



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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Grade

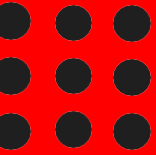
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Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 190E120 AUTOMOTIVE ELECTRONICS I YEAR /I SEMESTER

MECHATRONICS ENGINEERING

Unit 2 – Sensors & Actuators





❖ Syllabus:

- Working principle of sensors, Types of sensors, Airflow rate sensor, Position sensor, Throttle angle sensor, Temperature sensor, MAP sensors, Knock/Detonation Sensor, Load cell, Lambda Sensor(Exhaust gas O₂ Sensor), yaw rate sensor, sensor feedback control, Electronic Control Unit (ECU), Principle of actuator, Types of actuators, engine control actuators, Solenoid actuators, motorized actuators (Stepper motors).

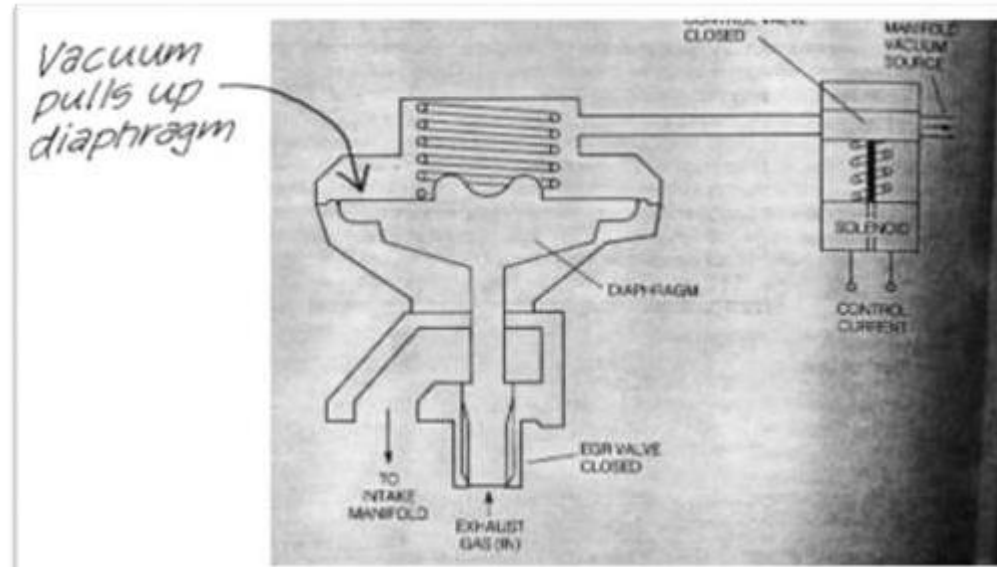


❖ EGR Valve Actuator:

- The exhaust gas recirculation (EGR) is utilized to reduce NO_x emissions. The amount of EGR is regulated by the engine controller.
- When the correct amount of EGR has been determined by the controller based on measurements from the various engine control sensors, the controller sends an electrical signal to the EGR actuator.
- Typically, this actuator is a variable-position valve that regulates the pressure as ~~Although there are many EGR configurations, only one representative example will be discussed to explain the basic operation of this type of actuator.~~ Although there are many EGR configurations, only one representative example will be discussed to explain the basic operation of this type of actuator.
- The example EGR actuator is shown schematically in Figure. This actuator is a vacuum-operated diaphragm valve with a spring that holds the valve closed if no vacuum is applied.



- The vacuum that operates the diaphragm is supplied by the intake manifold and is controlled by a solenoid-operated valve. This solenoid valve is controlled by the output of the control system.
- This solenoid operates essentially the same as that explained in the discussion on fuel injectors. Whenever the solenoid is energized (i.e., by current supplied by the control system flowing through the coil), the EGR valve is opened by the applied vacuum.





- The amount of valve opening is determined by the average pressure on the vacuum side of the diaphragm.
- This pressure is regulated by pulsing the solenoid with a variable-duty-cycle electrical control current.
- The duty cycle of this pulsing current controls the average pressure in the chamber that affects the diaphragm deflection, thereby regulating the amount of EGR.



❖ Petrol engine idle speed control

- Idle speed control is an important element of the control strategy for any engine management system. The control strategy for engine idling must take account of factors such as engine coolant temperature, engine load, power assisted steering, alternator load, etc.
- Many systems are fitted with an idle speed control valve that provides a supply of air that by-passes the throttle valve, whilst other systems may make use of the electronic throttle control.
- Two types of valve are used to provide a computer controlled idle air supply. One makes use of a **stepper motor**, as shown in Fig. 6.12, and the other uses a **solenoid operated valve** as shown in Fig. 6.15.

