Fuel Supply System For C.I Engine

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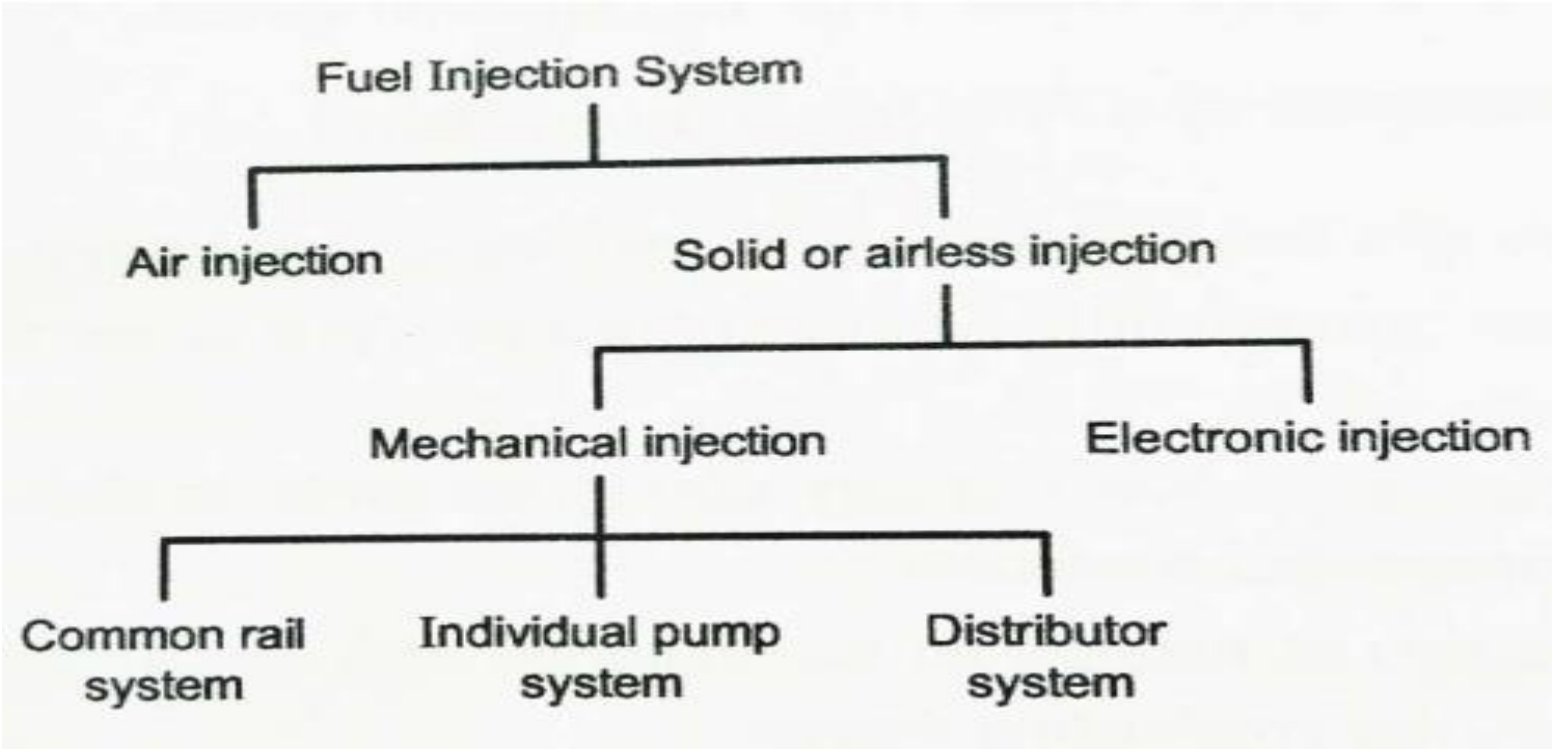
Fuel injection system for diesel engine



Air Injection System

- Here, the fuel is injected by means of high pressure air at about 70 bar into the combustion chamber.
- It needs compressor to supply compressed air & the fuel pump to draw the desired fuel from fuel tank both to be supplied to the injector.

- Advantages
  I. Provides good atomization of fuel.
  II. Heavy viscous fuel can be used .
- Disadvantages
  I. Air compressor needs extra maintenance.
  II. System is bulky and expensive.

