loudspeakers are operated to generate the correct amount of anti-noise.

The result is virtually silent exhaust without generating additional and unwanted back-pressure across all engine operating conditions. This increases fuel economy and reduces exhaust emissions.

Sensors and microphones pick up the pattern of the pressure waves an engine emits from its exhaust pipe (Figure 1 & 2). This data is analyzed by a computer. A mirror-image pattern of pulses is instantly produced and sent to speakers mounted near the exhaust outlet. Opposite waves are created that cancel out the noise. Noise is removed without creating back pressure in the



muffler. Electronic mufflers can be designed to emit certain sounds or no sound at all.

Catalytic converter

Extractor manifolds

The extractor exhaust manifold system for an internal combustion engine, which improves its efficiency by using precise geometry to reflect the pressure waves from the exhaust valve at a particular time in the cycle.

Advantages of extractor manifold

- Separating the gas flow from the individual cylinders.
- Avoid the inter cylinder gas interference
- Maintaining an optimum gas velocity by chosen tube diameter

- Allowing the individual cylinders to assist one to another where the individual exhausts merge.

This type of exhaust system can be used with or without a muffler and so can be used on both race car and road vehicles.

Absorption mufflers in exhaust system

This type of mufflers are almost indispensable element of modern exhaust systems. The absorption material is just as important as a calculation method for designing the mufflers in order to ensure that they are optimally used.

Absorption

Automotive exhaust noise can be attenuated in several ways. A distinction is generally made between active and passive attenuation. The modern engine exhaust system consist of more than one absorption muffler to reduce the noise and pollution. The absorption mufflers are dissipating the sound energy through the use of porous materials.

Noise absorption components

Reactive / absorption silencers in single package unit

Flexible connection

The exhaust pipe takes the burning gases from the exhaust manifold. The silencer pipes are fitted under the chassis body to lead the exhaust gases away from the manifold. The silencer pipes are mounting with flexible connection to the chassis or body of the vehicle. The flexible connections are prevent the damages by heavy jerks or rough up and down movement of the vehicles.

Ceramic coatings

Ceramic coating is capable of with standing of high temperature and it has very good chemical and corrosion resistance and possess excellent thermal barrier characteristics, providing a dramatic reduction in radiated heat. It is self-cleaning properties.

Ceramic coatings contain the gaseous heat with in exhaust pipes. This causes the gasses to heat up and expand as a result exhaust flow is boosted.

Catalytic converter: The catalytic converter looks like a muffler. It is located in the exhaust system a head of the muffler. Inside convertor are pellets or a honeycomb made of platinum or palladium The platinum or palladium are used as a catalyst (a catalyst is a substance used to speed up a chemical process). Catalyst is chemically oxidized or converted to carbon dioxide and water. This converter works to clean the (exhaust) unburnt hydrocarbons before they fly out the tail pipe.