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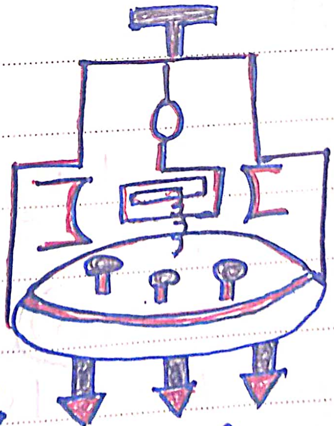
Degree-II(H), paper-IV, Group-B, 16/02/2024.

Name:- Giridhar Kumar.

Topic :- Moving Coil Galvanometer.

Principle:- It is Based on the principle of the force of interaction between the current carrying conductor and a magnetic field. A coil is suspended in a magnetic field. The current to be measured is passed through the coil. The current through the coil produces a magnetic field which interacts with the given magnetic field in which the coil is suspended. Due to the interaction the coil gets deflected and measuring the angle of rotation current can be calculated.



A circular or rectangular coil of about 10 to 15 turns of a fine insulated head T, by means of quartz fibre in between the concave pole pieces of a strong magnet

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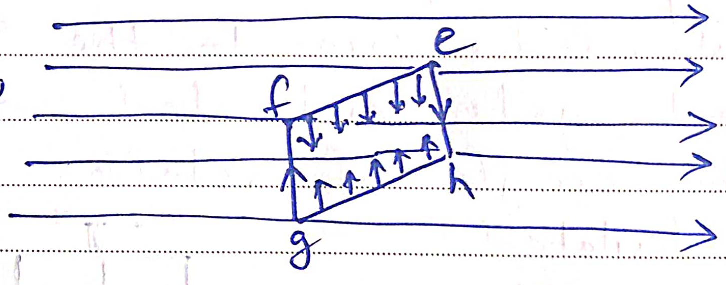
Theory :- Given, n = the no of turns in coil.
l & b = the length of each vertical & horizontal side of the coil.
i = the current flowing through the coil
B = the induction vector of the magnetic field in which the coil suspended.

We know that the force experienced by the current carrying in conductor place in a magnetic fields is

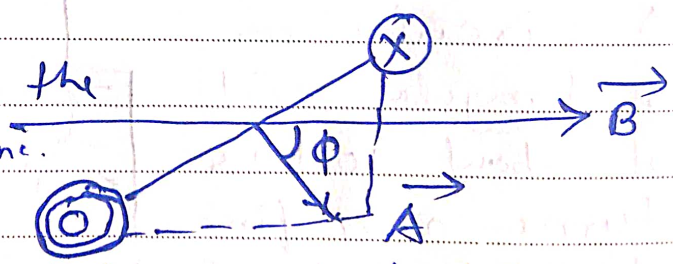
$$\vec{F} = i(\vec{l} \times \vec{B}) \quad \text{——— (1)}$$

Force on each wire 'de' and 'fc'



$|\vec{F}| = ibB\sin(90° - \phi)$
$= ibB\sin\phi$

where ϕ = angle between the normal to the plane.



The force on the two vertical wire 'cd' and 'ef' by using equ (1) are found to have magnitude

$F = ilB\sin 90° = ilb.$

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Applying the right hand curl rule for vector product the direction of the force are shown in the above figure.

Now the Momentum of the couple

$$P = ilB \times OC$$

$$P = ilBb\sin\phi = i(lb)B\sin\phi = iAB\sin\phi$$

∴ there are n turn is the coil

So $\boxed{P = niAB\sin\phi}$

Again Let C = torsional couple per unit twist of the suspension wire

θ = the angle on which coil rotating

∴ Restoring couple $= C\theta$ —— (2)

$\Rightarrow nAiB\sin\phi = C\theta$

$$i = \frac{C\theta}{nAB\sin\phi} \quad \text{—— (3)}$$

By using concave pole piece the magnetic field is made.

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radial so that for any position of coil ϕ is always 90°

So $\sin\phi = \sin 90^\circ = 1$

$$\therefore \boxed{i = \frac{C\theta}{nAB}} \quad \text{--- (4)}$$

Here n, A & B are all constant.

$i \propto \theta$