Solid or Airless Injection System

- Here, fuel is directly injected into the cylinder without the aid of compressed air.
- The fuel does not vaporize at ordinary temperatures & also the fuel supplied needs to be atomized & mix with air, it requires high injection pressure over 70 bar.

Types of solid Fuel Injection System

I. Mechanical Injection
II. Electronic Injection

Mechanical Injection is further classified as:

a) Common rail direct injection (CRDI) system
b) Individual pump system
c) Distributor system

Common-Rail Direct Injection (CRDI) System

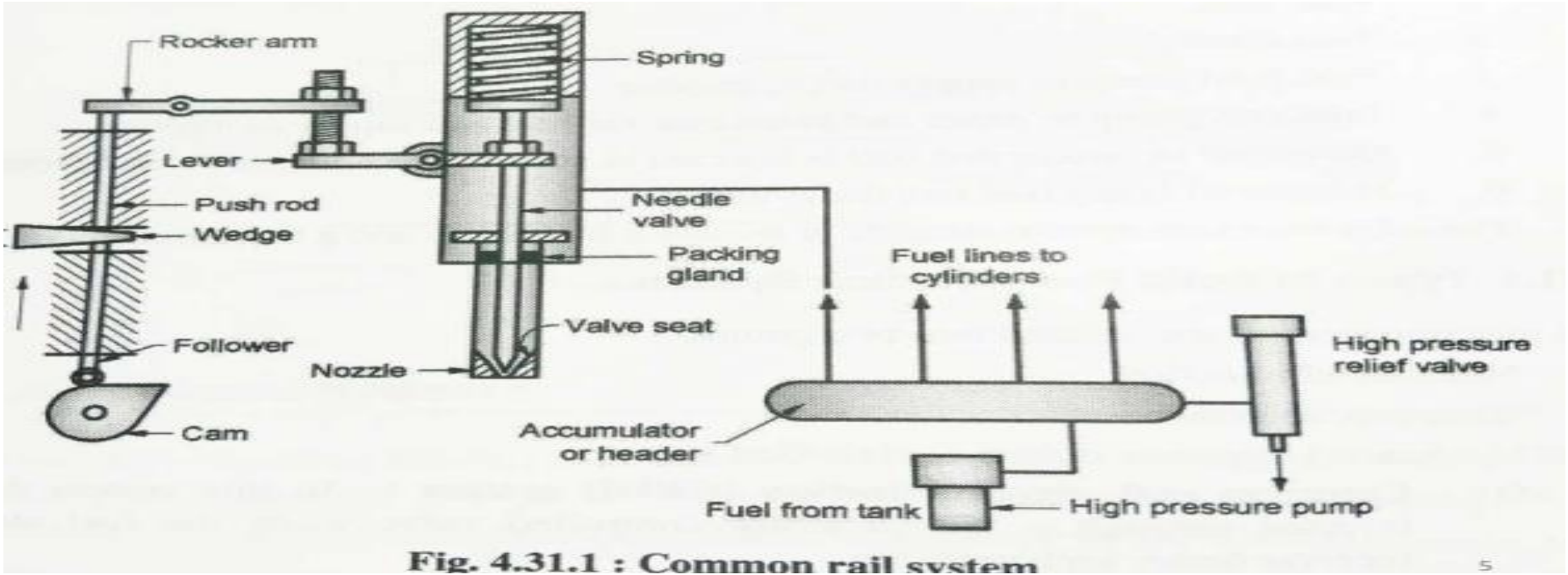


Fig. 4.31.1 : Common rail system

Advantages

I. This system is simple & easy to maintenance.
II. It Can control fuel supply as per load & speed of engine.
III. It has only one pump needed for a multi-cylinder engine.

Disadvantages

I. System needs accurate design .
II. There is a chance of developing leakage at the valve seat.
III. Injection pressure used are in range of 200 – 300 bar pressure.

