Construction manual solar record player

Material

You will need the following materials for the construction:

- 1-2 long-playing records
- 1 motor with reduction, 12V or 6V, standard speed 120-180 rpm
- 1 M4 bolt with nut and 2 washers
- 1 connecting piece to the motor axle (modelling supplies) OR 1 screw terminal for thick cables
- 1 solar panel 12V / 300-500mA (24 cells) or 6V / 500mA (12 cells) -> corresponding to the motor
- 1 power switch (e.g. in-line interrupter)
- Approx. 3 m power cable (duplex cable for positive and negative)
- 2 screw terminals
- Soldering tin
- 4 metal clips from office supplies
- 1 painting apron

For the base:

Aluminium tripod option:

- Approx. 80 cm aluminium strip, e.g. 3 cm or 1.5 inch wide, 3 mm thick
- Aluminium tube with a slightly larger diameter than the motor, approx. 8 cm long
- 6 short aluminium rivets

Other options for the base:

- A log of wood OR
- A few bits of roof batten OR
- A wooden box

Optional:

- 1 "beret" (French painter's cap)
- 3 wheels from a broken toy car OR 3-4 suitcase wheels
- Screws (either with nuts OR wood screws, depending on the base) to attach the wheels
- "Loctite" screw lock or Araldite glue
- Foam adhesive tape, approx. 1 mm thick
- 1 plywood disc of the size of a record (i.e. approx. 30 cm in diameter)

Tools

For the construction, you will need the following tools:

- Soldering iron
- Metal saw
- Metal OR wood file (depending on the material of the base)
- Vice

- Hammer
- Drill with set of drill bits
- Rivet pliers
- Electrician's screwdriver OR fine Allen key

Optional:

- Jigsaw or fretsaw
- Coarser wood saw

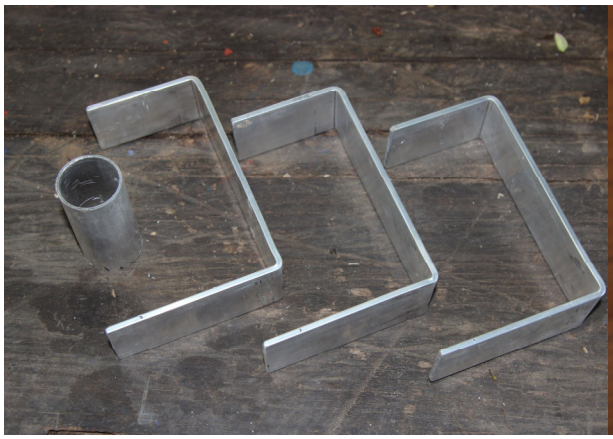
Step by step instruction

Step 1a: Aluminium tripod as a base

To prepare the three "legs", it is best if we first make a sketch of our model (see sketch below). Then we cut three pieces of the aluminium profile to the right length, using the hacksaw. We use the metal file to break all the edges. We also prepare a piece of tube with 6 cm length.

In a vice, we bend the metal legs according to the pictures and the sketch below, using the hammer. Afterwards, we attach each leg to the piece of pipe with 2 rivets, as shown in the second sketch below. To do this, we pre-drill the holes and press the rivets into them, using the appropriate rivet pliers. We file the top three rivets with a metal file until the motor can be inserted into the tube. We leave the lower three rivets protruding (towards the inside); they give the motor a stop so that it does not fall out of the tube at the bottom.

If the motor does not sit firmly enough in the tube, stick pieces of 1 mm thick foam tape to the inside of the tube. (This can also be double-sided adhesive tape *without* removing the top protective film).

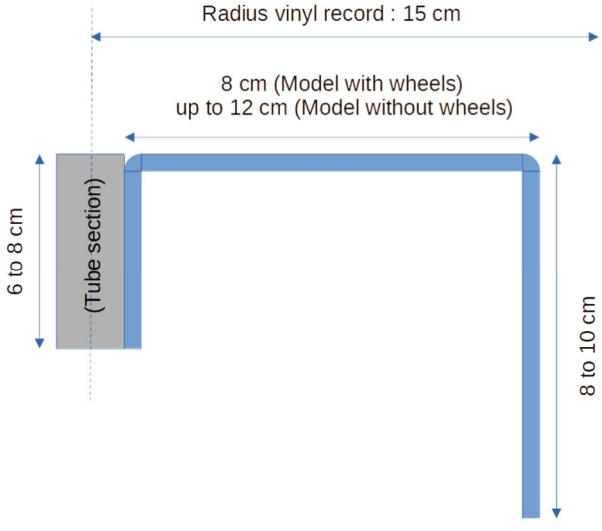


Pipe section and 3 aluminium brackets are prepared.

