Different Parts of a DC Generator

A DC generator is composed of the following main parts:

1. Shaft
2. Bearings
3. Commutator and brushes
4. Armature Core
5. Armature Windings
6. Pole Core and Pole Shoes
7. Field Winding
8. Interpoles
9. Magnetic Frame and Yoke

Shaft

Shaft is the inner most part of DC generator. It is made of mild steel with a maximum breaking strength. The shaft is used to transfer mechanical power from or to the machine. The rotating parts like armature core, commutator, etc. are keyed to the shaft.

Bearings

The ball or roller bearings are fitted in the end housings. The function of the bearings is to reduce friction between the rotating and stationary parts of the machine. Mostly high carbon steel is used for the construction of bearings as it is very hard material.

Commutator and brushes

Commutator

The commutator of a DC generator is a cylindrical structure that is made of copper segments stacked together but insulated from each other using mica. The primary function of a commutator is to supply electrical current to the armature winding.

Brushes

The brushes of a DC generator are made with graphite and carbon structure. These brushes conduct electric current from the external circuit to the rotating commutator. Hence, we come to understand that the commutator and the brush unit are concerned with transmitting the power from the static electrical circuit to the mechanically rotating region or the rotor.

Armature Core

The armature core of DC generator is cylindrical in shape and keyed to the rotating shaft. At the outer periphery of the armature have grooves or slots which accommodate the armature winding.

The armature core of a DC generator or machine serves the following purposes.

It houses the conductors in the slots.

It provides an easy path for the magnetic flux

Armature Windings

The insulated conductors are placed in the slots of the armature core. The conductors are wedged, and bands of steel wire wound around the core and are suitably connected. This arrangement of conductors is called Armature Winding. The armature winding is the heart of the DC Machine.

Armature winding is a place where conversion of power takes place. In the case of a DC Generator here, mechanical power is converted into electrical power.

Pole Core and Pole Shoes

The Pole Core and Pole Shoes are fixed to the magnetic frame or yoke by bolts. Since the poles, project inwards they are called salient poles. Each pole core has a curved surface. Usually, the pole core and shoes are made of thin cast steel or wrought iron laminations which are riveted together under hydraulic pressure. The poles are laminated to reduce the Eddy Current loss.

Field Winding

Each pole core has one or more field coils (windings) placed over it to produce a magnetic field. The enameled copper wire is used for the construction of field or exciting coils. The coils are wound on the former and then placed around the pole core.

When direct current passes through the field winding, it magnetizes the poles, which in turns produces the flux. The field coils of all the poles are connected in series in such a way that when current flows through them, the adjacent poles attain opposite polarity.

Interpoles

Interpoles, also known as commutating poles, are small poles placed in between the main poles of a DC generator or motor. The effect of armature mmf on the main field flux is to distort the main field flux and to reduce the net main field flux. Interpoles are designed in DC motors to overcome the effects of the armature reactance and the self-induction of the machine.

Magnetic Frame and Yoke

The outer hollow cylindrical frame to which main poles and inter-poles are fixed and by means of which the machine is fixed to the foundation is known as Yoke. It is made of cast steel or rolled steel for the large machines and for the smaller size machine the yoke is generally made of cast iron.

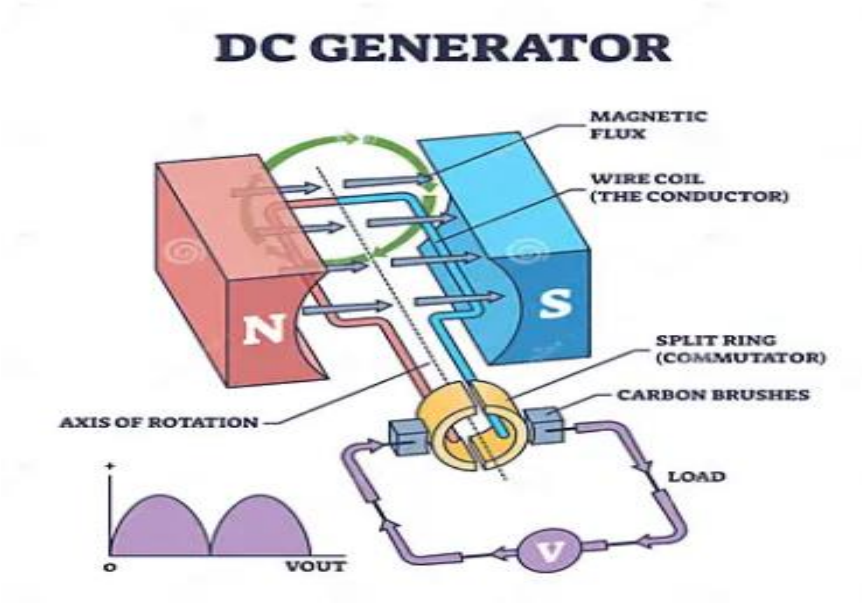
The two main purposes of the yoke are as follows:-

