

IV) Shunt wound DC motors - In this type of DC motor field coils are connected in parallel with armature. The field winding consists of a large no. of turns of comparatively fine wire so as to provide large resistance. The field current is much less than the armature current, sometimes as low as 5%.

The below figure shows the connection diagram of a shunt wound DC motor.

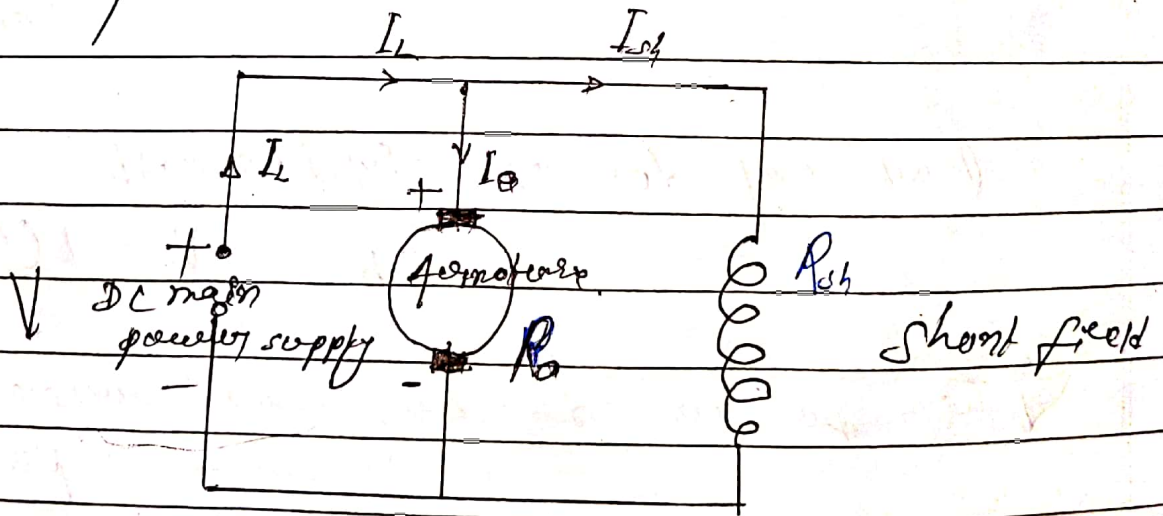


Fig: Shunt wound DC motor.



From diagram,

Input line current,  $I_1 = I_a + I_{sh}$ .

where

$I_a =$  Armature current,

$I_{sh} =$  shunt current.

If  $R_a$  and  $R_{sh}$  are the armature resistance and shunt resistance then,

$$I_{sh} = \frac{V}{R_{sh}}$$

The back emf developed in the dc motor is

$$E_b = V - I_a R_a \quad \text{--- (1)}$$

Now, power drawn from mains,

$$P = VI \quad \text{--- (2)}$$

∴ Mechanical power developed = power  $I_1 P -$  loss in armature and shunt field.

$$= [IV - (I_{sh} V + I_a^2 R_a)]$$

$$= IV - I_{sh} V - I_a^2 R_a$$

$$= V(I - I_{sh}) - I_a^2 R_a$$

$$= V I_a - I_a^2 R_a$$

$$= I_a (V - I_a R_a)$$

$$= I_a E_b \quad [ \because V - I_a R_a = E_b ]$$

∴ Mechanical power developed =  $I_a E_b$ .



Compound wound DC Motors - A compound wound motor has both shunt and series field coils. The shunt field is normally  $\frac{1}{10}$  than the series field.

Compound wound ~~motors~~ motors are of two types namely cumulative compound wound differential compound wound motors.

