

Answer on Question 65739, Physics, Electric Circuits

Question:

Weekend breakfast! I love waffles and bacon, and have to have my coffee. The waffle iron is rated at 1200 W and my coffee pot draws 700 W of power. Today I will be making the bacon in the microwave, which is 900 W . If all three appliances are on the same household circuit (which has $\Delta V = 120\text{ V}$), will I be able to make my breakfast if the circuit breaker trips at 20 A ?

Solution:

Let's first calculate the total power draws:

$$P_{tot} = P_{waffle\ iron} + P_{coffee\ pot} + P_{microwave} = 1200\text{ W} + 700\text{ W} + 900\text{ W} = 2800\text{ W}.$$

Then, from the definition of the power we can find the current through the circuit breaker:

$$P = IV,$$
$$I = \frac{P}{V} = \frac{2800\text{ W}}{120\text{ V}} = 23.3\text{ A}.$$

Answer:

As we can see, the circuit breaker trips at 20 A (and with total power draws in our case the current through the circuit breaker is even greater - 23.3 A), so we won't be able to make the breakfast.