Simple $10 Fog Juice (Glycol) Smoker

A 12V Design for Your Boat

You can build this simple smoker in an hour with readily available low cost parts. It puts out a lot of smoke per amount of battery power used. The design is based on great smoker design work done by *strmn54* on RCGroups/Cars/Tanks at this thread: http://www.rcgroups.com/forums/showthread.php?t=1182927
The big breakthrough in his design is the use of a simple resistor as the heater element rather than the complicated wound coil of specifically sized nichrome wire in most designs for model boats. The resistor allows design of a small, compact, lower amp unit that puts out a lot of smoke for the power used. Comparing an efficient nichrome "percolator" smoker running at 12V and 2A (24 watts) to this resistor smoker running at 12V and 1.2A (14 watts), the smaller unit puts out less "smoke", but a lot more than the expected half-amount the bigger unit (smoke output is roughly proportional to the watts used for similar design smokers). Bottom line, this design is compact, cheap, easy to build, low wattage and puts out a LOT of smoke per power used.
(Remember that glycol solutions are very poisonous (and they taste sweet). Keep away from pets and children! Even a few licks can kill. Wash your hands and any spills thoroughly. Don't leave a paper towel used to wipe up glycol anywhere that a pet can get to it.)

Parts and Materials:

Resistor, 10 ohm, 1watt	Radio Shack	RS 271-151
Fan, 40mm, 12V	AllElectronics.com	#CF318
(http://www.allelectronics.com/make-a-store/item/CF-318/12VDC-40MM-COOLING-FAN/1.html)		
Lamp wicks, cotton	Hardware store	
Project Box, 2"x 3"	Radio Shack	RS 270-1801
Stack tube (syringe tube)	Surplus store	To fit model
Wire, Silicone insulated, 18g.		
Silicone sealant		
Glycol based fog fluid - Party or other stores that sell or rent fog machines.		

Assembly:

The pictures tell the story. This smoker was designed to run at about 1.2 amps with a 12V battery. The 10-ohm, 1watt resistor gets very hot and evaporates the fog juice off the wick. *Do not let the system run dry*. The unit is very efficient and puts out a lot of smoke for the 14 watts of power it consumes.

A smaller 25mm (1") fan can be used, but they are usually rated at 5V. A resistor could be used to drop the 12V down to power the smaller fan.

It pays to use a good quality smoke fluid containing a mix of glycols that give smoke with good density and "hang- time". The fluid is available where party or holiday fog machines are sold or rented.

