

- (A) I know the fuse drew a current of $I = 15 \text{ Amp}$ and there was an applied voltage of $V = 120 \text{ V}$ so the total power draw was:

$$P_F = IV = (15 \text{ A})(120 \text{ V}) = 1800 \text{ W}$$

- (B) The total Power draw was:

$$P_{\text{FAN}} + 3 \cdot P_{\text{LIGHT}} + P_{\text{IRON}} \geq P_F$$

or//

$$P_{\text{FAN}} \geq P_F - 3 \cdot P_{\text{LIGHT}} - P_{\text{IRON}} = 1800 \text{ W} - 3 \cdot 100 \text{ W} - 1100 \text{ W}$$

or//

$$\boxed{P_{\text{FAN}} \geq 400 \text{ W}}$$

- (C) Since I experienced severe pain but was able to pull my hand away, I drew 8-15 mA of current. Let's assume it was midrange so: $I_S = 10 \text{ mA}$

- (D) If my resistance were $R = 600 \Omega$, then for a $V = 120 \text{ V}$ source the current draw should have been:

$$V = IR \rightarrow I = \frac{V}{R} = \frac{120 \text{ V}}{600 \Omega} = 0.2 \text{ Amps} = 200 \text{ mA}$$

This should have given me severe burns and stopped my heart. Clearly it didn't, so I must not have drawn this amount of current.



(E) If I figure I only drew 10mA of current based on the effects I felt, then the resistance should be:

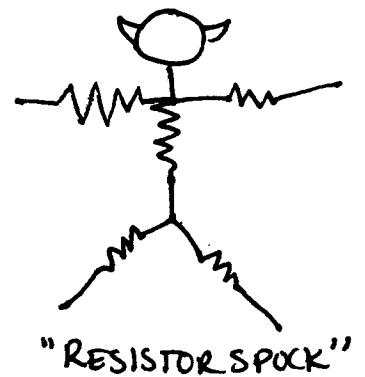
$$V=IR \rightarrow R = \frac{V}{I} = \frac{120\text{V}}{10 \times 10^{-3}\text{A}} = \boxed{12000\ \Omega = R_S}$$

(F) My body looks like two resistors in series (insides and skin) so the equivalent resistance (figured in E) is given by:

$$R_S = R_{\text{SKIN}} + R_{\text{INSIDE}}$$

or//

$$R_{\text{SKIN}} = R_S - R_{\text{INSIDE}} = 12000\ \Omega - 600\ \Omega = \boxed{11400\ \Omega}$$



This is WAY lower than dry skin, so I must have been nervous about playing with electricity.

(G) Suppose my feet are $24\text{cm} \times 10\text{cm} = 0.24\text{m} \times 0.1\text{m} = 0.024\text{m}^2$ in area, and my soles are 0.01m thick. The resistance of my shoe then is:

$$R = \rho \frac{d}{A} = 10^{13}\ \Omega\text{m} \cdot \frac{0.01\text{m}}{0.024\text{m}^2} = \boxed{4.2 \times 10^{12}\ \Omega} \quad \text{A HUGE RESISTANCE}$$

(H) If my shoes and I are in series then:

$$R = R_S + R_{\text{SHOE}} = 12000\ \Omega + 4.2 \times 10^{12}\ \Omega = 4.2 \times 10^{12}\ \Omega$$



Given this resistance the current draw should have been:

$$V=IR \rightarrow I = \frac{V}{R} = \frac{120 \text{ V}}{4.2 \times 10^2 \Omega} = 2.9 \times 10^{-11} \text{ A}$$

This is an EXTREMELY TINY current. I probably wouldn't have felt a thing.

This illustrates something about insulators and how they protect you. They have HUGE RESISTANCES, so protect you by not drawing a lot of current.