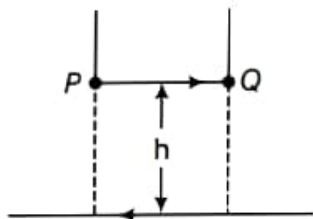


Q. 22A A long straight wire carrying current of 25A rests on a table as shown in figure. Another wire PQ of length 1m, mass 2.5 g carries the same current but in the opposite direction. The wire PQ is free to slide up and down. To what height will PQ rise?



K Thinking Process

The force applied on PQ by long straight wire carrying current of 25A rests on a table must balance the weight of small current carrying wire.

Ans. The magnetic field produced by long straight wire carrying current of 25A rests on a table on small wire

$$B = \frac{\mu_0 I}{2\pi h}$$

The magnetic force on small conductor is

$$F = BIl \sin\theta = BIl$$

Force applied on PQ balance the weight of small current carrying wire.

$$F = mg = \frac{\mu_0 I^2 l}{2\pi h}$$

$$h = \frac{\mu_0 I^2 l}{2\pi mg} = \frac{4\pi \times 10^{-7} \times 25 \times 25 \times 1}{2\pi \times 2.5 \times 10^{-3} \times 9.8} = 51 \times 10^{-4}$$

$$h = 0.51\text{cm}$$