

SOFT CIRCUITS

When I discovered that there was such a thing as conductive thread and that LEDs could be sewn into clothes I was seriously excited. The best part is that it's very easy to do and you get to be super creative with it. We already talked about LEDs, so let's talk about sewing, conductive thread and circuitry.

Sewing is one of the world's oldest technologies! Thread and needles were often made from plant materials or from the bodies of insects and animals. Being able to sew allows people to join pieces of material together to create larger, more complicated structures like clothes, blankets or tents. Working with materials rose to great prominence in many cultures. In Europe during the Renaissance, textiles production made many people very rich and influential, allowing them to shape politics for hundreds of years. In China, only Emperors were allowed to wear silk. For much of human history, fabric, sewing and its various art forms has defined social status.

Safety First!

Don't forget that needles are sharp. You have to be careful when you're threading and sewing so that you don't prick yourself with the needle. Go slowly and pay attention to where you are threading the needle in and out of the fabric. If you remain aware, you won't end up a pin-cushion!

Conductive thread is exactly what it sounds like: it's a thread that you can sew with and it conducts electricity. It's often created with stainless steel fibers or regular fibers coated with a conductive substance. An alternative to buying conductive thread is to strip old wires to obtain the thin metal inside which can also be sewn into fabric.

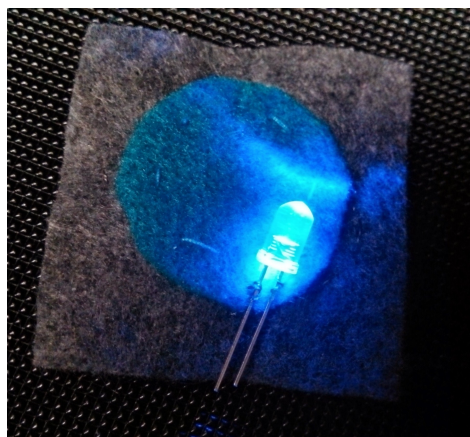
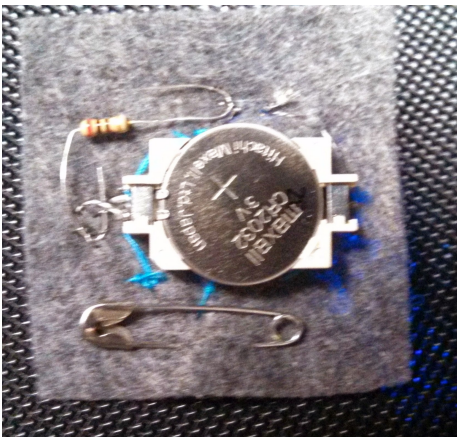
The conductive thread is used to create a circuit. A circuit is a closed system that provides electricity through a device. When the circuit is open, it's "off." Batteries provide the power to move electrons through the circuit. This is voltage and measured (naturally) in volts (V). The current of the flow of electrons is measured in amperes (A). Multiplying the voltage and the amps of the circuit lets you figure out how many watts (W) of power are generated. $V \times A = W$ Too easy!



STUFF YOU NEED

When you're creating your soft circuits and wearable LED projects, plan ahead! If you know what shape you're working with, that will inform where you will be sewing and where you'll want to place your electrical components!

You may wish to allow people to see the electrical parts and make it part of your design, or you might want to hide it, placing it on the back of the project or covered with other fabrics. It's up to you: be creative and have fun!



The back and the front of a simple electric badge. The front only shows the LED light, but the back contains all of the electrical parts that allow the circuit to flow.



Using conductive thread is easy. I only sew with one line of thread at a time. But with "regular thread" I normally "double" the thread on the needle for strength.

LED LIGHTS.

These can be purchased very inexpensively today from many places online or from stores like Radio Shack. It's a lot cheaper to get them online, I've noticed.

RESISTORS.

Sometimes these come packaged with the LED lights. If not, make sure you purchase some of the right type (we'll get to that.)

BATTERIES.

Any type is fine! Have at least 3 volts total.

BATTERY HOLDER.

Any type that fits your battery.

FABRIC.

Any type is fine. We're using felt because the edges of felt don't fray.

CONDUCTIVE THREAD.

This is special thread that can conduct electricity.

REGULAR THREAD.

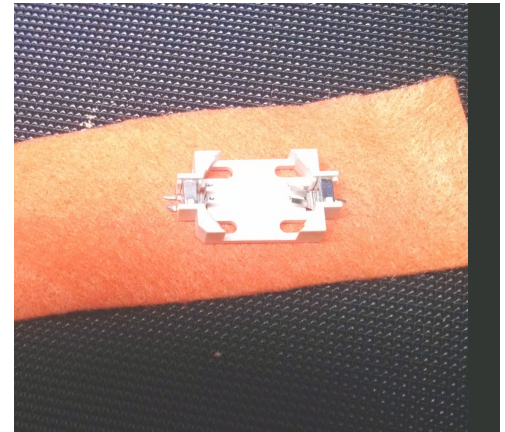
Any type of non-conductive thread.

NEEDLE.

Any kind of needle will work.