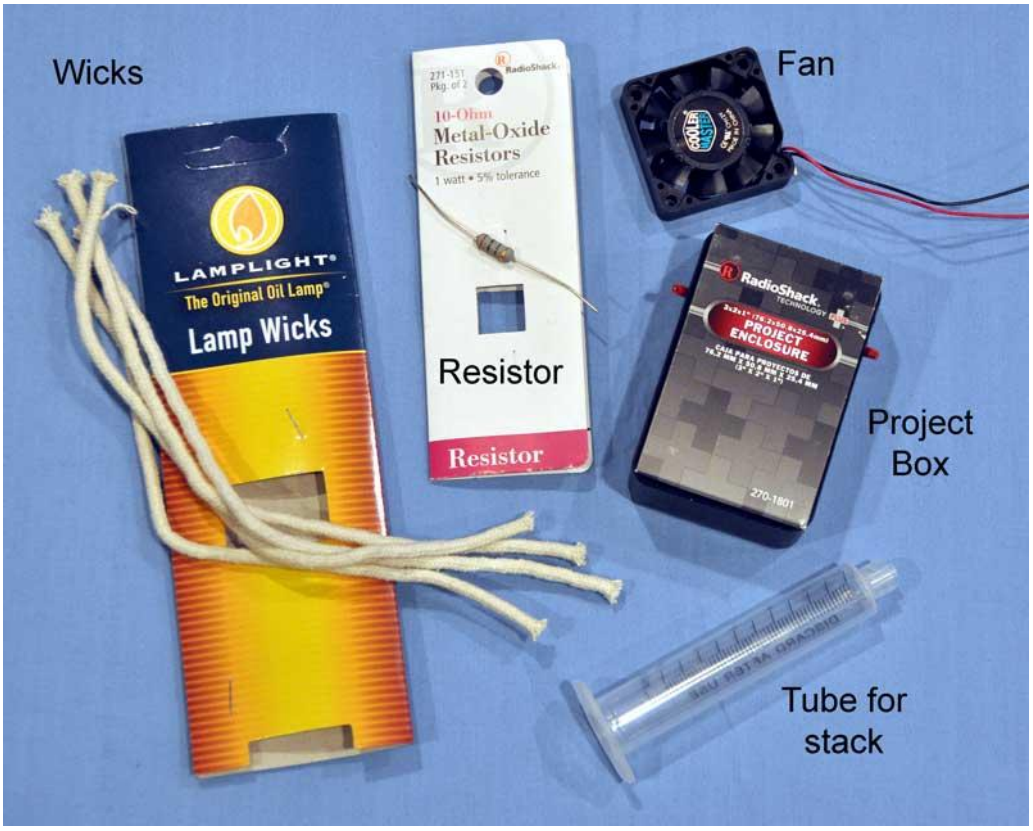
The box specified is 2" x 3", but pick a size to fit your model. One end of the box holds the heater (resistor) and stack. The fan is mounted on the lid at the other end of the box. Lay out the parts to determine where to drill the holes for the resistor power leads. The holes should be near the top edge of the box since the box is the fluid reservoir. The box should be filled to less than half full to avoid spillage. Strip two short pieces of silicone insulation from some high temperature stranded wire and insert them into the holes to act as heat insulators. The resistor leads will get very hot and the silicone insulation will prevent possible melting of the plastic box around the holes. Seal the insulators in place with a dab of silicone sealant.

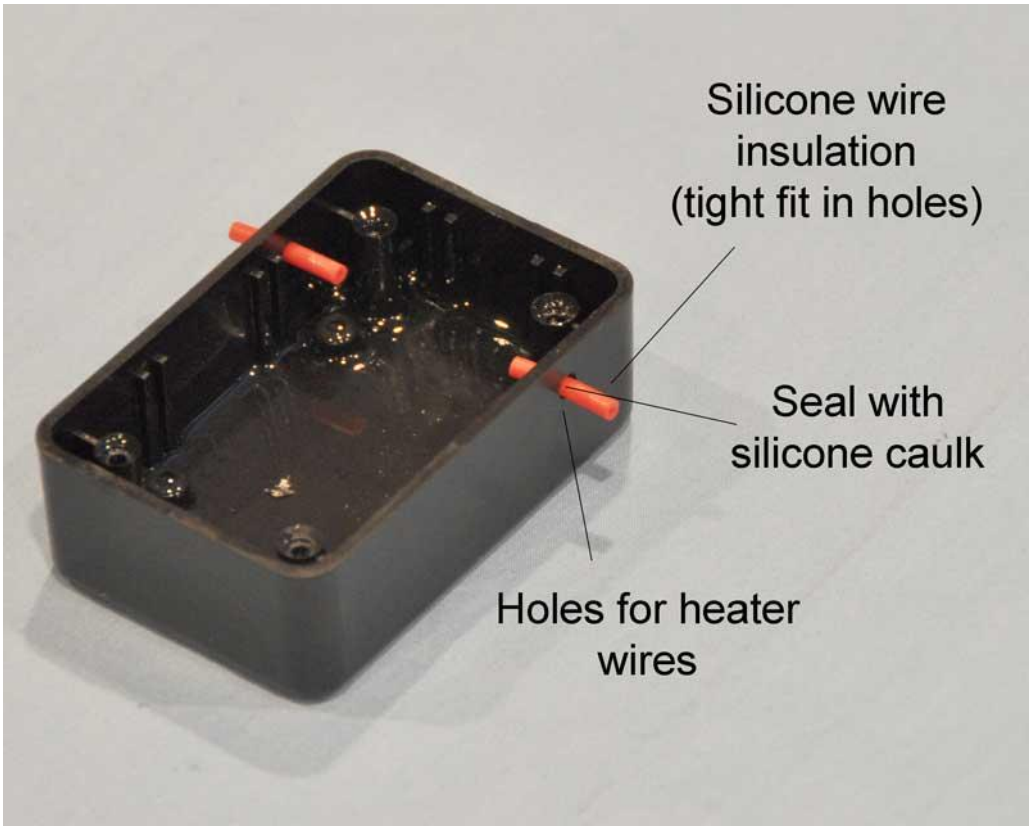
After tying the wick around the resistor, push the ends of the leads through the insulators and, center the resistor and bend the ends of the leads upwards to hold the resistor in place. Depending on box size, you may have to crimp extensions or the longer power leads to the resistor leads. It's best to use a short (1/8" long) piece of 1/16 " brass or copper tubing as a crimp tube to connect the resistor to the power leads because the leads may actually get hot enough to melt a solder joint.