Cumulative compound wound motor :-

In this type of DC motor field windings are connected in such a way that the direction of flow of current is same in both of the field windings. which is shown below,

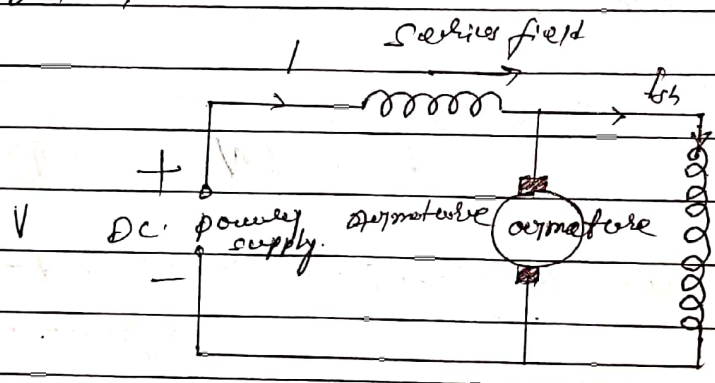


Fig: Circuit diagram of cumulative compound motor

In this type of motor the ~~field~~ flux due to series ~~at~~ field winding strengthens the flux due to shunt field winding.

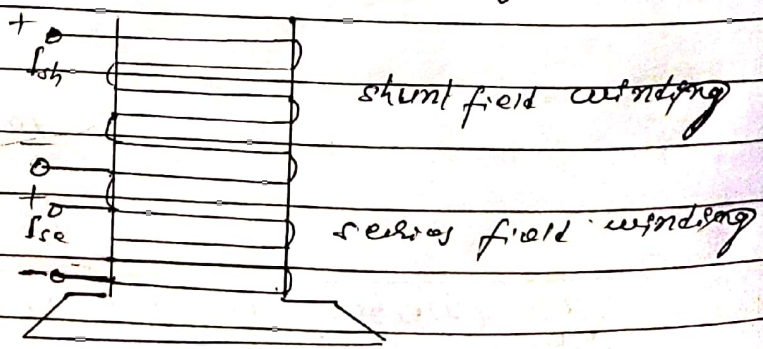


Fig: Winding connection diagram

Differential compound wound motors:-

one in which the field windings are connected in such a way that the direction of flow of current is opposite to each other in two field windings, which is shown below. In this type of motor the flux due to series field winding weakens the flux due to shunt field winding.

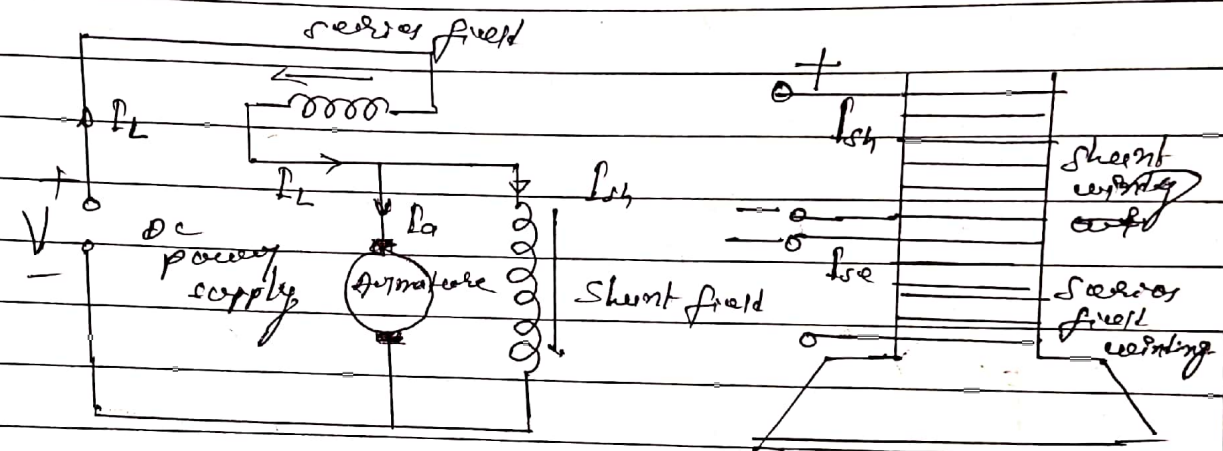


Fig: Circuit diagram of differential compound wound motor.

Compound wound motor are like the compound wound generator which has either long shunt connected or ~~short~~ short shunt connected. In long shunt connected, series field and armature are connected in series with each other and in parallel with shunt field. Similarly in short shunt connected compound wound motor, the armature and shunt field are in parallel with each other and this is in series with the series field.