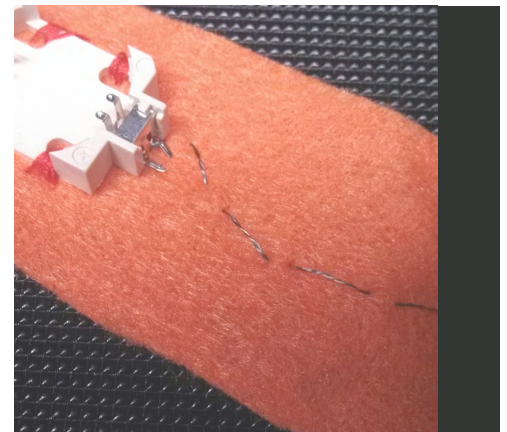
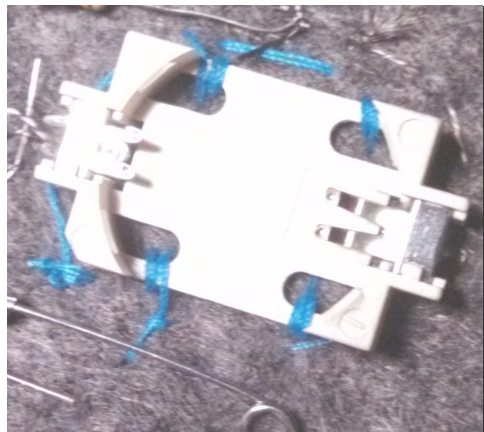
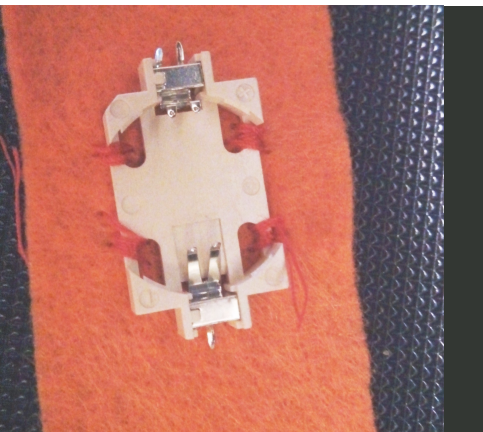
STEP BY STEP

SOFT CIRCUITS



1. Cut out some fabric. For this tutorial, I'm showing you how to make a bracelet, but you can make any kind of shape you wish.

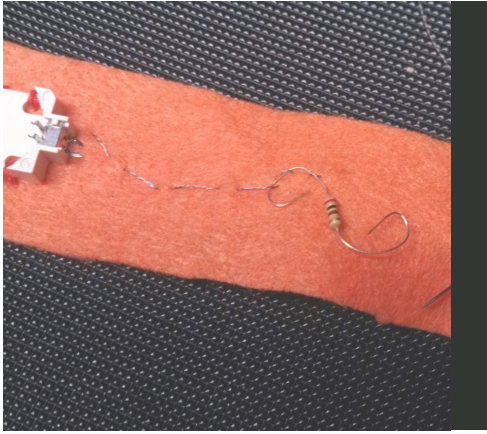
2. Figure out where you want to place your battery holder. Make sure the connections are able to be sewn down.



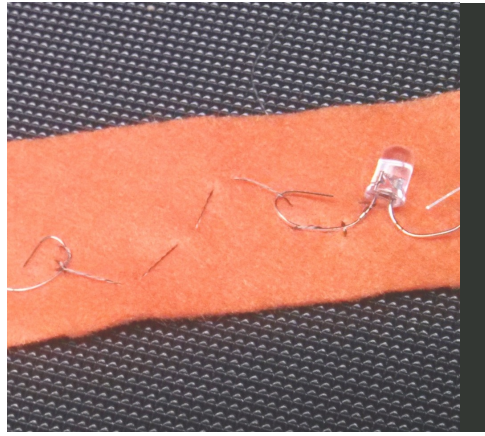
3. Sew the battery holder down using regular thread.

3a. Another shot of the sewn-down battery holder. Depending on the type of battery, you might be sewing it down differently.

4. Start sewing with conductive thread. First connect the thread to the positive end of the battery. Make sure your thread goes around the metal coming off of the battery. Sew your circuit along your fabric.



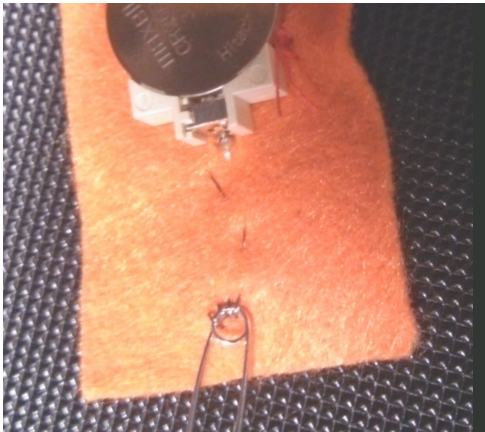
5. Get a resistor. In this case, I bent it into an interesting shape and then I sewed the conductive thread onto one end of the resistor. Sew a knot and cut your conductive thread.



6. Start the conductive thread again, sewing the other end of the resistor to your LED. Again, cut the thread after you've connected both of these things together.



7. Sew from the LED to the end of your fabric. Make a few lines across the end of the fabric and then cut the end of the thread.



8. On the other end of the battery, connect the negative end to a safety pin. You can also put your battery into the holder.



9. When you connect the safety pin to the lines of thread you made in step 7, you complete the circuit. Put on your bracelet and shine!



10. Light up the night with your cool new bracelet! Make other variations, such as badges, necklace or plushies that light up.



<-- To the left, you can see the whole bracelet at once.