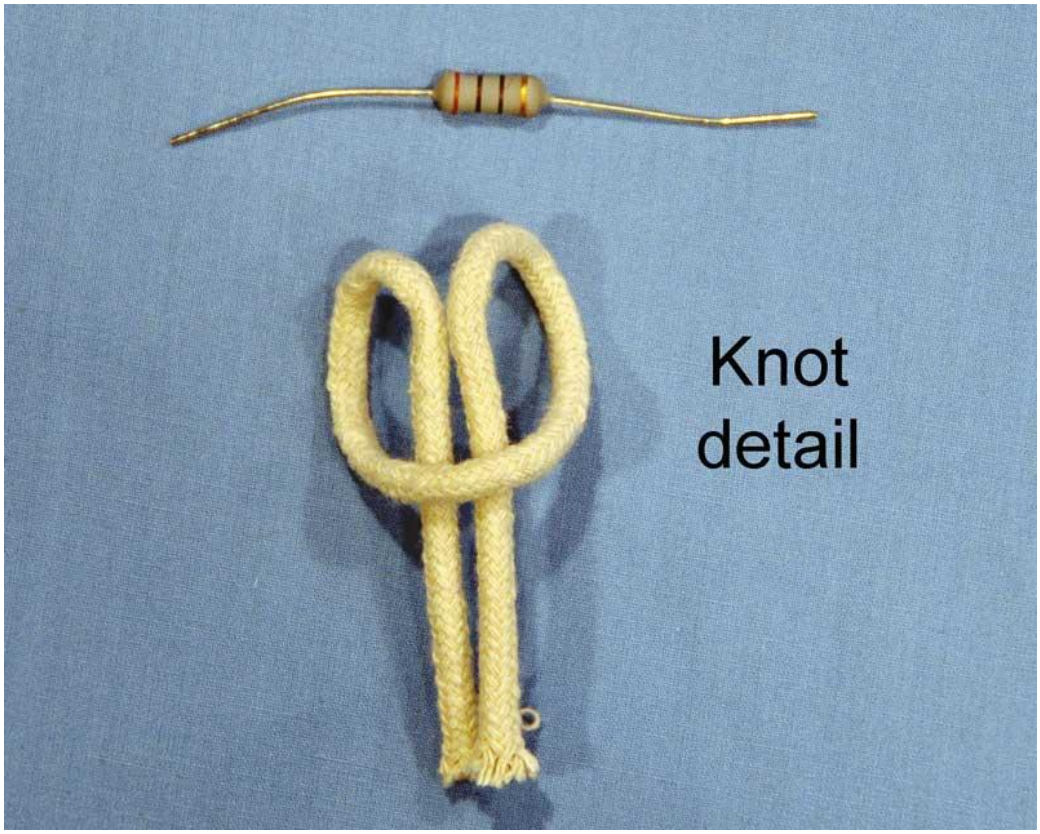
Position the hole for the stack directly over the resistor and wick. This keeps the plastic of the lid from being too close to and directly above the heat source. The opening should be a tight fit to the stack. The stack should fit into the hole so condensate drips back into the box, but should not be inserted so far as to touch the resistor, wick or power leads. Use a thin bead of silicone or an O-ring to make a collar at the bottom of the tube to help seal around the hole and to control the

