Fold–up motor/gearbox mounts.

Bob Alderman ©September 2008

This is a rewrite of a note that appeared in the Gazette in 2003. The earlier one had some very poor pictures, from my pre digital camera age. This I hope illustrates it better.

These units should provide a simple answer to the problems of motor mounting and meshing a worm and wheel gear system. It seems that in spite of their simplicity difficulties still arise. The steps described below illustrate the processes that I go through to obtain a free running assembly.

There are several sources of etched motor mounts some provided within kits, others from a variety of manufacturers. I believe they are a more than adequate drive for the smaller locomotive. The one used to illustrate this is from the Roxey range. This one is a 40:1 reduction though they do a number of other ratios.

This particular fret differs from a lot whereby there is a separate side plate plus fold up sides to make a rigid box. The gears are well finished.

Clean up etched edges as you would for a kit component removing any fret tabs that may remain. If necessary, using a taper reamer, open up the holes that receive the axle bearings. I would be looking for a “free” fit of the bearing in the hole. Remove any burrs generated.

The instructions for this unit quote that the axle bearings should be fitted to the sides before assembly. I would disagree with this and in every case will fit the bearings to the assembled gearbox etch.

The first side and top were folded and checked that they were square.

The second side was added and the closure across the two side plates soldered in place. All the fold lines have a generous fillet of solder to reinforce them. Check after doing this that the corners remain square as the solder can pull them in.

The axle bushes are added at this stage with a jury axle to align them across the sides.

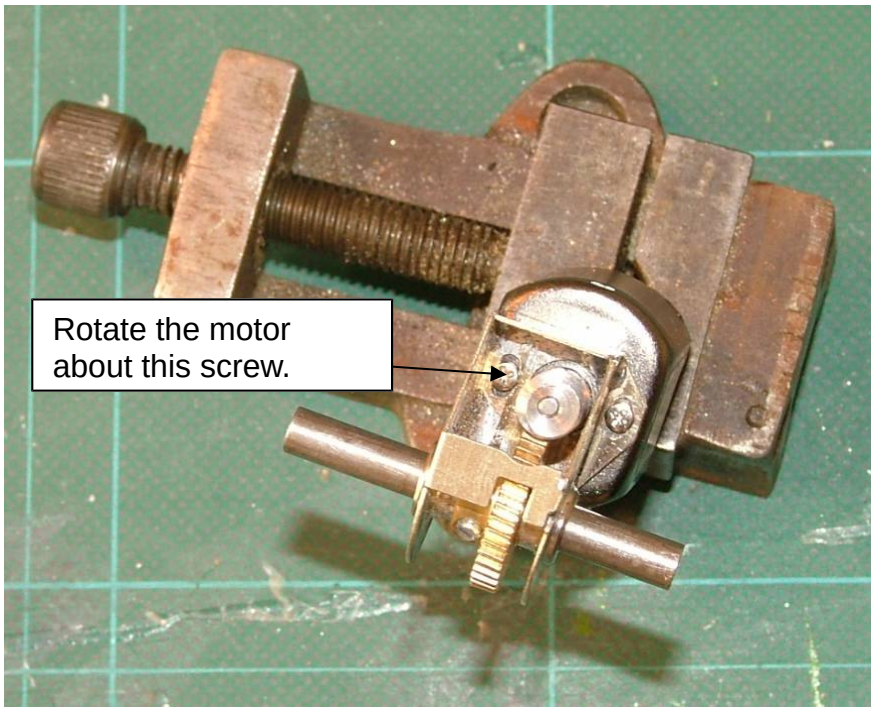
Solder the bushes to the sides with the jury axle in place. The axle should rotate freely after soldering showing that both bores are in line. This is unlikely to happen if the bushes are fitted at an earlier stage.

This particular gearbox assembles with the sides offset so that the gear wheel is centred under the worm. Some do not do this so spacers need to be made to ensure this. This can be a pack of washers but unless soldered together they can be extremely fiddly to get them onto the axle besides the gear. Short pieces of tube are easier to handle and with care can be soldered to the gear to make a single component.

The gear wheel was checked to see if it fitted between the bushes. It did not so a small amount had to be filed carefully off the ends of the bushes. This left a burr across the bore which was removed with small wire bush.
The wire brush is also useful for taking any machining burrs from the ends of the gear teeth. These are variable. Running the brush across the face of the teeth also imparts a small polish, a precursor to the polish generated during running.

The gear can now be fitted into the gearbox using the jury axle.

On the Roxey assembly the worm can be fitted to the motor before the motor is fitted to the gearbox. This is not always the case. Whichever way the worm is fitted ensure that it is a good fit on the shaft. If it is sloppy then tightening the grub screw can make it run eccentrically. This can only really be overcome by drilling the worm oversize and fitting a sleeve. Not an easy job even with a lathe. The one supplied with this unit was an excellent fit.
The motor and worm are attached with the two small screws supplied with the Mashima motor. If you ever loose one go to your supplier for a replacement. Alternatives can be too long and rub on the armature wrecking it.



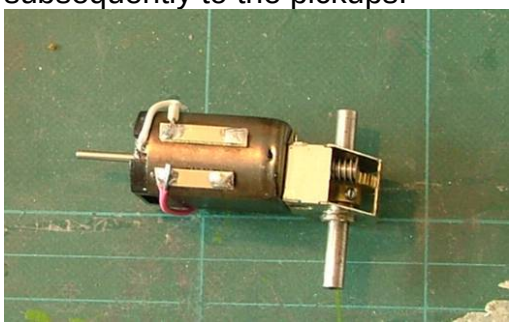
On this assembly the motor position can be adjusted up and down two slots in the gearbox. Some have holes. For the latter if one hole is elongated then by rotating the motor about the screw in the other hole the mesh can be adjusted.

The aim of careful assembly is to have free running quiet gearbox. The fitting of the bushes using the jury axle to align them is the first part of this. Free running is

subjective. What I aim to feel is the shaft rotate easily between my fingers with no binding. At this stage there is no oil on the bearings.

The gear mesh again is subjective. Initially I push the worm into the gear so the tooth engagement is deep. The Mashima motor helps here as it has an extended shaft. By rotating the shaft you can feel that this deep mesh has a lot of friction. The worn then needs to be lifted away from the gear. Try it in small stages feeling how free it is. You may go too far so have to go back. With gearbox illustrated the best position was when I was able to partly rotate the gear slightly under the worm. This rotation is small but can be seen. The movement equates to a little under half the pitch of the gear teeth.

Power can now be applied to assess the freedom and noise generation.
On a lot of motors the terminals are quite delicate and not up to repeated connection disconnection. The avoid this I bond two pieces of copperclad to the motor body and make a connection between them and the motor terminals. Wires for testing the motor can then be soldered to the copperclad safely to connect to the test power supply and subsequently to the pickups.



Run the motor in each direction without any load on the jury axle. There should be minimal noise from the mesh and at full speed the motor whine should be louder. Repeat using fingers to apply a braking load to the jury axle. Again there should be little noise from the mesh. If it noisy then the mesh is too slack and the worm engaged a little deeper with the gear. Try again.
If you are satisfied with the result now oil the bearings and apply some grease to gears. Running it again should be noticeably quieter. As the mesh runs-in so it should get quieter still.
The assembly can now be fitted into your chassis. Ensure that the axle in the chassis at the gearbox position runs as freely as it does in the gearbox.