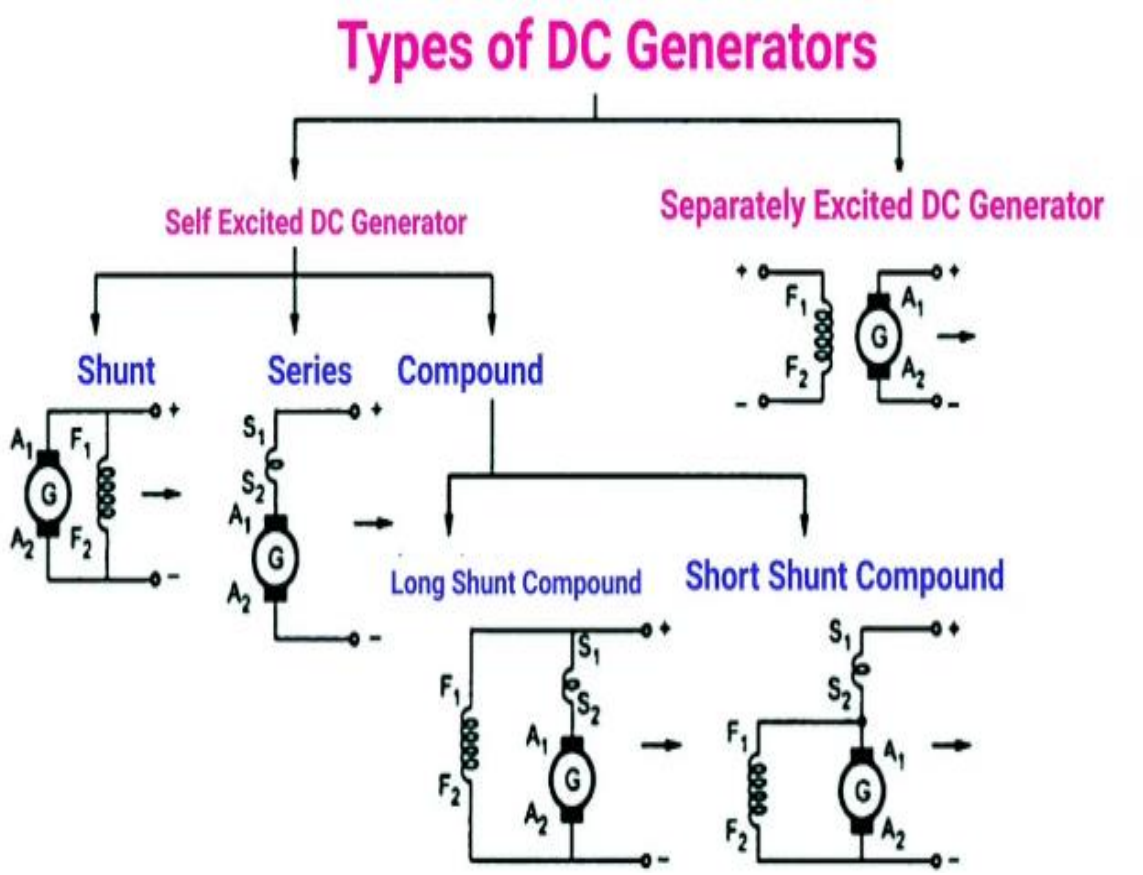
It supports the pole cores and provides mechanical protection to the inner parts of the machines.

It provides a low reluctance path for the magnetic flux.

Working principle of DC Generator

A DC generator is an electromechanical energy conversion device that converts mechanical power into DC electrical power through the process of electromagnetic induction. A DC generator operates on the principle of electromagnetic induction i.e. when the magnetic flux linking a conductor changes, an EMF is induced in the conductor. A DC generator has a field winding and an armature winding. The EMF induced in the armature winding of a DC generator is alternating one and is converted into direct voltage using a commutator mounted on the shaft of the generator.





Applications of DC Generator

- Speed regulation
- Battery charging
- Lighting installation
- Supplying power to DC motors
- Arc welding
- Compensating for voltage drop
- Providing power supply for hostels, offices, and lodges
- Power backup
- Supplying DC to welding machines

Electric Vehicle

A vehicle that works on an electric motor instead of an internal combustion engine is called an Electric Vehicle. Electric Vehicles are useful as they reduce the harmful emission released by the engine-based vehicle. They can be very helpful in reducing air pollution in the atmosphere.