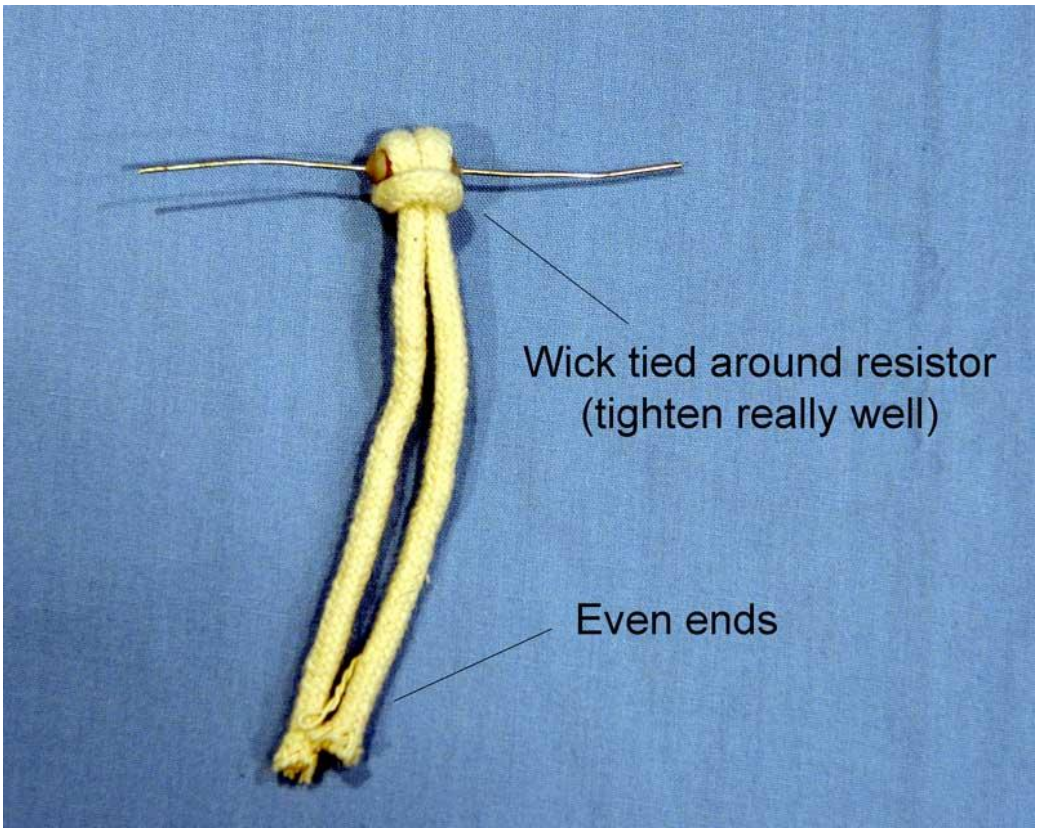
insertion depth of the stack. Remember that this stack is a liner that goes inside your scale stack. Don't use metal for the stack – it will cool and condense some of the fog that you used precious battery power to produce. Plastic syringe tubes make good stacks because they are heat resistant and come in many sizes.
Experiment with the fan opening. The pictures show a half circle with a diameter matching the fan blade. Start with a small hole (maybe only 1/2") and test run the smoker. Enlarge the hole in gradual steps to get good smoke flow without creating a "smoke jet". Another reason to keep the hole small is to prevent the smoke fluid from splashing up into the fan. Building a baffle into the fan opening to prevent fluid splashback would be a good design addition.
The fan can be simply sealed to the lid with a very light bead of silicone. All openings need to be sealed well or smoke will fill your hull or cabin.
Add fog juice to the container and wet the wick. The smoker can be filled through the stack. Add power to the resistor and fan and get smoke!