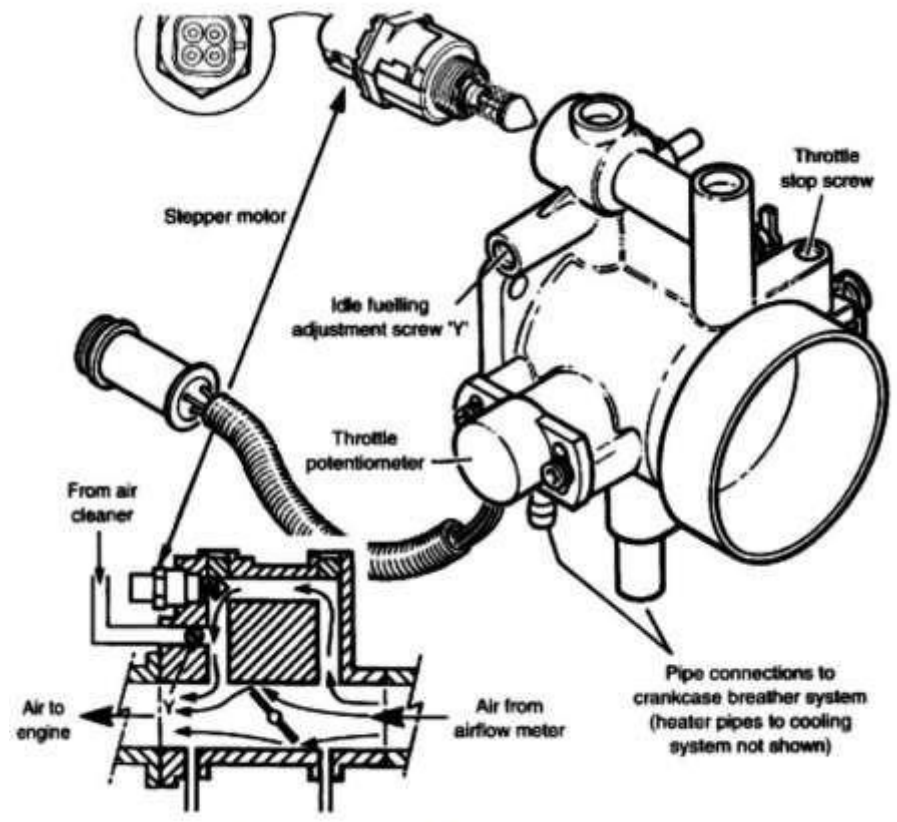


Fig. 6.12 A stepper motor operated air valve

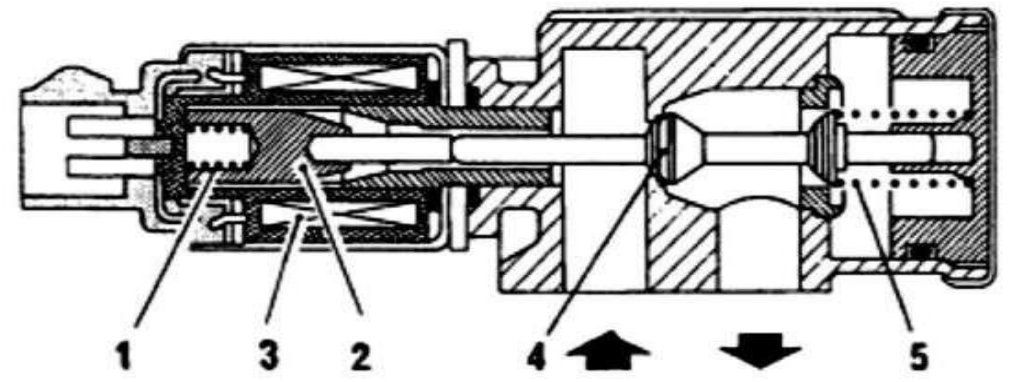
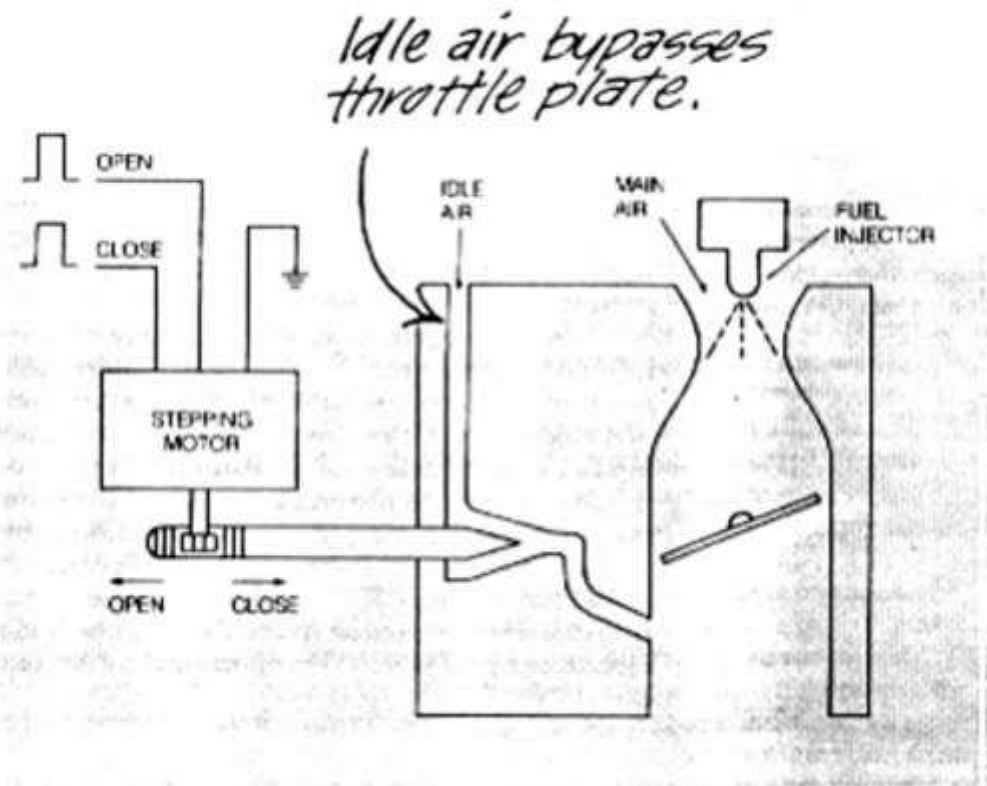


Fig. 6.15 A solenoid operated idle speed control valve