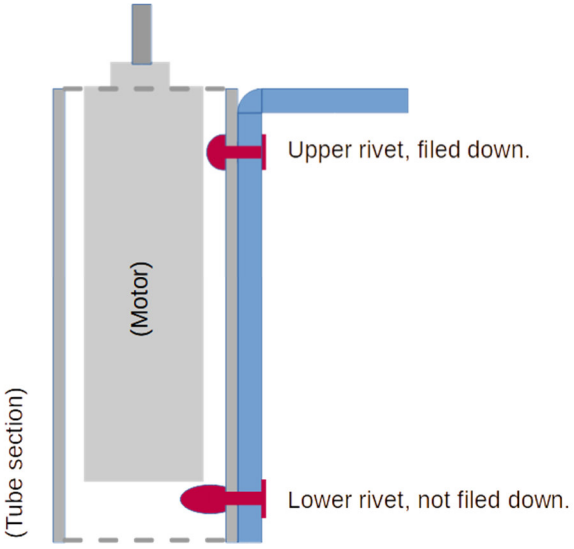
The brackets are attached to the tube, using rivets.

View from below.

View from above, with motor and adapter piece inserted.



Approximate dimensions of the aluminium brackets (blue).



Sketch of the position of the rivets. The upper one is at such a height that we can just reach it with the rivet pliers. The lower one is approx. 1 cm from the lower edge of the tube, so that the motor can rest on it.

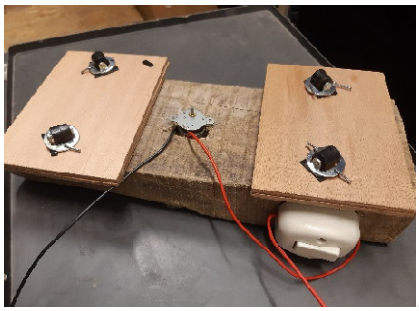
Step 1b: Other options for building a base

We can also build a base out of wood or prepare a box so that it serves as a base on one hand, but can also be used to store all the parts of the record player. In one place, the base must have a round hole that is slightly larger in diameter than the motor. The following pictures will give you some ideas:

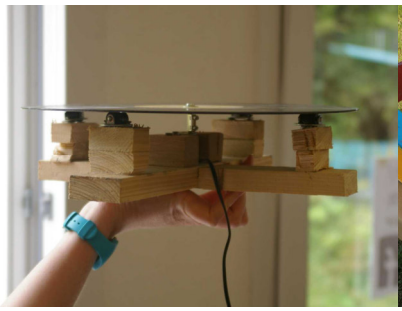
Example box: Base and storage space in one.

The top of the box has a hole for the motor and three luggage wheels.

Ready to play!



A base made from a wooden log.

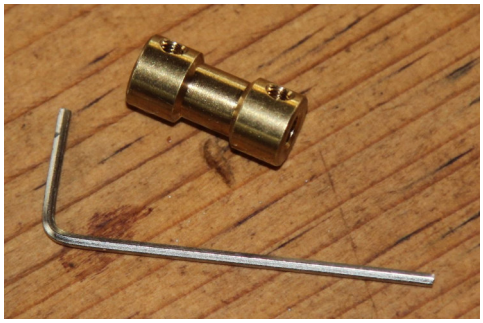


A base made from bits of wood.

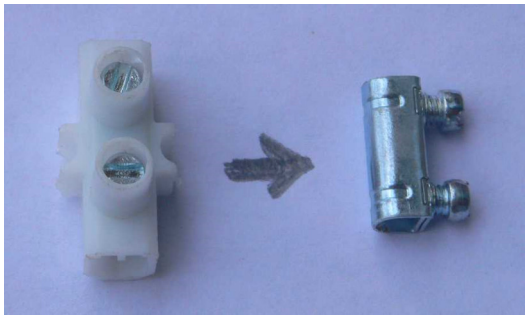
A frame made from plywood.