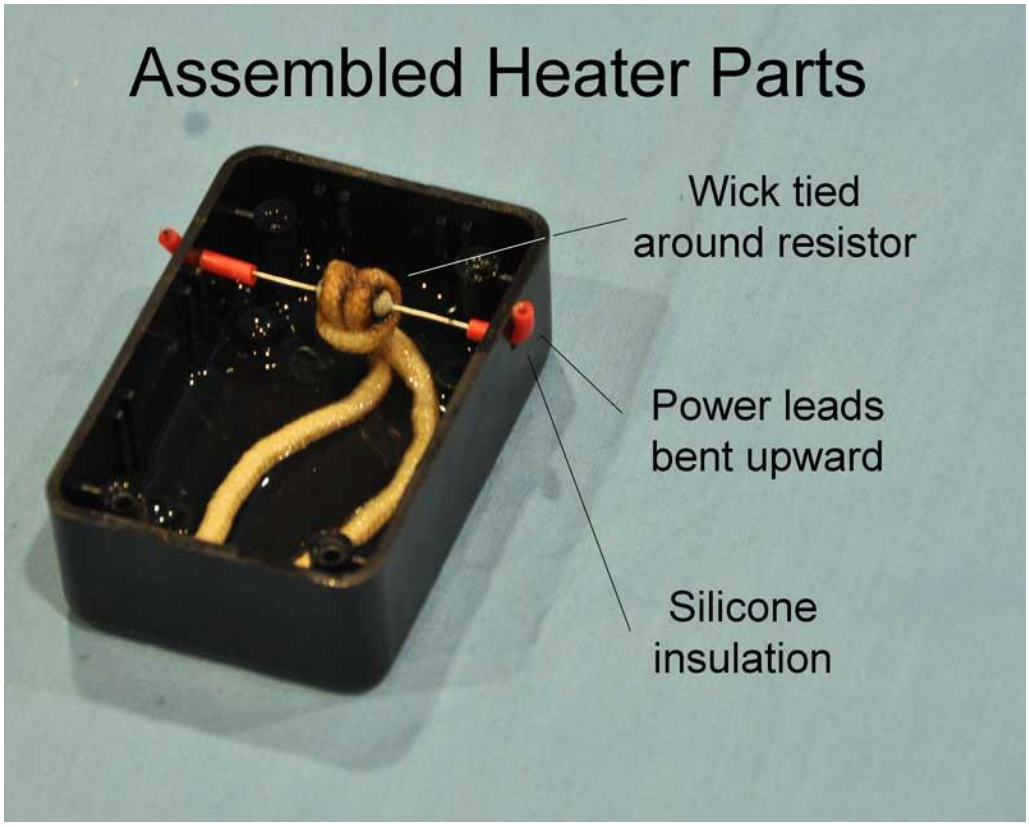
Some additional thoughts:
- Check the wick occasionally for burning or fouling. And remember not to run the wick dry.
- Use a fuse and a quickly accessible switch in the power circuit.
- Adding a small amount, about 1 part to 4, of 91% (not 70%) isopropyl rubbing alcohol can increase smoke output and help fluid flow to a new wick. Make the mix before adding to the smoker. The alcohol alone is flammable, but OK when mixed with the glycol. Keep the unmixed alcohol well away from a hot smoker.
- The system may overheat (melt) if the heater is powered without running the fan to provide some cooling.
- Only ne or two screws is necessary to hold down the lid.
- A metal lid is also provided with the box. That can be used instead of the plastic one.
- Don't overfill or tip the box – spilled glycol solution is sticky.
- WARNING – glycol solutions are extremely poisonous, especially to pets. It smells and tastes sweet and your pet will find and lick any spills it finds. Even a few licks can be enough to kill your pet! And wash your hands after handling – for your safety and your pets!

