Compound DC motors

DC compound motor is essentially a combination of Series DC motor and Shunt DC motor.

Construction

In a compound motor, we have both series winding and parallel winding. A winding is connected in series with the armature as in a Series DC motor. Another winding is connected in shunt with the armature as in a Shunt DC motor. This combination presents us the double advantage of having the torque characteristics of a series motor and the constant speed characteristic of a shunt motor in one compound wound motor.

Types of Compound Motors

Depending on the relative polarity of the series and shunt windings, we have different types of compound motors. There are 3 major classifications of DC compound motors:

1. Cumulative Compound Motors
2. Differential Compound Motors
3. Compound Interpole Motors

Cumulative Compound Motors

In cumulative compound motors, the polarity of the shunt winding is such that it adds to the series fields. This shunt winding can be either short shunt where the shunt is parallel with only the armature or long shunt where the shunt is in parallel with both armature and the series field. Since the shunt windings are done in such a way as to assist both armature and series field producing a cumulative effect, the motor is termed cumulative compound motors.

Cumulative wound motors give high starting torque like a series motor and reasonable good speed regulation at high speeds like a shunt dc motor. It can start with even huge loads and run smoothly (if the load varies only slightly) after that. As this type of motor offers the best of both series and shunt motor, it is practically suitable for most common applications, and so is widely used.

Differential Compound Motors

In differential compound motors, polarities of the armature and the shunt field are such that they oppose each other. In this type of motor, negative terminal of the shunt field is connected to the positive terminal of the armature.

In differential compound motors, magnetic fields of the shunt winding oppose the armature magnetic fields and the series fields. This kind of differential winding provides different torque and speed characteristics. Here as the shunt field is producing an opposite effect, it is unlike a shunt motor. So when the load is reduced, differential compound motor behaves more like a series motor and tends to over speed. When the load is increased, its speed is reduced drastically.

Compound Interpole Motors

Compound Interpole motors are different from both cumulative and differential motors. This motor has additional interpoles in series with the armature. The interpoles are connected in series in between the series winding and the armature. Physically, it is placed besides the series coils in the stator. The polarity of the interpoles and the series fields are same and they assist each other. Interpoles are of same gauge (thickness) as series windings. But we can have as many turns of interpoles as required to have strong magnetic field.

Interpoles help preventing armature and brushes from arcing. So brushes will last longer and it is not necessary to cut down the armature often. Overall, interpoles help to improve smooth functioning of the motor and prolong its life.

Compound DC Motor Speed Control

The speed of a DC compound motor can be easily controlled. It is enough if we change just the voltage supplied to it.

AC motors are well known for constant speeds and DC motors are popular for variable speeds. This was the situation before three decades. But, the advent of solid-state components and microprocessor-based controls has revolutionized the way we control motor speeds. Today, a solid-state AC variable-frequency motor drive can be used to vary the speed of an AC motor as easily as that of DC motors.

Applications

Cumulative compound wound motors are virtually suitable for almost all applications like business machines, machine tools, agitators and mixers etc. Compound motors are used to drive loads such as shears, presses and reciprocating machines.