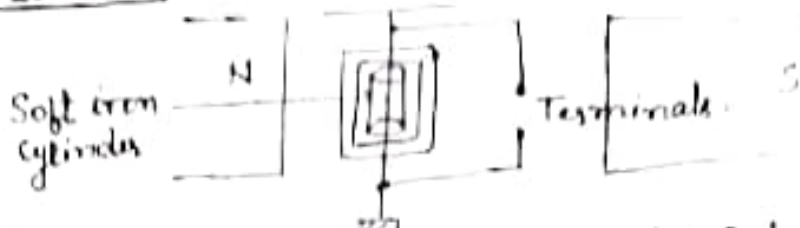
MOVING COIL GALVANOMETER

Galvanometer is a device to detect Current in the Circuit.

Principle:- A Current Carrying Coil placed in a magnetic field experiences a torque, the magnitude of which depends on the strength of Current.

Construction:-



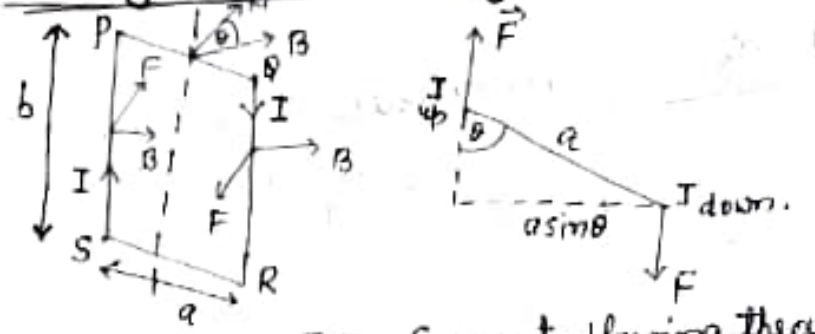
(1) Galvanometer Consists of a rectangular Coil of fine insulated Copper wire wound on a light non magnetic metallic (aluminium) frame.

(2) The two ends of the axle of this frame are pivoted between two bearings.

(3) A cylindrical soft iron Core is mounted symmetrically pole pieces of a strong permanent magnet.

(4) A cylindrical soft iron Core is mounted symmetrically between the Concave poles of the horse shoe magnet. This makes the lines of force pointing along the radii of a circle.

Theory and Working:-



I = Current flowing through Coil PQRS.

a, b = Sides of the rectangular Coil PQRS.

A = ab = Area of the Coil.

N = Number of turns in the Coil.

The magnetic force on side PQ and SR are equal, opposite and Collinear, so their resultant is zero. The two forces on the sides PS and QR are equal and opposite they form a Couple and exerts torque.

$$\frac{}{qv} = \frac{MLT^{-2} \times L^2}{AT \times LT}$$

$$\Rightarrow \phi = [ML^2T^{-2}A^{-1}]$$

$\therefore$ Torque = force $\times$ $\perp^r$ distance

$\Rightarrow \tau = NIbB \times a \times \sin 90^\circ$

$\Rightarrow \tau = NIBA$ { where A $b \times a$ = Area }

This torque deflects the coil through an angle α. A restoring torque is set up in the coil due to elasticity of the spring. $\therefore \tau_{restoring} \propto \alpha$ $= \tau_{restoring} = k\alpha$

where k is constant of proportionality called torsion constant i.e torque required to produce unit angular twist. In equilibrium

Restoring torque = Deflecting torque.

$\therefore k\alpha = NIBA$

$\Rightarrow \alpha = \left(\frac{NBA}{k}\right) I$

$\Rightarrow \boxed{\alpha \propto I}$

Thus deflection produced in galvanometer is proportional to the current.

$\therefore I = \left(\frac{k}{NBA}\right)\alpha = G\alpha$

$\therefore \boxed{I = G\alpha}$ The factor $G = \frac{k}{NBA}$ is Constant and is called galvanometer Constant or Current reduction factor.

Figure merit of Galvanometer :- The Current which produces a deflection of one scale division in the galvanometer and is given by.

$$\boxed{G = \frac{I}{\alpha} = \frac{k}{NBA}}$$

SENSITIVITY OF GALVANOMETER

A galvanometer is said to be more sensitive if it shows large deflection even when a small current is passed through it or a small voltage is applied across it. It is of two types:-

(i) Current sensitivity (ii) voltage sensitivity