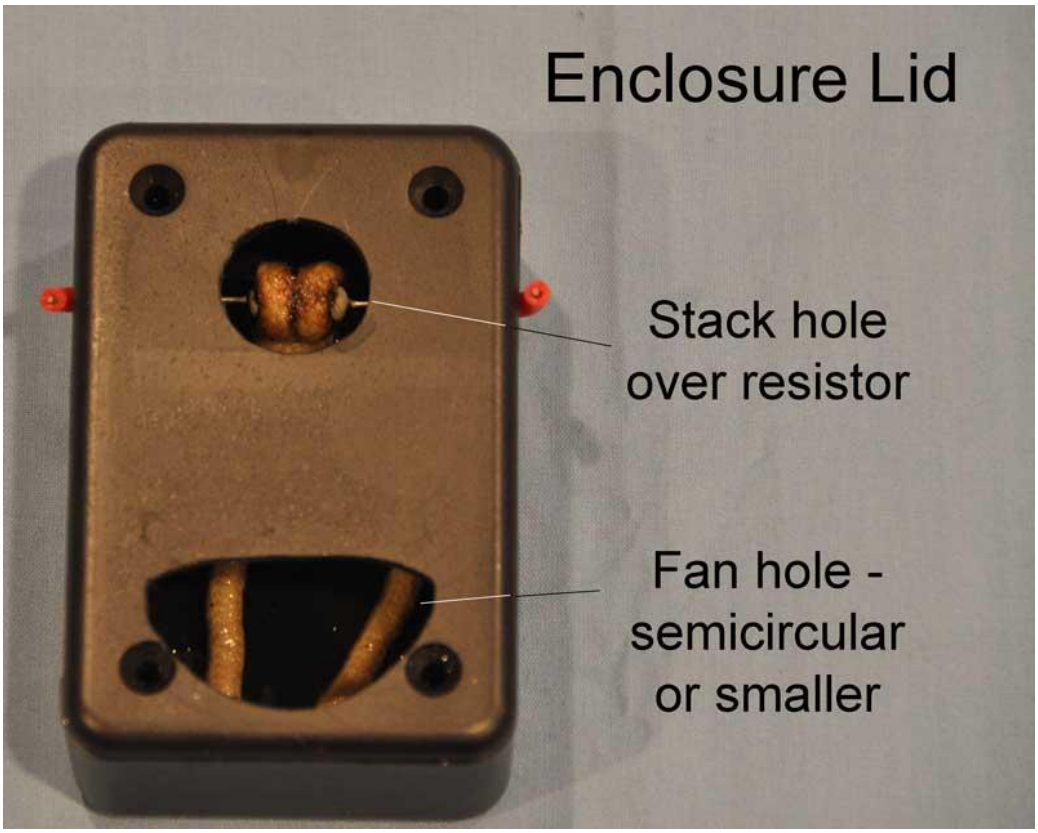

Wicks
LAMPLIGHT
The Original Oil Lamp
Lamp Wicks
10-Ohm
Metal-Oxide
Resistors
1 watt • 5% tolerance
Resistor
Resistor
Fan
RadioShack
PROJECT
ENCLOSURE
270-1801
Project
Box
Tube for
stack

