

IMPROVING THE GEAR SELECTION OF YOUR 5-SPEED BULTACO

by John Somerville

Does your prized Bultaco mysteriously jump out of gear, find false neutrals or not even select the gear you want (usually in front of your mates)? Poor gear selection can make riding your Bultaco a real pain but can be improved with hopefully a little, or maybe a lot of work. This article covers only the 5-speed models but the information is relevant to all the 4 and 6-speed gearboxes. There can be an individual fault or a combination of several that causes poor gear selection on your Bultaco, it is just a matter of identifying what is wrong – and it is not necessarily the selector mechanism that may be at fault.

Start by carefully checking the clutch, if it is slipping or dragging it can have a detrimental affect on the selection / operation of the gearbox. The clutch cable must be perfectly clean, well lubricated and routed so there are no kinks or tight bends that will cause friction and restrict its movement, resulting in a very heavy clutch and probably difficult gear selection. If necessary replace it with a complete new cable, the new Teflon lined types seem to work very well.

Now check the operation of the clutch: pull in the clutch lever and use a nylon cable tie to keep it hard up against the handlebar, Remove the spark plug and turn over the gearbox using the kick start lever. Check if there is any oscillation of the outer clutch pressure plate and body sprocket (basket) which can cause the clutch plates to grab, resulting in a poorly operating clutch and difficult gear selection.

Now strip the clutch, carefully noting how many turns in the adjusting nuts are on each of the six clutch tension springs, so you can increase or decrease the pressure on re-assembly to cure slipping / grabbing respectively (this does not of course apply to Sherpa's etc. that use retaining pins on the end of the studs). The outer edge of the adjusting nuts should be no further out than the ends of the studs, if they are turned ~5mm in then the springs have shortened and will need to be replaced, especially if they are not all exactly the same length.

Aftermarket Barnett springs seem to work well, but when ordering specify what bike they are for, I understand that heavier rate springs are available for Pursangs etc.

Note that there are two different length types of metal cups that the clutch springs seat in, occasionally they can be mixed up and you end up with one or more wrong cups in your clutch and the tension on the adjusting nuts not being even. Carefully check the individual clutch plates for warps, uneven wear, breakage, tab damage (where they contact the outer clutch basket and inner clutch hub) and glazing and if necessary replace the plates. I usually find that de-glazing the plates with a wire wheel then facing them with a sheet of 180 grade emery cloth on a sheet of glass to remove any high spots then sand blasting them (to stop slippage) works well, extending the life of a set of plates.

Don't forget the outer thrust plate, it has to be treated like the other clutch plates and be checked for wear and that the thrust bearing is still in perfect condition and alignment. On the later style clutches that use a clutch rod elongation (T-piece or 'mushroom') the working face that engages the thrust bearing can become worn and uneven, carefully machine and polish it or replace it. Check the fingers on the outer

clutch basket and the splines on the inner clutch hub for indents caused by the clutch plates, if any they must be filed smooth so the clutch plates can freely slide to engage / disengage. In extreme cases of wear (especially when alloy outer baskets are used), the basket and / or hub may have to be replaced.

Don't forget to check the six studs welded into the inner clutch hub for the clutch springs – they can become loose and need spot welding and machining to fix them securely in place, parallel to each other. If the outer clutch basket and inner hub oscillate when the kick start lever is used to turn over the gearbox main shaft, then the distance bush on the R/H end of the main shaft (directly under the clutch) may be worn unevenly as it is only made from mild steel. I have had to replace quite a lot of these bushes to ensure that the clutch spins truly, but there is another insignificant item that can also cause the clutch to oscillate: the 'O' ring between the distance bush and the R/H gearbox main shaft bearing.

I have proved by testing that if this 'O' ring is too thick in section then the distance bush will not seat squarely against the gearbox main shaft bearing and the entire clutch will oscillate and you will **never** be able to correctly adjust the springs so it spins true. If your clutch basket / hub oscillates, remove the 'O' ring and refit the clutch basket and hub and turn it over using the kick star lever and you will see what I mean – it should spin true. Try several different thicknesses of 'O' rings until you find one that fits correctly.

Make sure you check the clutch push rod for any wear and ensure that the ends are square to the rod where applicable. The rods used on the earlier style engines have the L/H end rounded for the spiral type throw-out mechanism, the latter rods for the vertical clutch operating shaft is square at each end with small rounded indents in the middle for a ball bearing. Both types of throw-out mechanisms need to work smoothly, for obvious reasons: ensure that both types are clean and well greased.

That's the clutch out of the way, now to check on the selector mechanism itself. Starting from the very outside of the bike, check that the gear lever is firmly bolted to the splines on the selector shaft. This may sound obvious, but I have come across quite a few bikes where the lever was loose, resulting in excessive gear lever travel and poor gear selection. If the splines are badly worn the shaft and / or lever will have to be replaced.