Individual Pump System

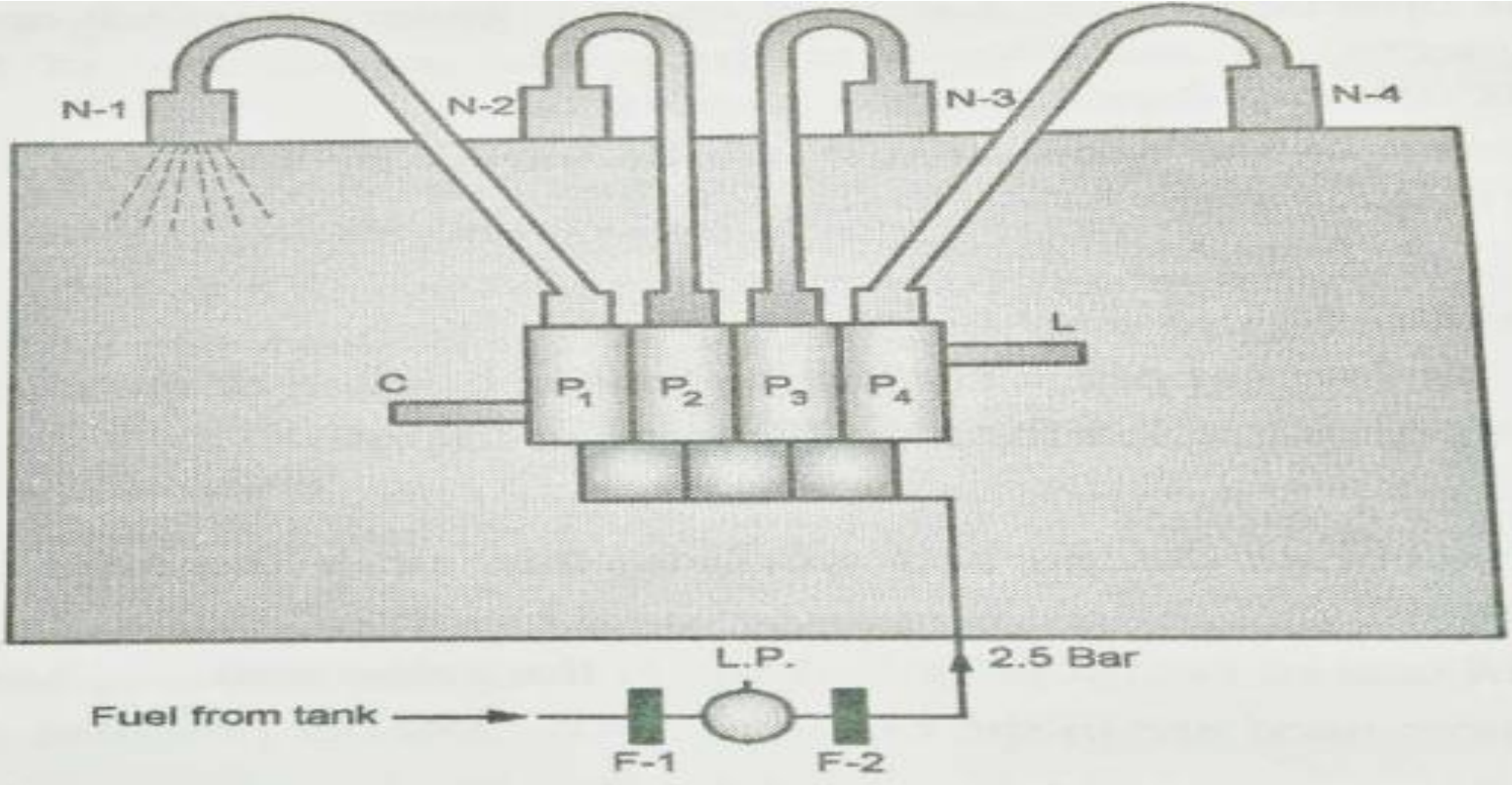


Fig. 4.31.2 : Individual pump system

Distributor System

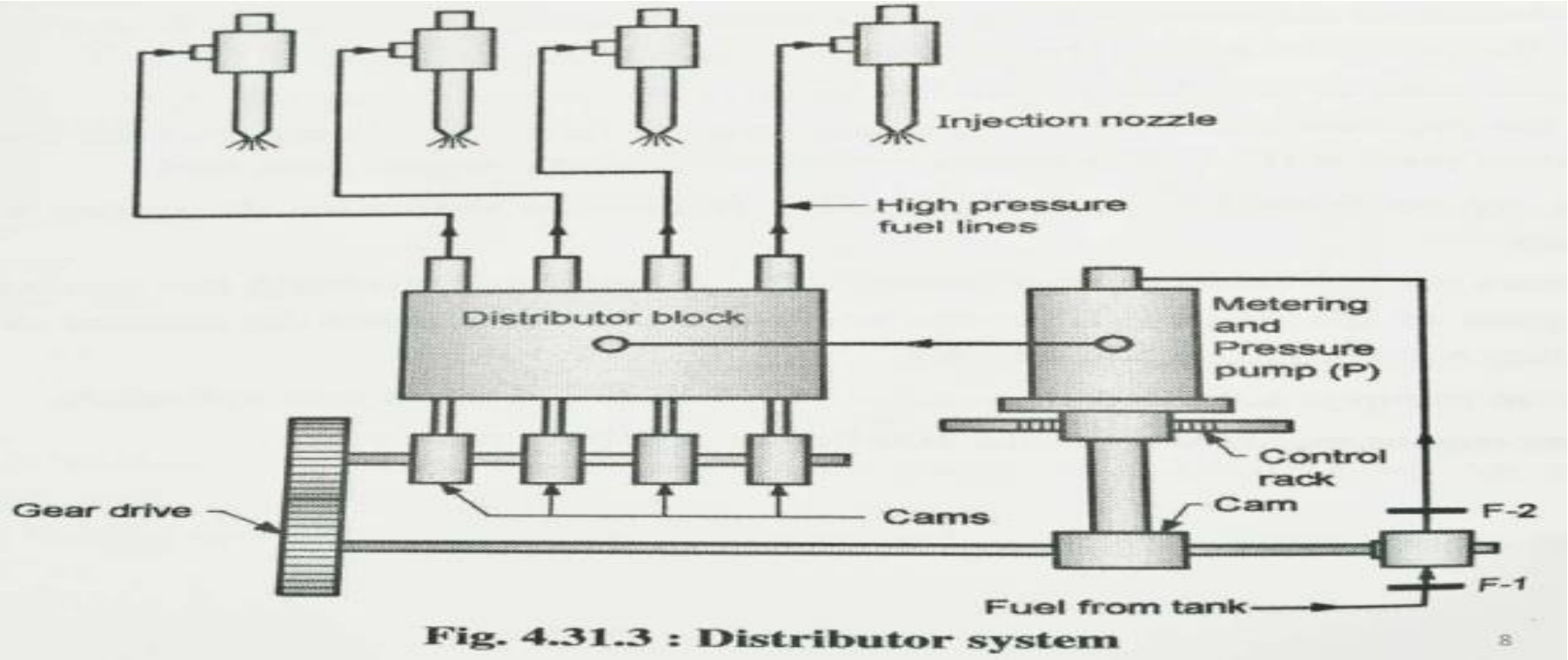


Fig. 4.31.3 : Distributor system

Electronic Injection

- It uses the electronic sensors for precise metering of fuel.
- The sensors feed the data to an electronic control unit (ECU) which determines the amount of fuel to be injected depending upon the engine speed & throttle position.

Advantages

I. Reduces fuel consumption & gives better mileage.

II. Reduces exhaust emissions.

III. Improves engine power.

IV. Prevents overheating of engine during braking & idling conditions of the engine.

Fuel Injection Pumps

Objectives

I. To deliver accurately metered quantity of fuel.
II. High pressures in the range of 100 bar to 300 bar needed depending upon the compression ratio of engine to achieve required atomization of fuel.
III. Fuel must be injected and terminated at the correct timing.

