Physics 12 Section 20-6
Force Between Two Parallel Wires

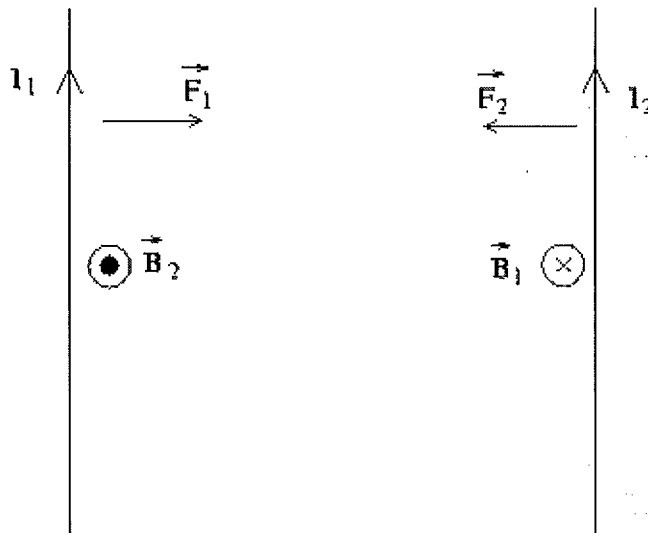1. The Force between two parallel wire can be calculated if we combine

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

Remember this is the B field at a distance r from a wire with a current of I flowing through it.

and

$$F = BIl$$

This is the force that a wire carrying a current of I feels when it is in a B field.

2. Two parallel wires, wire 1 and 2, have currents I_1 and I_2 respectively, flowing through them. Wire 1 produces B_1 and wire 2 produces B_2.

3. Looking at wire 1

$$F_1 = B_2 I_1 l$$

$$B_2 = \frac{\mu_0 I_2}{2\pi r}$$

$$F_1 = \frac{\mu_0 I_2 I_1 l}{2\pi r}$$

Example: Two wires of a 2.0m long appliance cord are 3.0mm apart and carry a current of 8.0A dc. Calculate the force between these wires.

$$F_1 = \frac{\mu_0 I_2 I_1 l}{2\pi r}$$

$$F_1 = \frac{(4\pi \times 10^{-7}) \times (8.0) \times (8.0) \times (2.0)}{2\pi \times .003}$$

$$F_1 = 8.5 \times 10^{-3} N$$

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