On the Metralla Mk2 gear levers that use a linkage, also check that the eccentric steel pin and the slot in the lever have not worn. There should be minimum play between them, if there is then replace them to help eliminate free travel in the selector. Check that the selector shaft is not bent – a bent shaft can jam in the R/H clutch case cover and make gear selection very difficult or even impossible. On L/H gear change models, the alloy gear levers are a waste of time – they flex and can cause poor gear selection. Replace them with the chromed steel type, ensuring that the lever does not jam against the magneto case cover on full travel upwards, which can prevent gear selection.

The next thing to check is the selector mechanism itself. Remove the selector fork axle and check that there is no free play between the large hairpin return spring and it's anchor pin, if there is replace the spring and / or build up the diameter of the anchor pin with some silver solder (or make an oversize anchor pin). Likewise check

the slot in the outer end of the selector fork and the pin on the lever assembly which slides in it for any play, if there is any fix as just described. Unscrew the three countersunk head bolts and remove the selector cover and trigger housing mechanism, ensuring that the lever assembly is securely bolted to it. Remove the two triggers and springs from the trigger housing and carefully inspect the outer edges of the triggers, which engage in slots in the selector drum.

They should be almost square, if well rounded they will not select gears properly. If the opposite edge is unused then all you have to do is to turn them over and refit them; if both sides are worn, file them to restore the correct shape or buy new ones. I usually stretch the two springs (a little) to increase pressure on the triggers. The final thing to check with the trigger housing is the fit of its shaft into the selector drum. Some shafts have very close tolerances of only 1/2 thou, others I have seen have ~12 thou. which results in the trigger housing wobbling around and adversely affecting the operation of the triggers and subsequent gear selection. Either replace the housing with one that fits properly, or fit a brass bush to the outside of the trigger shaft and machine it to fit.

The only other thing that can be easily checked is the selector drum plunger and spring, located on the rear end of the L/H crank case half, between the engine bolt mounts. Unscrew the plunger nut and remove the spring and plunger and check for wear on the end of the plunger. If necessary file, sand and polish it perfectly round and smooth, and stretch the spring a little to put more pressure on the plunger (which holds the gearbox in gear). This is all you can do to cure your selection woes without splitting the crank cases.

Next comes the time consuming job – splitting the crank cases so you can check on the gearbox and internal selector drum! This job only needs to be undertaken if the gearbox jumps out of gear, especially when under load (accelerating) and none of the previous work cures it. You should use a proper crank case splitting tool to do this job and know what you are doing.

Before starting the job, check the gearbox mainshaft for end play to ensure it is within limits; if not it will need to have spacers fitted to bring it into specs. Once the cases are split, remove the gearbox, selector drum, axle and forks. Check on the condition of the gearbox main shaft and bearings and replace if necessary – also the oil seals and 'O' rings on each end of the gearbox main shaft and the bronze bushes or needle rollers on the sleeve gear.

Now carefully check the gear cogs for wear / breakage, especially the teeth and the engagement dogs / slots. If the engagement faces of the dogs / slots are badly rounded the gearbox will jump out of gear under load (acceleration), this usually happens between first and second gear. The dogs / slots can be machined square again (and even undercut) but it may be cheaper to simply replace the affected gear cogs. Now check the selector forks for wear on the arms that contact their respective gear cog grooves and the guide pin on the base that locates in the selector drum grooves.

Wear can cause sloppy, missed gear changes so they are best replaced. For really precise acting selector forks have (good ones) hard chromed, ground and polished for a precise 1 thou. fit into their respective cog, this firmly locates the gear cog in

position with no sideways play (which can cause interference with neighbouring cogs). This is usually only done in conjunction with the gears being polished for a racing engine; it is expensive to have done. Now for the final item on the list – the selector drum. Check that there is minimal wear to the engagement slots on the R/H end (where the triggers engage) and the grooves for the pins on the selector forks are nice and smooth.

The final thing to do (required on every Bultaco gearbox I have ever seen) is to carefully file smooth and polish the cam plate on the L/H end of the selector drum. The cam face is rough and scratched as it came from the factory and causes a lot of friction, drag and wear on the plunger. Filing and polishing it makes for much smoother, lighter gear selection. Alternatively you could fit the ‘Silk Shift’ selector drum which has a highly polished, modified cam profile to all but eliminate false neutrals, I fitted one to my #143 Frontera and it works very well.

Now reassemble the engine and clutch, ensuring that the gearbox main shaft end float is within limits and the clutch is carefully adjusted as per the available workshop manuals.

The final thing that can affect gear selection is the type of oil used in the gearbox and clutch. Rather than argue the pros and cons of various oils, I will simply state that I use Castrol hypoy 80/90 extreme pressure differential oil in my Metralla gearbox (which lasted for 250,000 Km) and a mixture of 80% ATF and 20% Castrol MTX light viscosity motorcycle gearbox oil in my clutch, which doesn’t slip or drag when properly adjusted. ATF is reputedly the best type of oil for a wet clutch but needs a small proportion of lubricating oil for the primary chain and thrust bearing.

I hope this article may be of help in solving your gear selection woes. If you have any corrections that should be made, or additional tips re fixing selection problems, please contact me so I can update this article. Happy gear selecting!