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READERS' CONTRIBUTIONS

"Clutch Travel and Pushrod Adjustment"

An article by Tony Cripps

I've long been dissatisfied with my clutch. Some time back, I described my efforts in rebuilding the clutch pushrod, clevis pin and pedal after I found all these parts were worn and the previous owner had overcome these difficulties by making the master cylinder pushrod longer and leaving all the other worn parts in place. Believing that it is better to repair the problems rather than to fix the symptoms, I obtained another pushrod, made up a new pin, and welded up the holes in the pedal and redrilled them so that all clearances were taken up, thus ensuring that no pedal travel was wasted with worn parts. Despite these repairs, the engagement point of the clutch was still uncomfortably close to the floor.

Having previously attended to the pedal end of the system, it was now necessary to examine the situation with the slave cylinder. In my perusal through the official service sheets, I came across bulletins C66/65, C9/66 and C62/66 in which it is described the various efforts BMC made to introduce redesigned clutch components. Unlike in a mini, where the maximum throw and engagement are adjustable, an 1800 relies on all components being matched – and this includes the clutch spring unit, throw out bearing, slave cylinder pushrod, master cylinder mounting, and master cylinder pushrod. Unfortunately, given the number of design changes, there is plenty of scope here for problems due to mismatched parts.

I measured the length of the slave cylinder pushrod. What length should it be? Well, it depends on what clutch and bearing you have. In my case, I happened to have had the opportunity to examine the clutch while attending to the primary gear bearings and found that I was the fortunate recipient of a "performance" clutch – and so probably not any of the nominated genuine parts. Regretfully I did not examine the throw out bearing closely, not realising at the time that there were several designs.

In Service Bulletin C9/66, it can be found that the distance from the centre of the hole to the end of the slave cylinder pushrod should be 68.25 mm. BMC recommend shortening this by 4.75 mm to avoid over throw of the clutch unit – a modified rod having length 63.5 mm. Even more confusing was Service Bulleting C62/66 in which it can be found that the clutch push rod should be 63.5 mm and

shortened again by another 4.75 to 58.7mm if a newer style bearing was used with an older style clutch. That is, a slave cylinder pushrod could be any one of 68.25, 63.5 or 58.7 mm, a total variation of nearly 10 mm! My rod measured 65.7 mm.

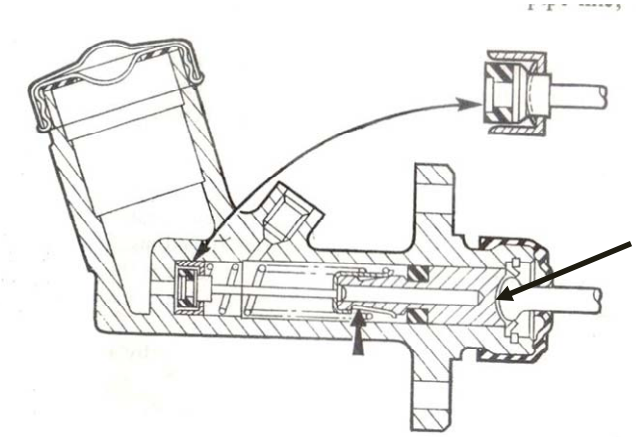
I felt I could make some compromise here so I obtained another pushrod (from a mini, which has a longer shank, but is otherwise identical to the 1800 in hole size and diameter) and altered its length to 66.7 – an increase of about 1 mm over what I originally had. This was easily fitted, but made absolutely no difference to the engagement point of the clutch.

The total movement of the clutch lever is determined by the pedal travel. What is important to know is that the upper limit of travel of the clutch pedal is fixed by the circlip and washer just inside the master cylinder main bore. When the pedal is in the uppermost position, a flange on the pushrod, to which the clutch pedal is attached by a pin, bears against this washer which is prevented from coming out of the bore by a circlip. The lower limit of travel is found when the clutch pedal hits the floor mat. Now, in the service sheets, it is found that the stroke of the master cylinder can be reduced by inserting spacers between the master cylinder flange and the fire wall. This has the effect of lowering the clutch pedal inside the car slightly (because moving the master cylinder away from the firewall takes the pedal with it). Thus, the pedal moves a shorter distance from top to bottom. The same effect can be had by shortening the pushrod in the master cylinder (if one wants to decrease the stroke) or lengthening the rod (if one wants to increase the stroke) since, this moves the pedal closer or away from the upper stop (the circlip and washer).

