Instructables.com December 23, 2007

Build a Microwave Transformer Homemade Welder

by stasterisk

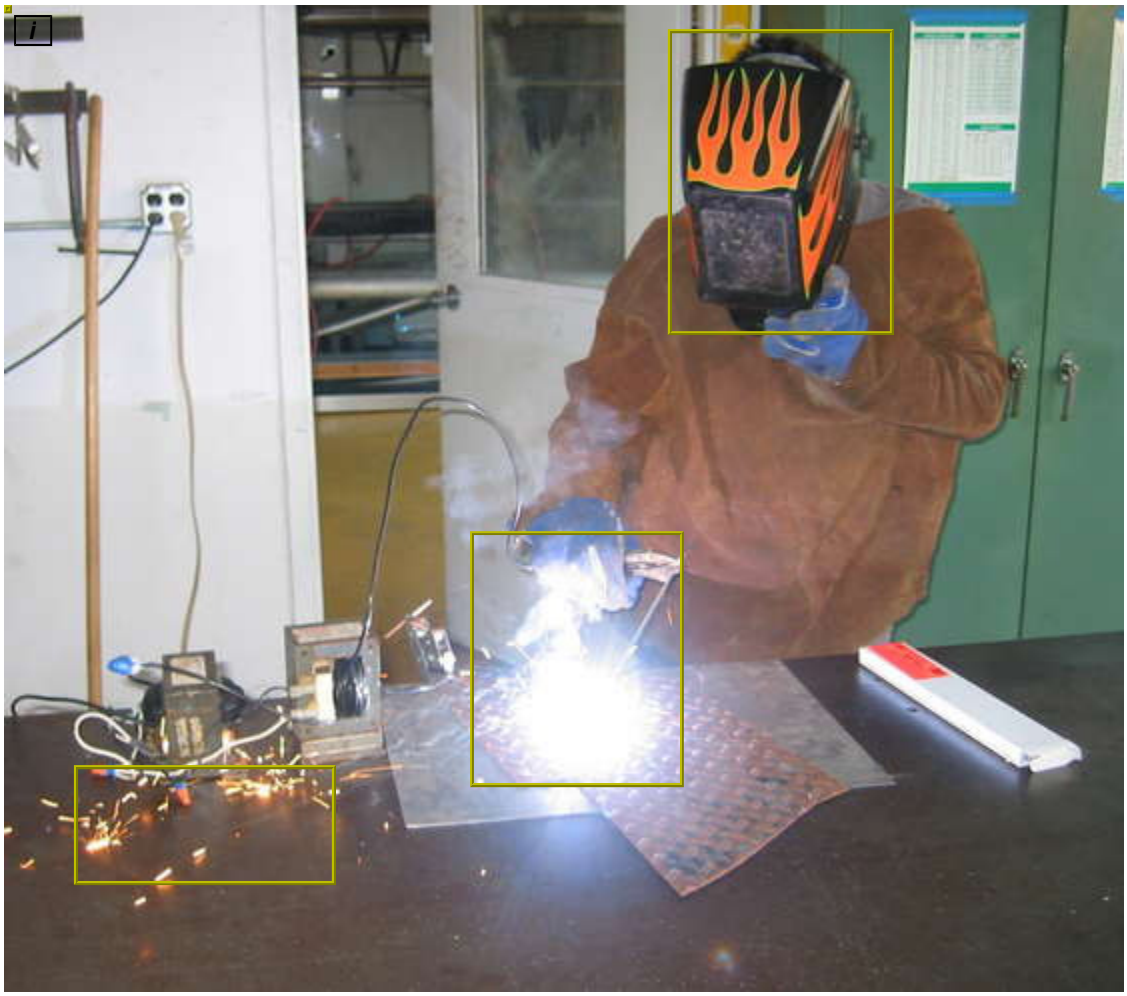
I had no idea making a DIY welder would be so easy to do. And, it's pretty much **FREE**!

So here's what you need to build a welder:
- Two beat up old microwaves
- Some 10 gauge wire
- Wire nuts

Stuff you need for welding:
- Welding helmet ($16 and up)
- Welding rods ($6)
- Vice grip or purpose-built electrode holder ($6 for either)
- C clamp for grounding clamp
- Gloves
- Thick nonflammable (leather) clothing that will cover your arms

Disclaimer: High Voltage ELECTRICITY and lots of CURRENT! Heat, electrocution, and DANGER! You could die and you could go blind!