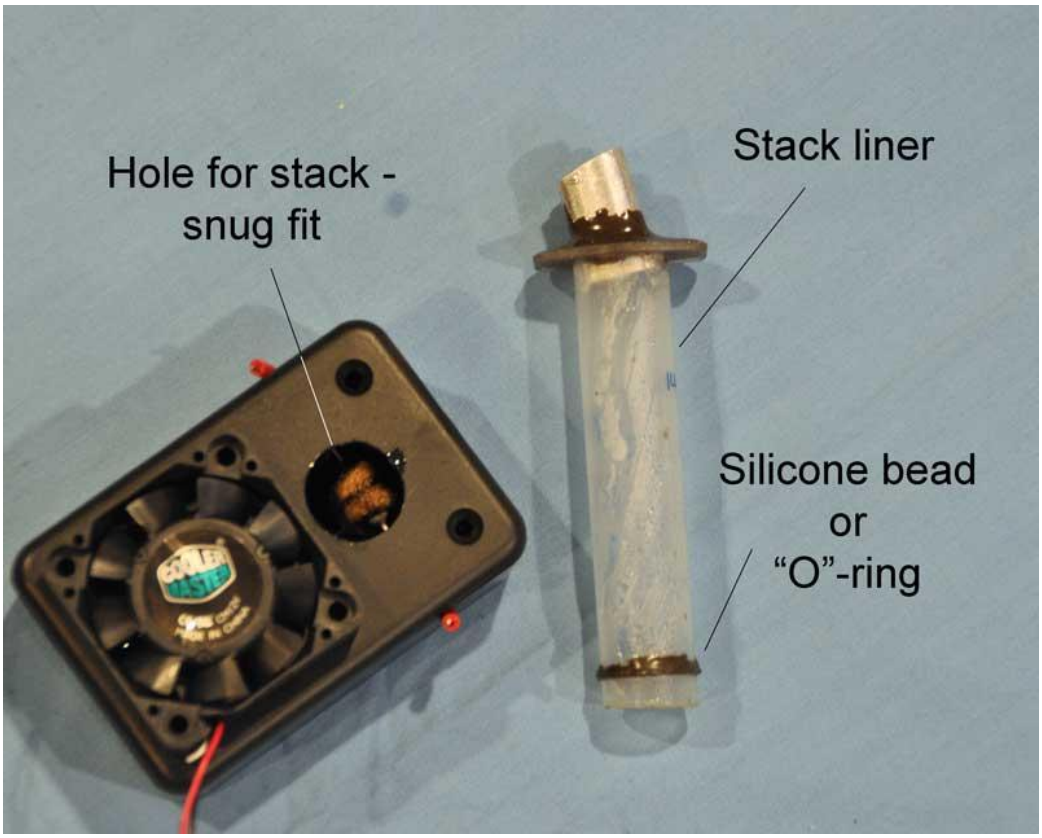

Silicone wire
insulation
(tight fit in holes)
Seal with
silicone caulk
Holes for heater
wires