Step 2: Prepare the motor

We solder one cable to the positive and one to the negative solder lug of the motor. One of the two cables is interrupted by a switch. Then, we install the connecting piece on the rotary axis of the motor. This can be done using an adapter piece from the modelling shop or the metal inner part of a larger screw terminal. The former requires a fine Allen key and the latter a fine screwdriver.



A connector from the modelling supplies.



A connector made from a screw terminal.

Motor with a professional connector.

Motor with tinkered connector.

Step 3: Prepare the record

Records vary in rigidity. Depending on how soft they are, we use only one or we place two on top of each other. We can also cut a plywood disc the size of a vinyl record (i.e. approx. 30 cm) and use this together with a record.

We insert an M4 screw through the central hole(s) with a washer above and below the disc. Later, we fasten the screw with a nut. It is best to secure the nut with "Loctite" screw glue or Araldite glue. The screw should protrude far enough, so that it can be inserted into the connector as far as it will go. If it is too long, we shorten it with a hacksaw.

Record with screw.

Plywood disc with a screw.

Step 4: Insert record and motor and test the setup

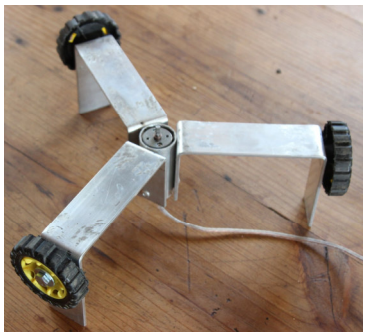
We connect the motor and the disc and push the motor into the prepared opening. Then, we connect the free end of the cable to the solar panel, for example with screw terminals. Afterwards, we place the solar panel in the sun, set the switch to ON and test, whether the record turns. Caution: It needs direct sunlight or at least daylight with very bright clouds. Artificial light indoors is much weaker and may not be sufficient to power the record player.

Step 5 (optional): Installation of "support wheels"

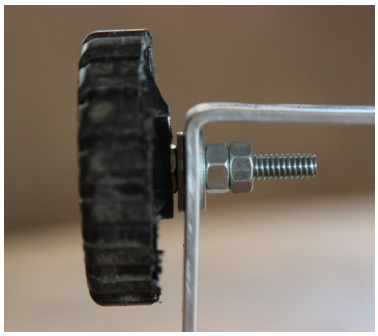
The record may tilt a little or wobble during rotation, especially if an improvised connector to the motor is used. In this case, it can make sense to mount 3 or 4 support wheels on the base, on which the record can rest. They are attached in a way that, ideally, there is some space between the wheel and the plate. Only if the plate tilts, it will touch a wheel.

The wheels of a toy car can serve as support wheels.

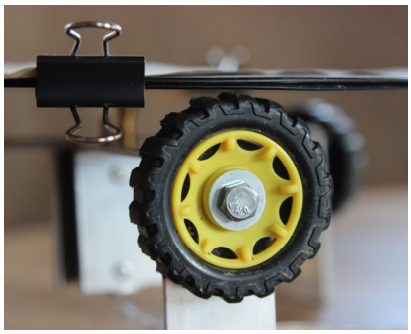
Small luggage wheels from the DIY store.



Three support wheels.



Two nuts, tightened against each other,



There remains some margin between the

allow free rotation. wheel and the record.

Playing instructions and hints

The solar record player is a great promotional tool and very fun activity! Kids as well as adults enjoy themselves with this toy.

Our record player works directly with a solar panel (no battery). We attach a sheet of paper to the disc and let it spin. The kids can paint on the rotating paper using either felt pens or watercolour and brushes. Let them wear an apron to protect their cloth and be ready to get some paint yourself... The kids can adjust the speed of the disc by playing with the angle of the solar panel or by shading one part of a cell.

Hints:

- It's cooler if you make some fuzz about being an artist. Give them a ”beret” to feel like a French painter.
- You can print or stamp a “Scouts go Solar” logo and website information on every paper before painting on it, the kids will take their painting home...
- If you leave the panel just laying around on the table, the kids can learn how to get more or less power and speed by moving it. This is the best learning effect!
- Very young kids tend to force a lot on the brush and stop the record...