Here are the really good how-tos that this project is informed by:
build a 70 amp welder
the tiny tim welder by tim williams
home made welding machine (via afrigadget)



step 1: Schematic

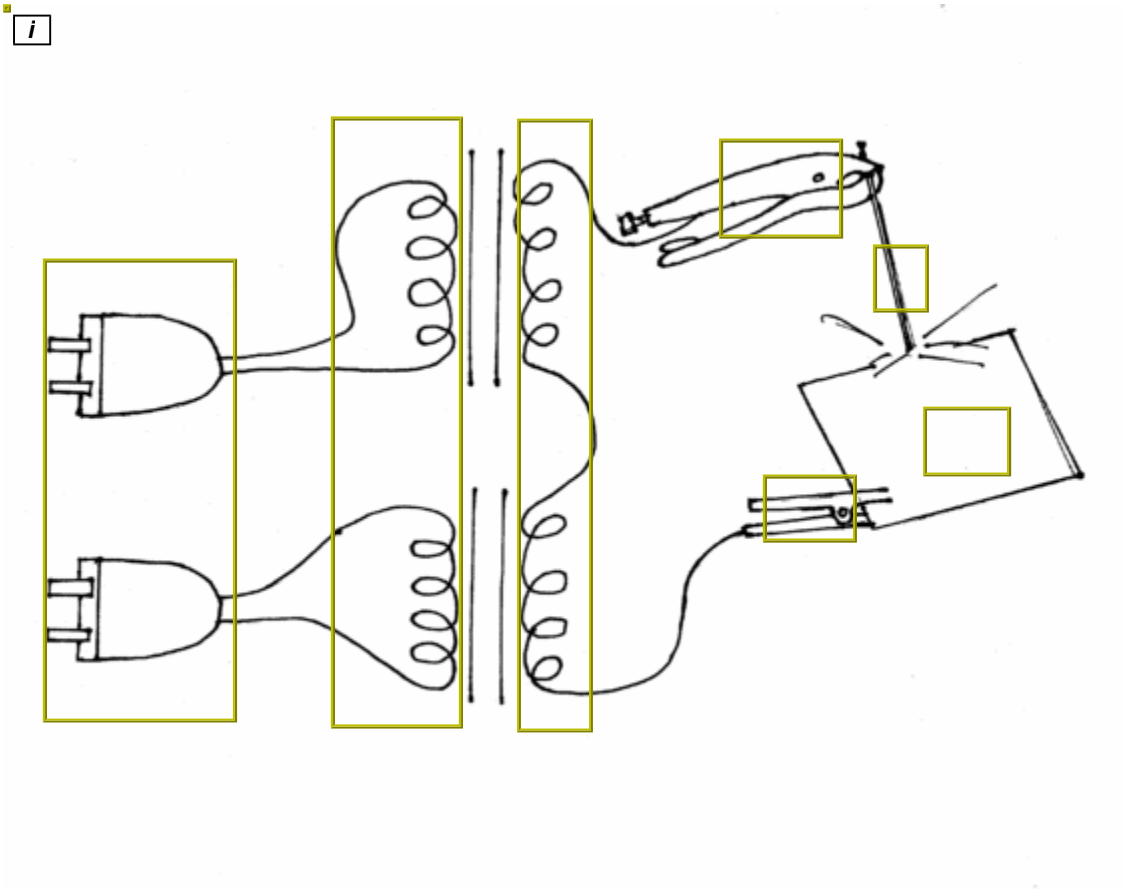
It's a pretty simple circuit.

In fact there's nothing in it except wire!

We'll take two transformers and wind low-voltage secondary windings on them with thick wire.

We'll put the secondaries in series with our welding rod and workpiece.
We'll plug the primaries into the wall.

I really like the way aaawelder put it: "do not include yourself in this circuit"



step 2: Dissect the Microwaves

Invite your non-hardware oriented pals over to help help dissect your donor appliances.
They'll love it. David Grosof donated one of these microwaves under the condition that we take it apart together.





