SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19OE120 AUTOMOTIVE ELECTRONICS

I YEAR /I SEMESTER MECHATRONICS ENGINEERING

Unit 2 – Sensors & Actuators

STARTING / CRANKING AND ELECTRIC SYSTEMS

- Requirement of starting system, Basic component of starting system, Starter motors and Circuits, Starter motor types, Starting and motor characteristics, diagnosing starting system faults, Advanced starting system technology, charging system, Insulated & earth return systems. Positive & negative earth systems, Development of spark in SI engines

Requirement of starting system

- The starting system of an automobile is used to start the internal combustion engine. Both SI and CI engines cannot start by itself.
- These engines need to be cranked by a starting motor. This motor is also called a starter or cranking motor.
- Cranking of any engine means rotating its crank shaft. Rotation of crank shaft causes the piston to reciprocate.
- When piston reciprocates, suction, compression, expansion and exhaust strokes of engine are completed.
- Thus, engine completes its working cycle and it starts running.
- Starting motor produces necessary torque to rotate the engine wheel (crank shaft) through a suitable gear (one pinion on motor and other ring gear around engine wheel

Basic component of starting system

- Starting system consists of the following :

(a) Starting Motor : Starting motor to produce rotation of crank shaft.

(b) Drive Mechanism : Drive mechanism to transfer rotary motion of starter to the crank shaft of the engine.

(c) The ignition switch to start motor.

Starter Motor

- It is also known as starting motor or cranking motor.
- It is used to start heavy engines which cannot be started by hand cranking.

Function of Starter

- IC engines are required to be rotated at some minimum speed after which the engines starts running by fuel supply.
- This initial rotation is given by the starting motor and this is the function of a starter.
- **Working Principle**
- A motor converts electrical energy into mechanical energy. Mechanical energy is obtained in the form of rotation of a wheel.
- This rotation of a wheel is used to start the IC engine.
- The motor works on the principle that “when a current carrying conductor is put in a magnetic field, it experiences a mechanical force”.
- The direction of force is determined by the Flemming‟s left hand rule. Flemming’s Left Hand Rule
- If we stretch the thumb, forefinger and middle finger such that they are mutually perpendicular, then according to this rule : “If the first finger points in the direction of magnetic field and the second (middle) finger in the direction of current then the thumb will give the direction of force acting on conductor or the direction of its motion”

Starting System:

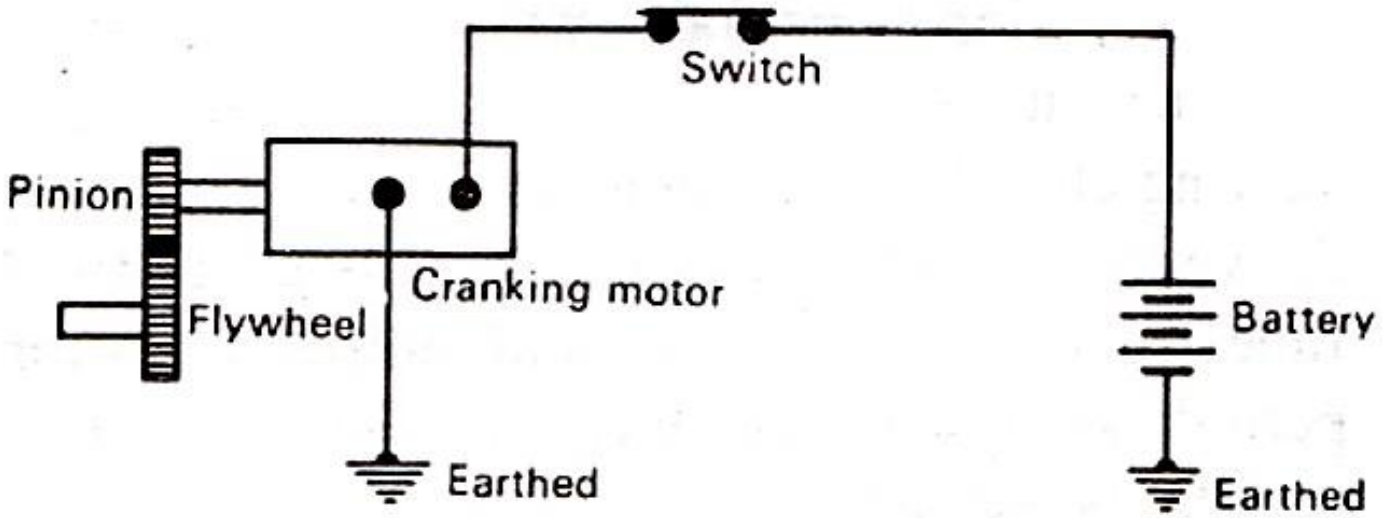

Fig. 2.2 A simple circuit diagram of the cranking motor.

- When the starter switch is put on „on“ position, the current from battery flows to starting motor, the motor starts rotating.
- The motor is connected to the drive unit, which is used to rotate the engine crank shaft. A small pinion (small gear) is fitted on the armature shaft of the starting motor.
- This pinion meshes with the ring gear when starter rotates. Thus, the fly wheel which is attached to ring gear also starts revolving.
- Thus, engine crank shaft starts revolving. With the revolution of crank shaft, the engine strokes viz. suction, compression, power and exhaust are completed.
- Therefore, engine starts running. The starter is engaged to the engine ring gear (attached to fly wheel) till the engine starts running.
- As soon as engine starts running, the starter is disengaged. The starting motor is a low voltage DC series wounded motor. 3.8.2 Dynamo or Generat