Burman Gearbox restoration (part one) GB 1953 Ariel VH 500 by George Torrens

The following information is the collective advice and my experience of refurbishing the Burman gearbox on my 1953 VH 500 single, reference GB6 G52 [940] C791. The bike is modelled by my wife, Amanda with dogs Peat and Moss in attendance.

I purchased a number of period manuals on the Ariel, all of which suggested "take the gearbox to your local Burman specialist" for repair. I hope this article will help those who take up the challenge.

The burman gearbox has no sprung loaded stops for the gears as modern gearboxes now have. This means the gears are kept in position by the selector forks only. If there is misalignment or wear on the three shafts or gear bushes, the gears put pressure on the selector forks. Burring and burning, mainly on the forks occurs and the gears lock mid-selection. This has happened to my gearbox. It works okay when unloaded, but when you put my (heavy) weight onto it, it locks.

In the earlier models, pre-1953, a heavy oil and grease mix is recommended. The heavy mix should help keep the gears in place once selected better than a lighter viscosity oil. Avoid using gearbox oil. I've been told that it polishes and further hardens the surface-hardened gears, shafts and selectors increasing wear.

The pictures to the right right show the fully disassembled gearbox, minus one or two clips or lock washers (check the parts drawing). A copy of the parts and general service manuals can be obtained from Roger Gwynn, Draganfly Motorcyles.

I found two of the main shaft gear bushes to be loose in their body. I took the gearbox to the AGM, where George and Chris Childs, the Club gearbox specialists, diagnosed overall wear on the bearings as the main problem. It should be noted that Chris and George thought the 4th gear was from an AJS. George said the parts were interchangeable and so not to replace the gear.

The Main bearing assembly did take some consideration in how to take out the bearing. It is not clear on the parts illustration that there is a steel ring in front of the bearing, held in place with a circlip. The oil seal sits on the outside of this subassembly and so masks the fixing.

I used a fly press without heating to remove all the bearings. I made a number of drifts to fit closely to the inner and outer section of the bush/bearing being pushed out, +/- 0.2mm or 0.040" British imperial, as shown in the images left. Using the fly press did cause some concern with the gear selector kick start outer casing, as it developed a small crack radiating from the kick start shaft hole. I cannot be sure if the crack was due to the press action and uneven casing support or just wear.

I did have to use a Birmingham Drift tool (an offset chisel-like piece of metal) to remove one of the outer casing oil seals.
At the AGM I purchased a number of replacement parts from George and Chris and other members, including bearings bushes and oil seals.

The lay bushes were originally made of oil-lite, a compression moulded, sintered bronze. The ones currently available are phosphor bronze, but have different characteristics in their wear and expansion, requiring a bigger clearance than for the originals, than might be stated in some manuals.

The replacement bushes are a standard length, which means one of the two smaller bushes (I think for selector fork shafts) that require replacement must be turned down to the same length as the original. The replacement gear bushes, once pressed into the gear body, require reaming (at least mine do).

Also, when fitting to an old shaft, the bushes should not be opened to accommodate the diameter at the ends of the shafts, where least wear has occurred. If there is excessive difference between the diameters the shaft requires grinding to bring them closer to the same diameter. If you don't you could end up with loose fitting bushes, the problem you're trying to solve. For exact tolerances and grinding requirements and new bushes and bearings, please contact George and Chris Childs, they're in the Cheval de Fer club officers list at the front.

All plain bushes will require some edge finishing to make sure there are no burrs. Oil holes may also need to be drilled through plain bushes once in place.

The pictures to the right are thumbnails of the full gearbox parts from a number of views, to allow you to study where everything goes in more detail.

I am currently waiting to access appropriate reamers and gaskets to finish the assembly. I need to undertake a final check on parts to ensure I haven't missed anything. It is a constant paranoia that I've left something out or not tightened all the bolts properly. This comes from once leaving the back wheel nut loose on a '56 NH 350 I owned at the time. It wasn't until my mate went down the road on it that I realised why the steering felt so sloppy. He's never trusted my engineering skills since!

I hope this article is of interest. Please let me know if I've got anything wrong.

George