Can Stirling engine plans

These instructions will help you build your own drinks can Stirling engine.

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Use a can opener or knife to remove the top from a can. Cut around the can, just below where the inward bevel starts.

You'll need a container for the water cooling jacket. Tuna tins are ideal for this, but you can use any heat proof container that will hold water. Cut a hole the tin big enough for the drinks can to fit through.

Turn the drinks can upside down and slide the tuna tin over it. Use a general purpose silicone sealant to make the joint water tight.
This can should be the same brand as the tin you used to make the displacer cylinder.

Use a can opener to remove the ring pull part from the top of the can.

Drill an 8mm hole in the base of the can. This will be for the nylon tube.

Tape the top can template around the can. Pay attention to the position of the arrow. It must line up with the 8mm hole.
Pierce through the two hole for the crankshaft using push pins.
These holes won't be big enough for the crankshaft so you'll need to make them bigger using a small piece of the steel rod.

Use a 4mm drill bit to drill the two holes for the angle bracket.

Pierce a hole in the centre of the viewing hole so can start cutting the hole out using tin snips.
Cut a small piece of the nylon tubing, around 25mm (1”) long. Push it through the 8mm hole in the can.

Turn the can over and seal around the nylon tube using epoxy resin. You'll need to hold the can at an angle to stop the epoxy running into the centre of the can.

Once the epoxy is set, you can bolt on the angle bracket using the M4x12 screws.
Dismantle three of the terminal block and drill a 2mm hole in two of them. The third one is for attaching the flywheel.

Form the displacer crank arm, the dimensions are along side the templates. You'll need to add the heat-shrink and electrical connector as you bend it.

The diaphragm crank arm needs to be rotated through 90 degrees around the axis of rotation (see photo!).
The diaphragm crank arm completed.

Take another drinks can, it should be an aluminium can. Cut a strip of the can around 50mm high. This will form the outer ring of the displacer. You're going to staple it back together so that it will fit inside of the displacer cylinder.

Staple the strip of the drinks can back together, so that it's about 4 mm smaller than the displacer cylinder can. It should drop to the bottom of the can without sticking anywhere.
Cut and fold over two tabs on opposite sides of the displacer outer ring. Pierce two small holes into the tabs using a push pin.

Form a piece of the thin steel wire into the approximate shape shown in the photo.

Fit it into the holes in the tabs. Bend the ends over so that it can't slide out of the holes.
Tie the end of the nylon wire through the small hoop in the displacer.

Cut a piece of the wire wool approximately 75 mm (3”) square. Fit this into the displacer outer ring.

Cut some tabs into the bottom of the displacer ring to stop the wire wool from sliding out.
Drill a 4 mm hole in the centre of the milk bottle lid and a 6 mm hole about 12 mm (1/2”) from the edge.

I made a wooden jig to hold the CD and electrical connector in place. There's no reason that this couldn't be made from cardboard or something similar, if it's to be used only once. There is grease proof paper under the CD so that it doesn't stick to the jig.

With the CD and connector in place, fill the void around the centre of the disk with hot melt glue.
The diaphragm is sandwiched between two M4 x 15 washers. Pierce a small hole in the approximate centre of the balloon, thread the bolt and washer through.

Make sure it's tightened up well to create an airtight seal.

You'll need a small connector rod with an eye that can be bolted onto the diaphragm bolt.

Bolt the connecting rod onto the diaphragm. It's a good idea to use two small washers either side.
The fire tin is cut from a 400g tin can. Follow the template with the tin snips.

This step is very important!

You need to make a very small (0.5 – 0.6 mm) hole in the centre of the can using a sewing needle. The sewing needle will not be strong enough to pierce through the can on its own, so make a tiny starter hole using a push pin. Then grip the sewing needle with pliers and push it through the can. You could also use a 0.5mm drill bit if you have one.

If you make this hole too big, the engine will not work.

Thread the nylon wire through the small hole in the top can. Carefully push the top can into the displacer cylinder. Push it down around 5mm. You must be very careful not to crush the can. It's easiest to angle the top can forward and push on the back of the can where it's strongest.

Bolt the milk bottle lid onto the angle bracket.
Cut a piece of the silicone tubing to fit between the milk bottle lid and the nylon tubing. Seal around the silicone tube where it enters the milk bottle lid using hot melt glue. The glue should be on the inside of the milk bottle lid.

Thread the crankshaft through the bearing hole (1).

Thread the crankshaft through the bearing hole (2).
Secure the flywheel using the electrical connector you glued onto it.

Fit the diaphragm in place and secure the connecting rod into an electrical connector. You'll need heat-shrink tubing either side to stop the connector sliding along and binding.

The last step is to fix the nylon line in place. When the crankshaft is at top dead centre it should pull the displacer to about 5 – 8 mm from the top of the displacer cylinder.
You're ready to try your engine now, I hope it runs first time. Fill the cooling jacket up with cold water. Light a tea light candle and place it underneath the displacer cylinder. Oil all of the moving parts.

After a minute or so, the engine should be hot enough to run. Turn the flywheel to get it going.

Does it work? I hope so, but if not, here's some tips.

- Check for air leaks by submerging the engine in warm water and pushing on the diaphragm, you'll see any leaks as bubble coming from the engine the only place it should leak a little is around the hole for the nylon wire.

- Are the bearing holes loose and freely rotating? Sometimes the electrical connectors can sit at a bit of an angle, binding on the crankshaft.

- Does the displacer fall freely? It should move up and down easily.

- Try adjusting the tension on the diaphragm, sometimes it can be too tight or too loos.

- If all of the above seems okay, it is probably the hole around the nylon wire that's too big. It should be around 0.5 - 0.6 mm.