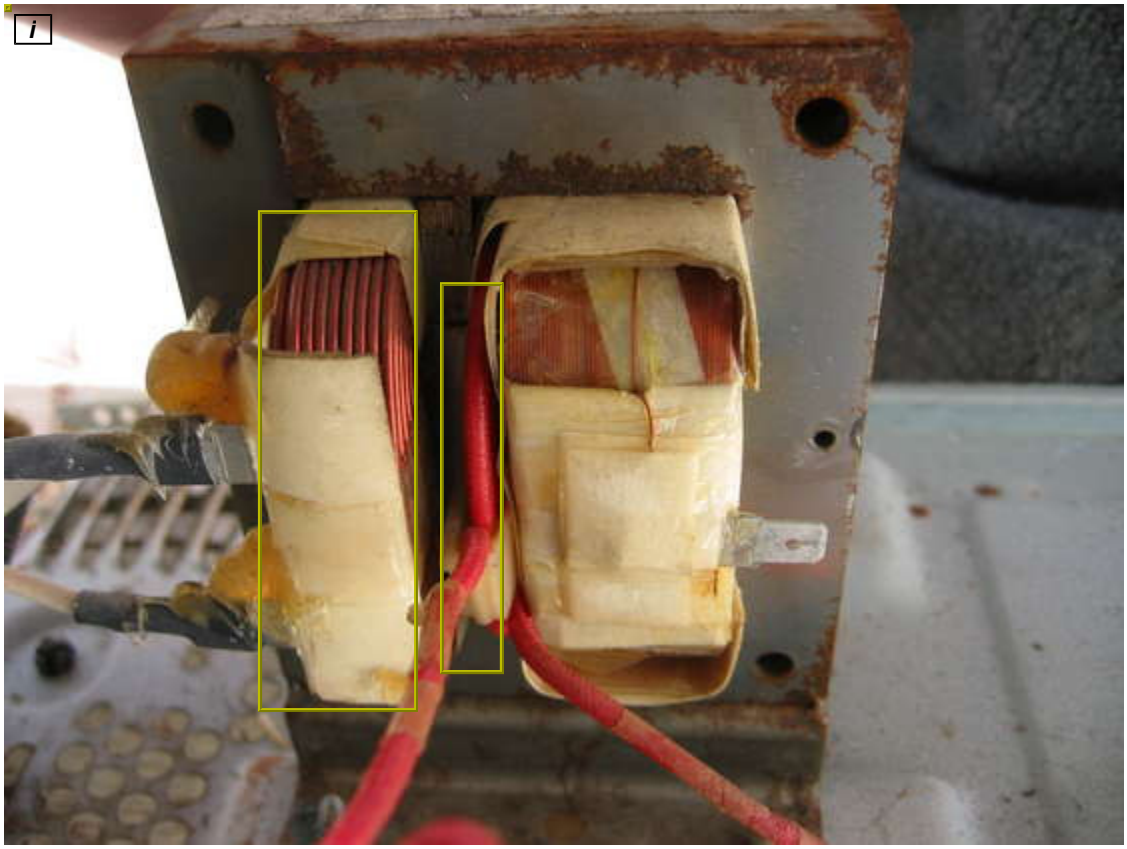


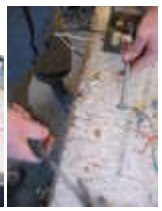


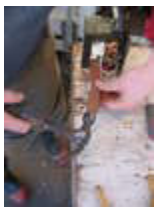

step 3: Prepare the Transformers

Chop and and knock out the secondary (thin wire) windings.
Don't nick or damage the primary windings in any way.

If you do, you could create shorts where two windings conduct to each other, allowing electricity to bypass certain parts of the coil, making effectively a smaller coil, and creating something different than what you expect at the output. Or, you might chop the connection entirely, ruining the primary. So do your best to keep it intact.

