

Experiment 2: Electric Fan / DC Motor Circuit

Goal

In this experiment, we build an electric fan, using a DC motor. DC stands for “Direct Current”, which means that the current flows in one direction all the time. A motor is a device that spins when an electric current flows through it. What components will we need for this circuit?

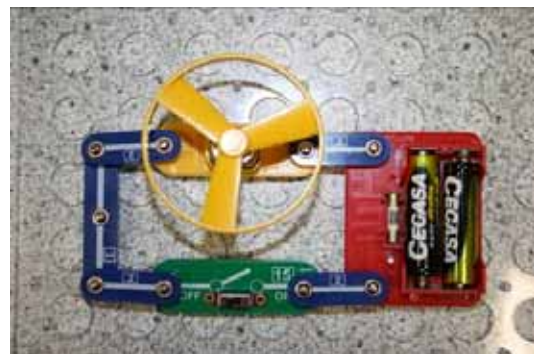
Components

1. Motor. Of course, we will need the motor. The motor changes electrical energy into mechanical energy.
2. Fan blade. We attach the fan blade to the motor, so that the fan will spin when the motor spins.
3. Switch. Like in the lamp circuit, the switch will turn the circuit on and off.
4. Battery. Power for the motor will come from the battery pack.
5. Connectors. Electricity needs some way to flow between the components. We use connectors of various lengths to connect up the battery, the switch, and the motor.

Build it!

First, place the main components, that is the lamp, the switch, and the motor. Make sure that the motor is the right way around! The + on the motor should be beside the + on the battery pack.

Now connect them all up with connectors, and place the fan blade on the motor shaft. The fan blade will only sit loosely on the motor shaft.



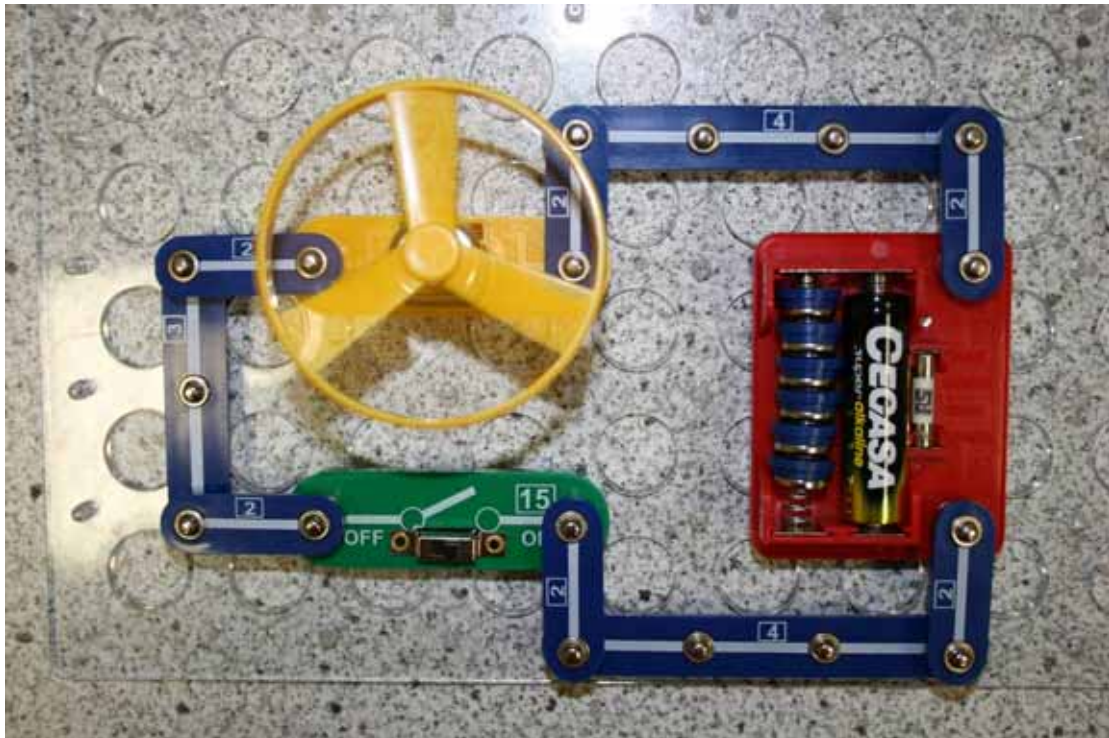
In Action

When you close the slide switch, electric current flows from the battery, through the motor, and back to the battery again. As the current flows through the motor, it spins. The fan blade spins too, blowing air up and away from the motor. You can feel the cool air by holding your hand over the fan blade. Be careful – the fan blade is only sitting loosely on the motor shaft, and it will probably take off, so guard your eyes and face.

Change it around

What would happen if the fan was spinning the other way? Instead of blowing air out, the fan would suck air in. We can make the fan spin the other way by changing the direction of the current flowing in the circuit. This means that we have to turn the battery pack around. The circuit for this is shown on the next page.

In the last circuit, we had the annoying problem of the fan blade taking off after it had build up enough speed. We can prevent this by making sure the blade doesn't spin so fast. Any idea how we can do this? The answer is in the picture on the next page.



This circuit will cut the speed of the motor in half, by cutting the battery power in half. We can do this by taking out one of the batteries, and replacing it with a “short circuit” (I did this using six of the one one-snap connectors in a row). Now the fan will spin at half the speed – which is a bit safer to work with!

There is another way to make the fan spin in the other direction, without having to turn around the battery pack. We could have left the battery pack as it was, and just turned around the motor itself (so that the + on the motor faces away from the + on the battery pack). The motor will spin the other way, sucking air in instead of blowing it out.

Real World

We use DC motors everyday. One example is the electric fan that keeps us cool on hot summer days. Think of any device where you want to change electrical energy into spinning mechanical energy- like a cordless drill, electric toothbrush, or the wheels of a toy car- they all contain DC motors.

By changing the direction of the motor, we can push the air down instead of blowing it upwards. This is how a toy helicopter would work. By pushing the air downwards, the helicopter is lifted upwards.