MODEL ENGINEERS' WORKSHOP

IMPROVED BEARINGS FOR THE MYFORD SUPER SEVEN HEADSTOCK

Ken Willson decided to upgrade the headstock of his S7 with Roller Bearings

IMPROVED BEARINGS FOR THE MYFORD SUPER 7 HEADSTOCK

Ken Willson needed to change the bearings in his Myford Super Seven so he tried an experiment.

Temporary trial of spacer rings.

OVERVIEW

Over the years I have kept a watchful eye and ear on the condition of the headstock spindle rear ball bearings so as to ensure a long and satisfactory life. The twin angular contact ball bearings can be tricky to adjust, even following the instructions in the Myford Manual. As the note in the manual states: *'Overloading will cause rapid deterioration of the spindle bearings'*. Despite following the instruction to 'oil daily (well most of the time) they do have a finite working life. So the time has come to replace them and my thoughts have turned to a different approach.

Thoughts on taper roller bearings

The high quality, and expensive, Super Gamet taper roller bearings in my Harrison M300 suggested to me that fitting a pair of taper roller bearings to the Super 7 could be advantageous in that they would provide a stiffer bearing arrangement since the rolling path is wider and this might also be an interesting approach to take at a time of bearing replacement. The advantage of taper roller bearings is that they have an increased load carrying capacity and the adjustment is easier.

The traditional 'back to back' arrangement of the pair of 7205BE angular contact bearings in the Myford Super 7 (Myford Part No 73003) provides a relatively stiff arrangement which can also take up tilting moments. These slight tilting moments occur because the front tapered bronze bush and cone set-up needs a running clearance, albeit small. There is also a side load on the spindle caused by the drive belt. The small running clearance is controlled by the relative positions of the adjusting rings, also called 'locking rings' in parts of the Manual that are adjusted with the Myford 'C' spanner. Having set the bearing preload, it is normal to start from the position where the spindle is adjusted to the position whereby (because it has been moved to the left) contact is just made between the spindle cone and the bush, preventing rotation. From this position, the No 1 adjusting ring - this ring is nearest to the chuck end - is rotated anticlockwise by 15 degrees, (¼in. movement at the adjusting ring rim) and then the No 2 adjusting ring on the left-hand side is brought into contact with the bearings and thus the spindle moves to the right. This is deemed by the lathe makers to be the preliminary setting, which may be varied according to the running conditions. It is always useful to make sure that there is a fine amount of oil apparent at the junction of the steel spindle and the bronze bush when the lathe is in use.

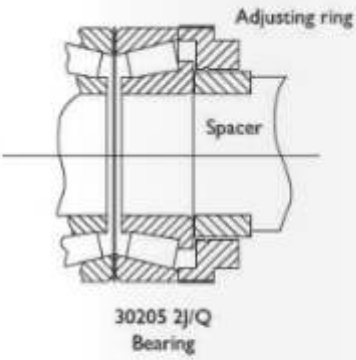
Experimental Fitting

The standard metric bearings are 52 x 25 x 15mm (Myford Part No. 73003), housed in the left part of the headstock casting within a matching 52mm bore that is 44mm long and threaded for the two adjusting rings (Myford Part No. G2430). The standard bearings have an oil lubricated speed rating of 15,000rpm, well outside the speed range for the actual spindle arrangement in use. The nearest equivalent size of tapered roller bearings, 30205, have an oil lubricated speed rating of 10,000rpm and are longer end-to-end, so some accommodation for this is a necessity as part of this modification. I have used a pair of 30205J bearings for the experimental fitting in one Super 7 and 30205 J2/Q SKF in my S7 PCF (**ref 1, 2, 3** and **4**). 'Q' specification bearings have a reduced running-in phase due to a lower initial friction.

An initial setup was tried whereby spacing rings were made to accommodate the 'overhang' of the centre element, whereas the width of the standard bearing is 15mm, the overall width of the 30205 is 16.25mm and the outer element is only 13mm. These components are shown in **photo 1**.

It rapidly became apparent that the new assembly would, in fact, be too long to be accommodated within the 44mm available if a practical length of adjusting ring thread engagement was to be obtained, so I chose to modify the adjusting rings which did, at least, maintain the thread engagement length. Such a modification will not affect their use in a standard setup should you wish to revert to standard bearings as the contact between the ring

Fig. 1



and a bearing cup outer face is not affected other than being slightly narrower, radially. The cross sectional drawing (**fig 1**) shows the various elements of the new bearing arrangement. Having said that, it all depends upon whether or not you have two lathes, or access to another, if you want to modify *existing* components (**photo 2**).

My main Myford Super 7 is a power cross feed version, my second machine, an older, standard model, is currently undergoing a long term refurbishment and has formed the basis for this experiment (**photo 3**).

So what are the steps to be taken and how to go about it?