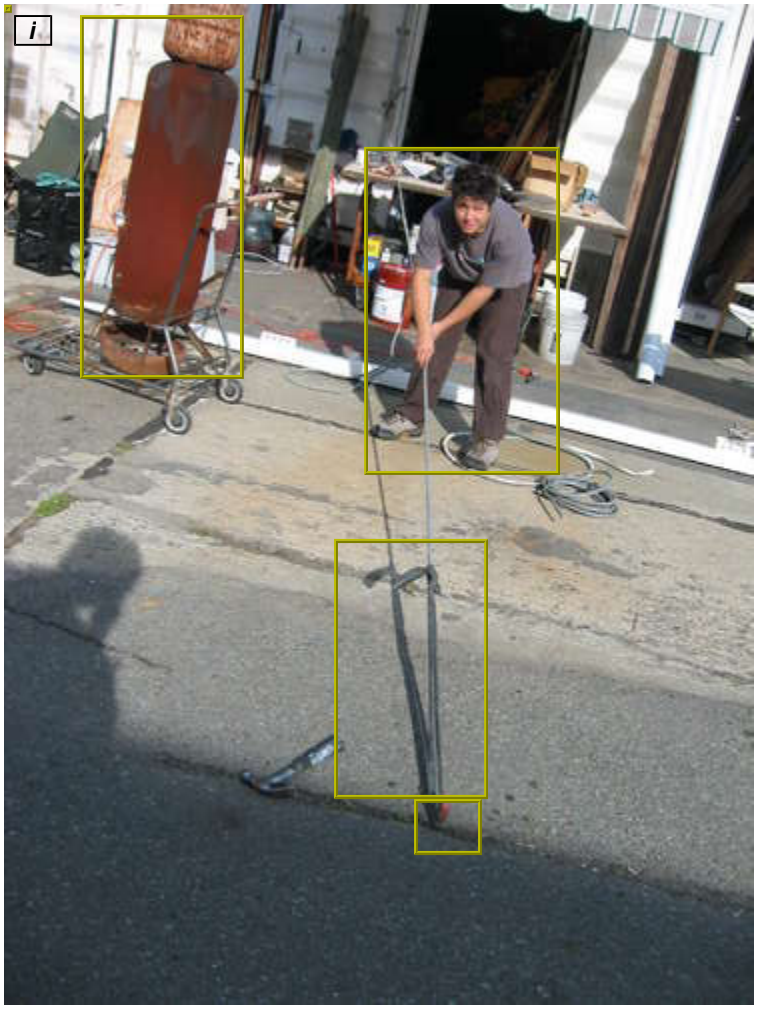






step 4: Get some 24 foot chunks of ten-guage wire

We scavenged some heavy wire from an old powerboat the owner was scuttling.
We stripped the outer jacket off and separated the inner conductors to wind new secondaries on our transformers.



step 5: Wind the new transformer secondaries

We wound 20 turns of 10-guage wire on each transformer. That's just about how much wire would fit into the available space. It took a little over 20 feet of wire each.

tip: draw tally marks on your table to keep track of the number of windings.

How does a transformer work?
The primary winding is an electromagnet connected to alternating current.
The humming magnetic field of the primary induces a current to flow in the secondary winding. If both windings have the same number of turns, the output voltage is the same as the input.
(minus a smidgin due to eddy currents, resistance, etc.)
If the secondary has more turns than the input, its output voltage is higher. That's the type of transformer you started out with.

OUTPUT VOLTAGE = INPUT VOLTAGE * (NUMBER OF SECONDARY TURNS) / (NUMBER OF PRIMARY TURNS)

Our primary has 100 turns and gets connected to 100 volts AC. We're winding 20 turns on the secondary, so we'll get about 20 volts out.

The available POWER STAYS THE SAME regardless of what the output VOLTAGE is.
POWER (WATTS) = AMPS * VOLTS

If the primary is made take 1000 watts (100 volts * 10 amps) out of the wall, we'll be able to take 1000 watts out of the secondary. With 1/5 of the windings, we can draw 50 amps out of the secondary.

That's the cartoon version with play numbers anyway.
Over here in our shed full of reality we've got two of these beasts in series and plan to short the outputs through a welding rod like Jennifer Beals.

Let's just say we're going to pull a whole lot of amps, which is why we need to wind our secondary with such thick wire.

The copper conductor in ten-guage wire happens to be 1/10" (0.1") in diameter.