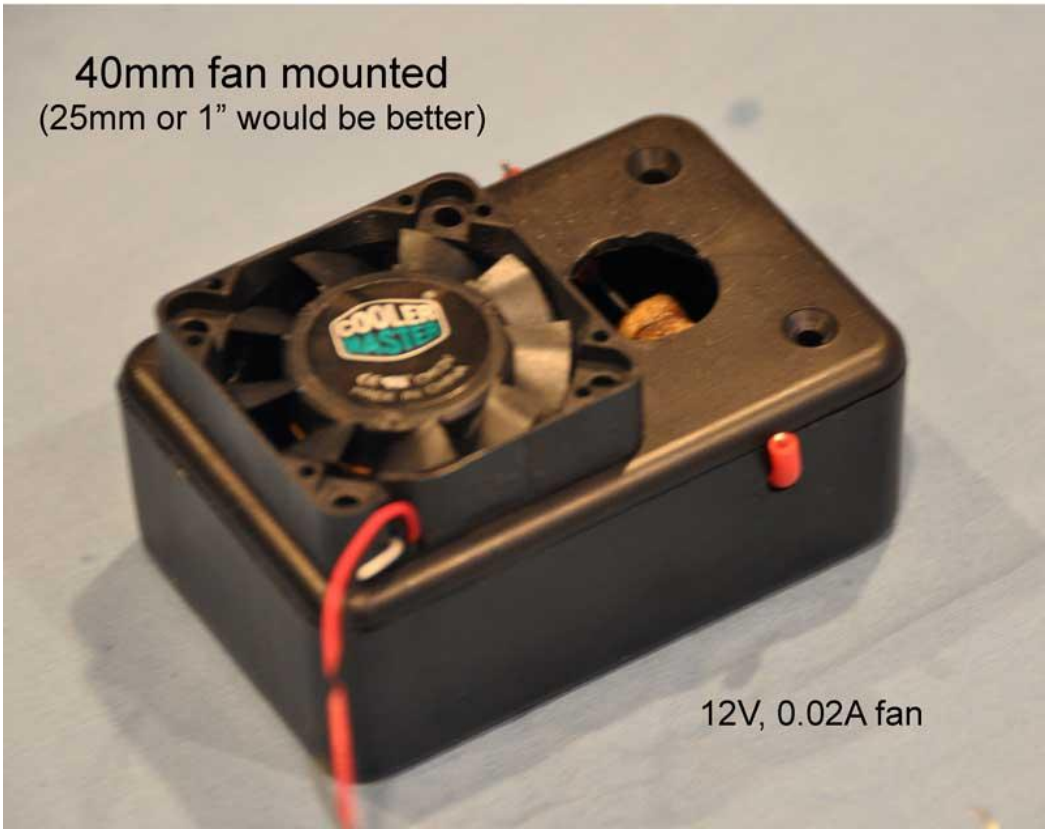

Knot
detail

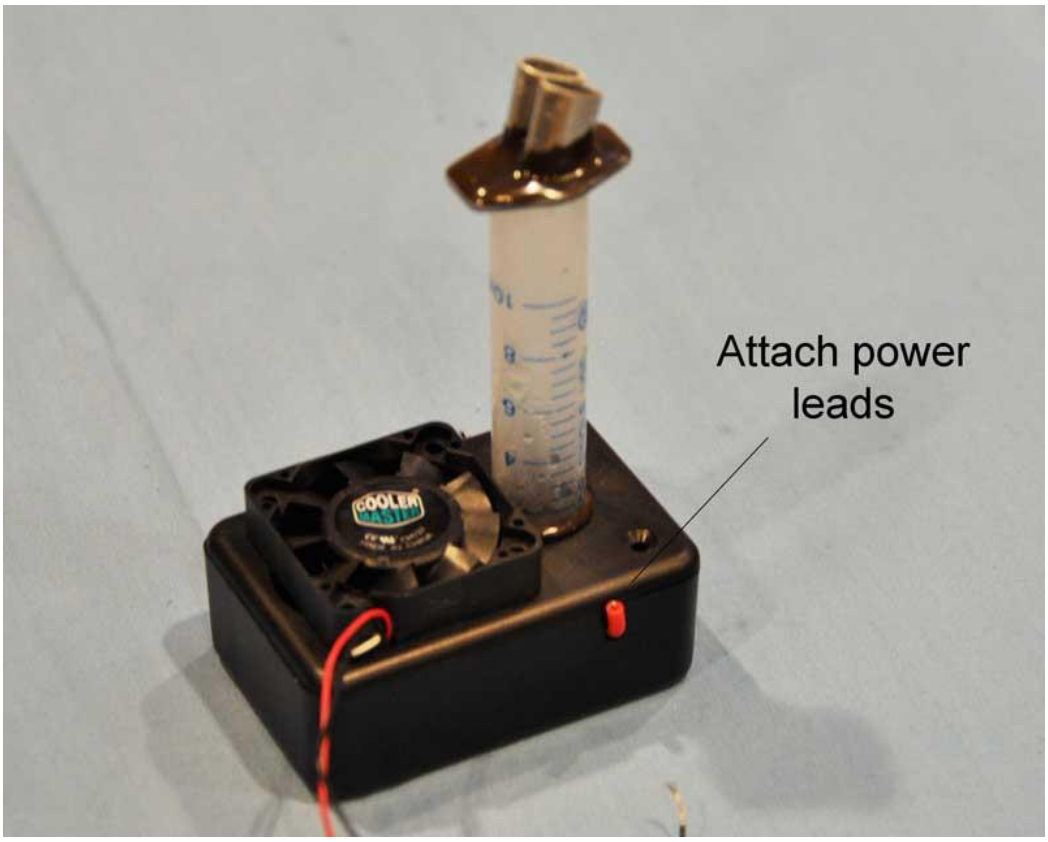

Wick tied around resistor
(tighten really well)
Even ends


Assembled Heater Parts
Wick tied around resistor
Power leads bent upward
Silicone insulation


Enclosure Lid
Stack hole over resistor
Fan hole - semicircular or smaller


Hole for stack -
snug fit
Stack liner
Silicone bead
or
“O”-ring


40mm fan mounted
(25mm or 1” would be better)
12V, 0.02A fan


Attach power
leads