Types of Injection Pumps

I. Jerk type injection pump (Bosch fuel injection pump)
II. Distributor type injection pump

Bosch Fuel Injection Pump

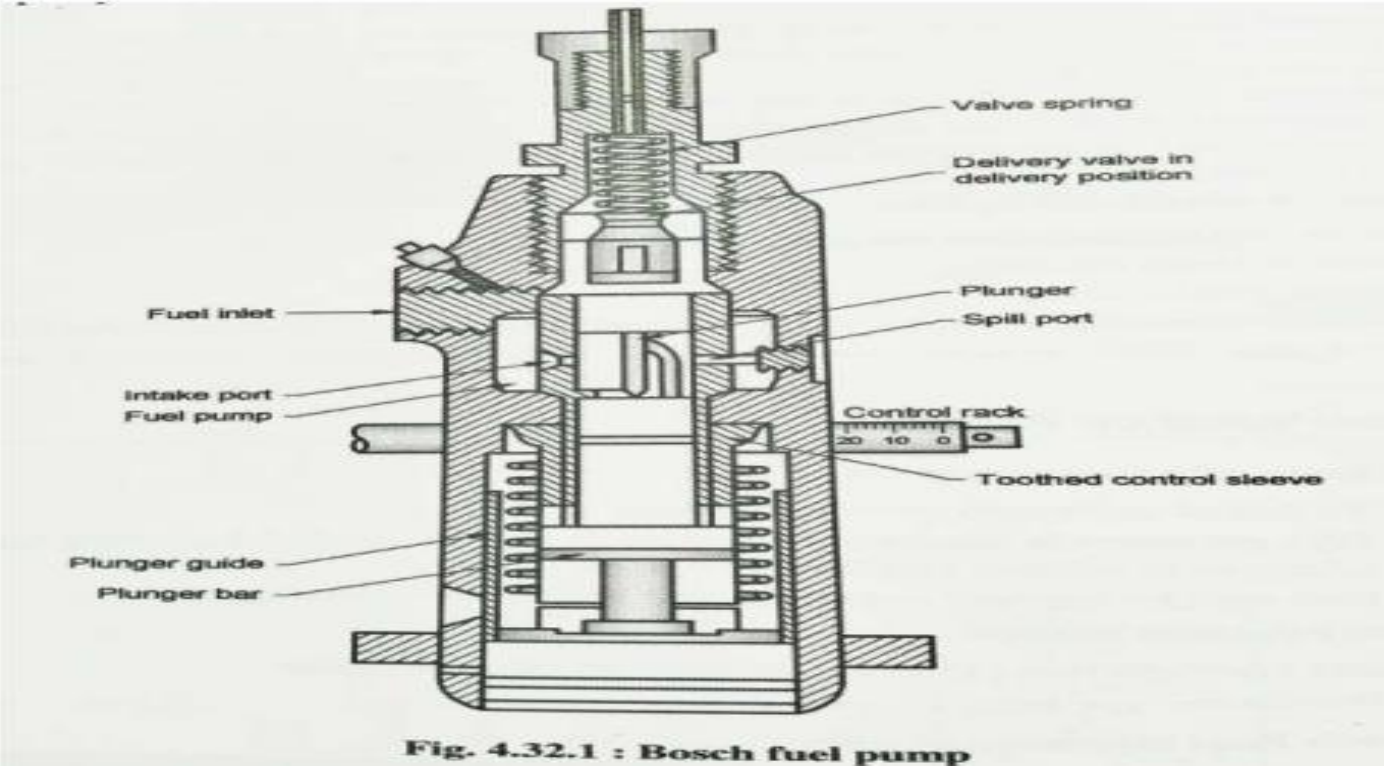
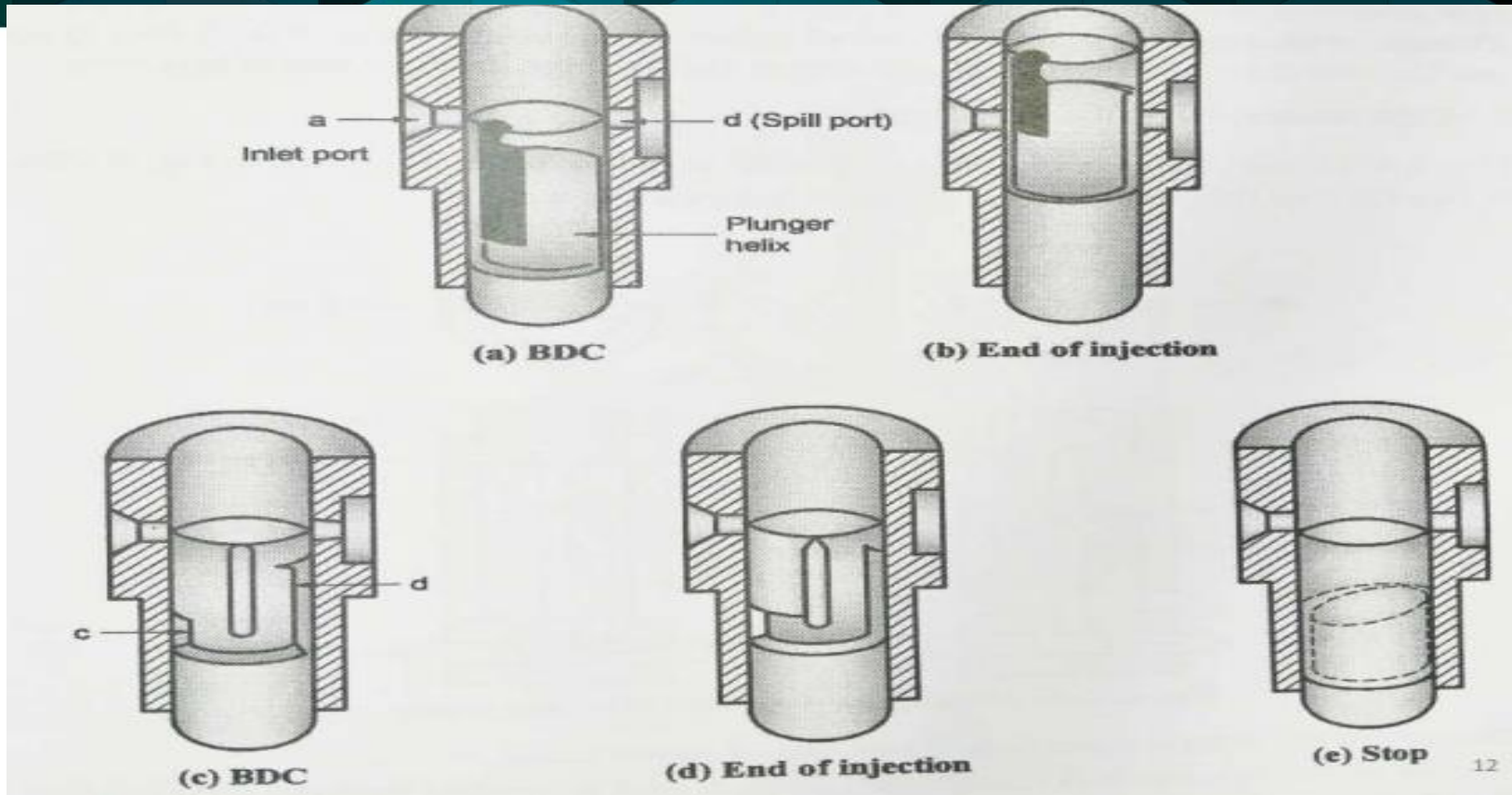