What is not so obvious is what effect lengthening or shortening the slave cylinder pushrod will have. It actually doesn't matter much what the length of the slave cylinder pushrod might be because altering the length would just alter the starting position of the piston in the bore of the slave cylinder. The same amount of fluid would be displaced, and the piston would move the same distance in the bore, it would just start at a different position depending on the length of the push rod. As long as the slave cylinder piston is not hard up against either end of the slave cylinder bore, the length of the slave cylinder pushrod won't make any difference to the engagement point of the clutch.

Even though I had restored the pedal and pin, and now having found that the slave cylinder pushrod didn't make any difference, there was still something evidently wrong. Looking carefully at the action of the pedal, I found that the first few mm of movement on the downward stroke wasn't doing anything productive. By twisting and squinting, I could see that the master cylinder pushrod was going into the master cylinder, but in the first few mm of travel, it was not making contact with the master cylinder piston. Indeed, the pushrod seemed to move upwards a little before a solid contact was made with the piston whereupon it would then move horizontally as designed. Now, those of you who have investigated this area will know that the end of the master cylinder pushrod is rounded (convex), and the mating face of the piston is also rounded (concave). To explain what is happening, one has to know that when the clutch pedal is released, spring pressure from the clutch pushes back on the slave cylinder, which in turn (via hydraulic pressure) pushes out the master cylinder piston – but only so far. The master cylinder piston moves back up the bore of the master cylinder and then stops at some point when

the pressure from behind disappears (i.e. when the clutch spring unit stops pushing back). But, while the master cylinder piston may come to a stop, this does not mean the pedal has to. The spring on top of the pedal box brings the pedal out until the pushrod bears against the washer which in turn bears against the circlip in the master cylinder bore. Thus, if there is wear in the washer, master cylinder piston, or pushrod, there will be a gap between the end of the push rod and the master cylinder piston when the pedal is in the fully up position. So, the pushrod sags down a little as the rounded end of it sinks down the corresponding concave surface of the piston. This gap will be taken up in the first few mm of pedal travel and has the effect of shortening the stroke of the master cylinder.



Having identified this, I restored the end of the pushrod to the extent that the instant the clutch pedal is pressed, the pushrod makes contact with the piston, thus eliminating any wastage of valuable pedal stroke. I am pleased to report that the clutch engagement point is now about 1/3 of the way up from the floor which is probably about right and won't over-throw the clutch spring unit.

Despite all these efforts, I was still having severe clutch problems resulting in much difficulty in changing gears, especially reverse. There was also a very odd noise from the clutch which could be both heard, and felt as a vibration in the pedal when the pedal was pushed down. Upon engaging the clutch, this noise would disappear – very curious.

There was nothing for it, but to take the thing out and have a look, with the view to replacing the clutch. Have you ever tried to purchase a replacement clutch for an 1800 in Australia? Not one supplier had one, although several had carbon thrust bearings in stock. Thankfully, Tony Wood in UK had one available and sent it out in just a few days, so with new clutch in hand, I proceeded to dismantle the whole thing.

As mentioned before, the previous owner of my vehicle decided that a performance clutch (with fingers) and roller bearing was deemed suitable – and so this was the first to go into the rubbish bin. The new clutch had the proper bearing plate on the fingers and the proper carbon bearing, so all looked good. By great luck, I decided to inspect the crankshaft spigot bearing – and here's where all my troubles lay. It was very worn. This meant that the radial thrust from the idler gear and clutch shaft was being taken mostly by the bearing in the idler gear casing and had very little support at the

other end. This was why I was getting a vibration/noise as one end of the clutch shaft flapping around in the spigot while the bearing was doing its best to keep things centrally aligned.

Of course it is impossible to get a new spigot these days, so I had to make one from some bronze bush which was available from an industrial supply shop. The old bush was removed with a home-made extractor, and the new bush carefully machined to be a press fit into the crankshaft and a nice sliding fit onto the clutch shaft. Oil was forced into the bronze as much as possible by pressing between thumbs and then leaving overnight.

After much effort, everything was eventually reassembled and a road test revealed what a delight an 1800 clutch could be when all is as it is supposed to be.