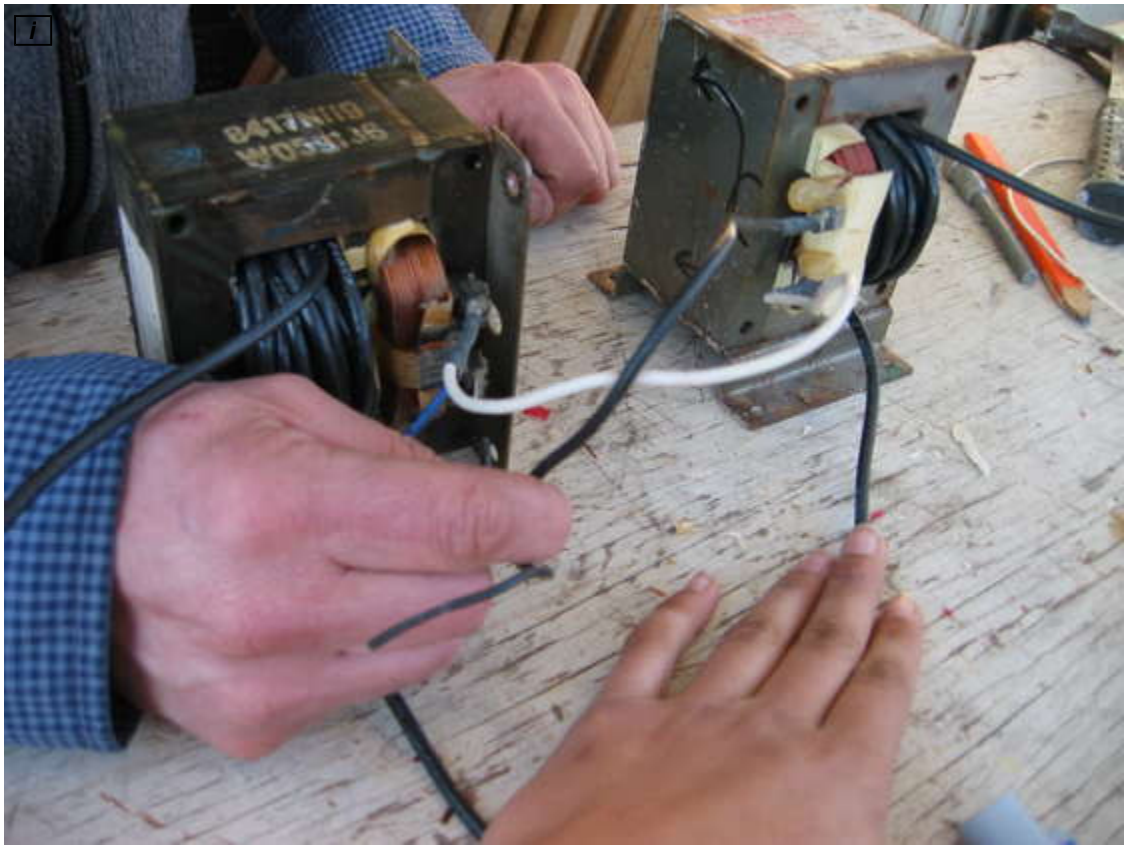
Here's a table of conductor diameter, guage, and current rating.



step 6: Wire your two transformers together

Why do we use two transformers?
Just one of these isn't big enough to make a really juicy welder.
If you happen to find a big enough transformer somewhere, feel free to use that.

Here's how to hook up two transformers.
First we wire both primary windings in parallel to the wall cord.
Then we wire the thick secondaries in series so they both"Push and pull" in the same direction.









step 7: Test

Get out yer voltmeter:

Here's the test to make sure the secondaries are both pushing the same direction.
Our two secondaries in series produce 38volts AC with no load. That seems about right.
If they'd phased wrong it could have been fixed by reversing the wiring to any winding.

Where Tim says "out of phase" in the video, he means "in phase". That is, the center tap **should** be less than the outer two leads, and if things weren't that way, the transformers would be fighting each other, or phased wrong.





step 8: Weld

holy cow, it works!

We wanted to add a series inductor to give the unit more "inertia", but it didn't matter!

Here's Star striking an arc.
It welds great with these thin 1/16" 6013 rods.
Even sticking the trode to the work doesn't heat up the transformers much.