Fig. 4.32.1 : Bosch fuel pump


a
Inlet port
d (Spill port)
Plunger
helix
(a) BDC
(b) End of injection
c
d
(c) BDC
(d) End of injection
(e) Stop

Distributor Type Fuel Pump

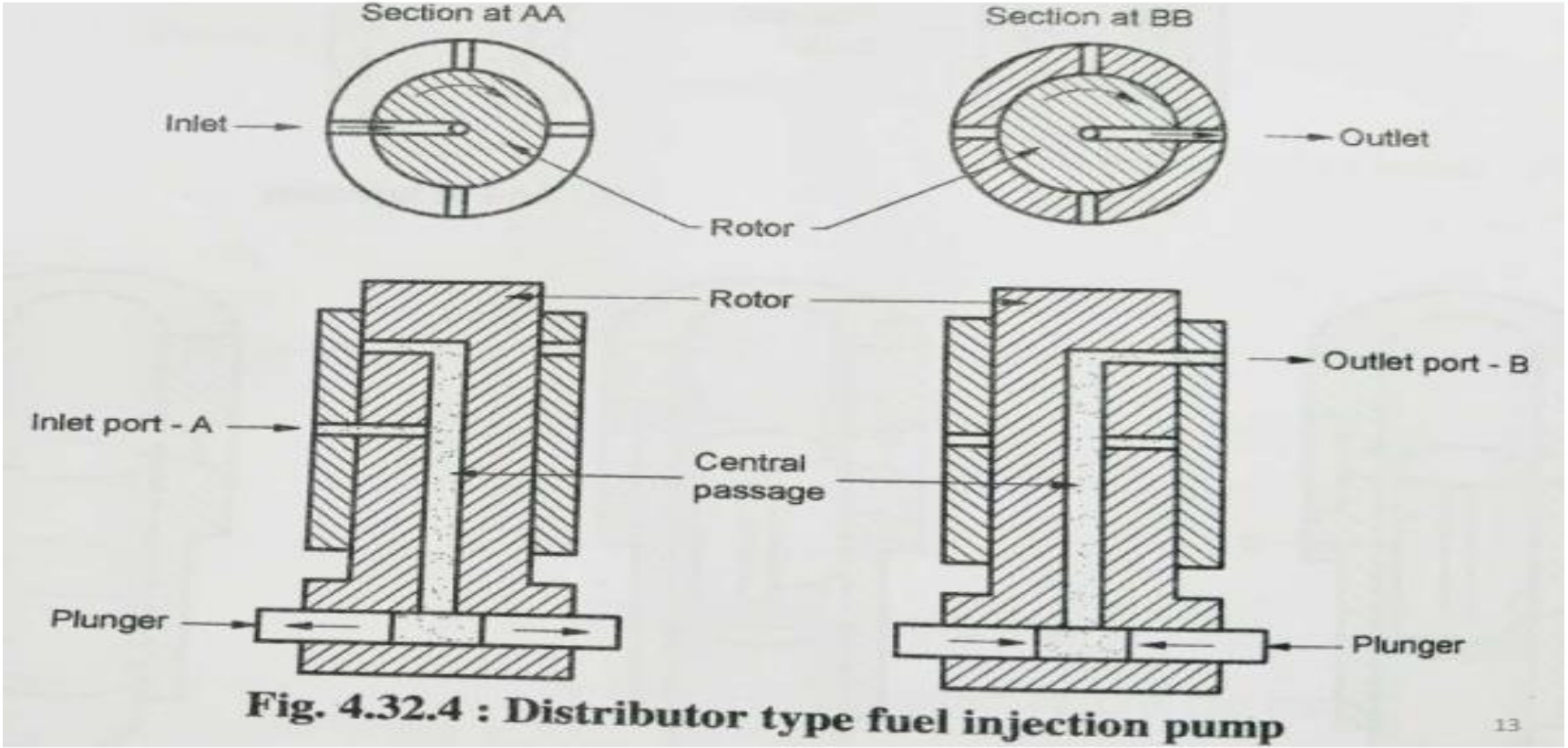


Fig. 4.32.4 : Distributor type fuel injection pump

Nozzles

- Nozzle is the part of an injector through which the fuel is injected into the combustion chamber.
- Design of nozzle should be such that the liquid fuel leaving the nozzle is atomized which helps in proper mixing of fuel & air.
- Type of nozzle used in an injector depends on the type of combustion chamber used in an engine.

Various types of Nozzles:

I. The pintle nozzle
II. The single hole nozzle
III. The multi-hole nozzle
IV. The pintaux nozzle

Pintle Nozzle

Specifications:

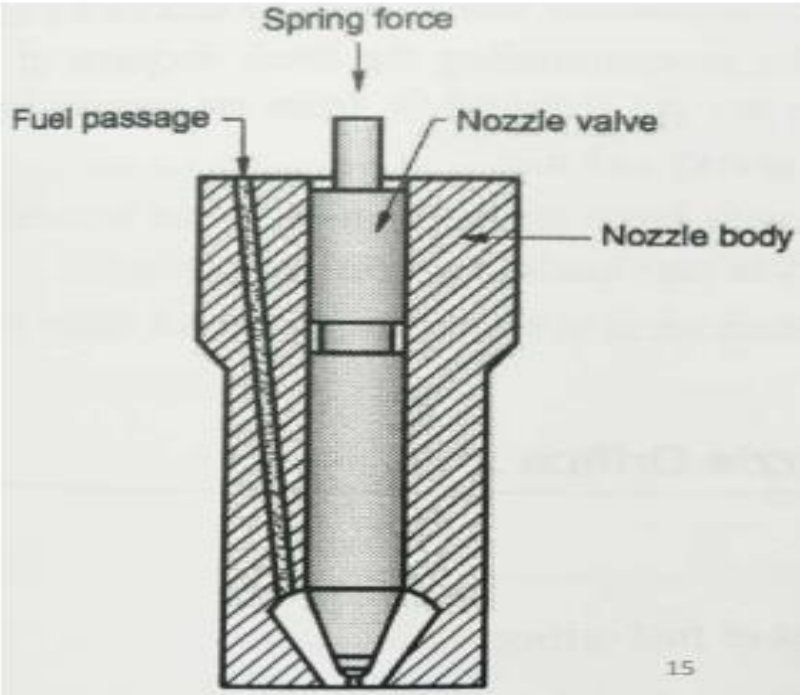
I. Have thin ends in the form of pin.