Firstly mount an adjusting ring (old or new) in a chuck; I used a 75mm diameter three jaw chuck, setting the jaws *inside* the bore with the large diameter screwed thread facing towards the tailstock. Do not over tighten, merely enough to hold the part whilst taking light cuts with a boring tool. It is also possible to mount in a larger diameter chuck, using reverse jaws but holding the outside of the slotted part, provided that there aren't any burrs caused by use of the 'C' spanner. If burrs exist at these slots they should be removed by lightly filing the offending areas. These burrs may also be present on new adjusting rings. (How do I know, you may ask?) Clock the flat ring, facing the tailstock, to ensure that it is running true, i.e. does not wobble. As you will *not* be cutting away much of this outer face, merely making it narrower, the final accuracy of its use in pressing axially against the bearing's outer ring is as good as the original Myford manufacture. Set the tool against this ring whilst the lathe is stationary, to establish a reference point against this outer ring. The ring is shown in cross section in **fig 2**. Bore and face in the normal manner until you have achieved the dimensions specified. I suggest that you keep to the tolerances shown. I have worked in metric since this component is already to metric dimensions, but the imperial equivalents are easily calculated by those who do not possess the necessary metric kit. Repeat for the second adjusting ring to the same dimensions. You can see the remaining untouched 'black' annular ring on the photograph.

There remains but one additional part to make or modify. To the right of the right hand bearing there is a distance sleeve (Myford Part No. A2055) which abuts a step on the spindle. This step carries the Vee cone pulley assembly. To keep all parts capable of being used on the standard setup, it is desirable to make a new distance sleeve, shown as **fig 3**. Mount a short piece of mild steel round bar in a suitable chuck. The finished diameter needs to be 34.7mm and the bore should be a close fit on the 25mm ground surface of the spindle. Turn the outer diameter in accordance with the drawing, face the end (mark with a small marker pen dot on the outer face) and with the usual combination of drilling and boring, carefully finish, to a high standard, to the required bore dimension. If you are unsure or have limited facilities to accurately measure the bore, I suggest you make a simple go/no go gauge to monitor the dimensions as given in fig 2. Finish the new distance sleeve by parting from the unused portion of the mild steel

Modifying the lock ring.

The headstock removed.

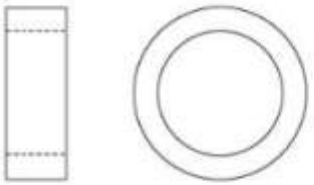
Fig. 2 Adjusting Ring

Counterbore Ring

Diameter 47.5mm - 47.6mm
Depth 3.4mm - 3.5mm

DO NOT remove any material from face of ring other than that of the counterbore diameter

Fig. 3



Overall diameter 34.70mm (+0.05-0)
Internal diameter 25.01mm (+0-0.005)
width 12.2mm (+0.1-0)

The components.

round bar, and then, by reversing the part-finished distance sleeve in the chuck (or collet), face the second end to achieve the required length as drawn. Remove the corners from the new distance sleeve, inside and out. The reason for marking the original faced outer end is because, as this end is machined at the same settings as the outer surface and inner bore, it is likely to be square to the axis, but more about this later (**photo 4**).

If you have decided to use the adjusting rings you already have you will already have disassembled the various components of the headstock assembly, possibly including removal of the tumbler reverse lever, to give a wider working space around this point. (NB. When you reassemble this last item, do not over tighten the tumbler reverse locating screw, located to the rear of the point where the stud enters the left hand side of the headstock casting, as you may well succeed in driving the stud out of the lever, as this part is only a press fitted stud.) You do not, however, need to remove the tumbler reverse lever as there is more than enough room to carry out the necessary fitting.

Before removing the spindle for the first time, remove the socket set screw located below and to the left of the spindle nose and insert a strong, long needlework pin to locate in the oil Lubricating Wick. This will stop the wick spring from forcing the wick upwards into the tapered bearing space.

Reassembly

Reassemble the spindle, the modified adjusting rings, new distance sleeve (with the marked end towards the bearing inner raceway 'cone'), new bearings and old bearing spacer washer without any other parts, to test your new set-up. Follow the full bearing setting procedure outlined above and also shown in the *Lathe, Operation, Installation and Maintenance Manual*. NB. The bearing spacer washer between the outer raceway 'cup' MUST be replaced with the oiling slot upwards, so as to locate it beneath the oil nipple. You may find that the lateral position of the 30T gear on the left hand end of the spindle is slightly different, but as long as it will fully engage the 28/30T tumbler gear there is no problem in that. Having set the adjusting rings to the required clearance as above (**photo 5**), you may now take the spindle out, leaving the bearings in position, unaltered, and proceed to full reassembly. You might also take this opportunity to replace the drive belt (Myford Pt. No. 73000).

On completion, remove the pin, replace the socket set screw and refill the oil via the large oil cup on the front face and also oil the new bearings using NUTO H32 or equivalent hydraulic oil.

If you have taken this opportunity to renew the drive belt (or belts), it will be necessary to follow the usual procedure by adjusting the swing head adjusting screws to correctly tension the new drive belt. If you have changed the motor drive belt, a similar action will be needed to slacken and set the motor drive belt tension by means of the motor platform clamp screw. Make sure the rotational direction of the belt is correct; some belts have an arrow denoting the normal direct of running, which is of course the forward direction, not the reverse direction of the lathe.

Readers who may wish to explore the factors affecting bearing choice and other factors should look at the excellent series of articles which are available on the SKF website: www.skf.com

You may now return to happy turning! ■

References

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Setting the bearings.