II. Shape of the pin can be varied.

III. Hollow cylindrical jet or a wide angle spray can be obtained.

Advantages

I. It avoids dribbling of fuel in the combustion chamber



Single hole nozzle

Specifications

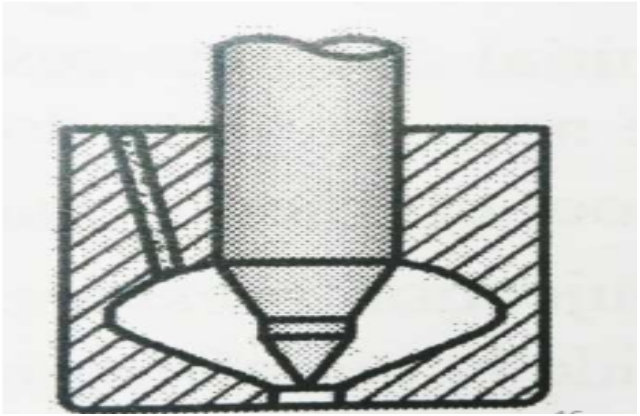
I. A single hole is bored at bottom tip of nozzle.
II. Hole diameter is of 0.2 mm.
III. Spray cone angle obtained ranges from 5-20 degrees.

Advantages

I. Suitable for open combustion chamber

Disadvantages

I. Gives small spray cone angle.
II. Have a tendency to dribble.



Multiple hole Nozzle

Specifications

I. Have multiple holes bored at the tip of the nozzle.

II. Number of holes vary from 4 to 8.

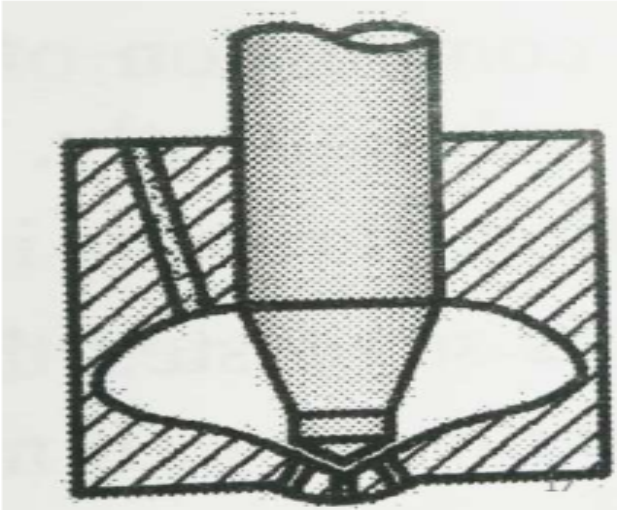
III. Diameter vary from 0.2 mm to 0.35 mm.

Advantages

I. It ensures proper mixing of fuel in the chamber.

Disadvantages

I. It requires high injection pressures in the range of 180 to 200 bar.



Pintaux Nozzle

Specifications

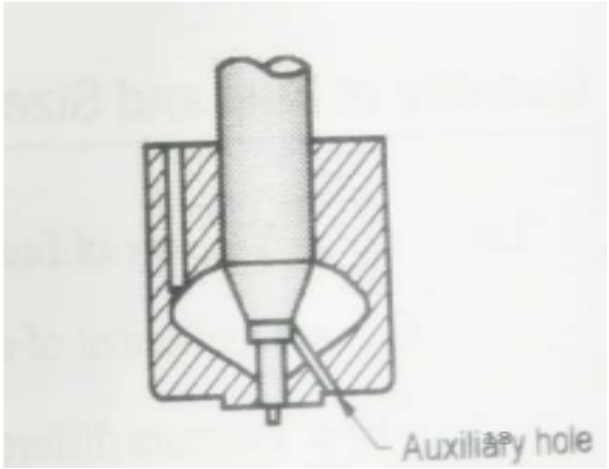
I. Pintle type of nozzle with an auxiliary hole drilled in it.

II. Auxiliary hole injects fuel in a direction upstream the direction of air before the main injection starts.

Advantages

I. It reduces the delay period due to better heat transfer between fuel & air.

II. It results into better cold starting performance.



Thank you