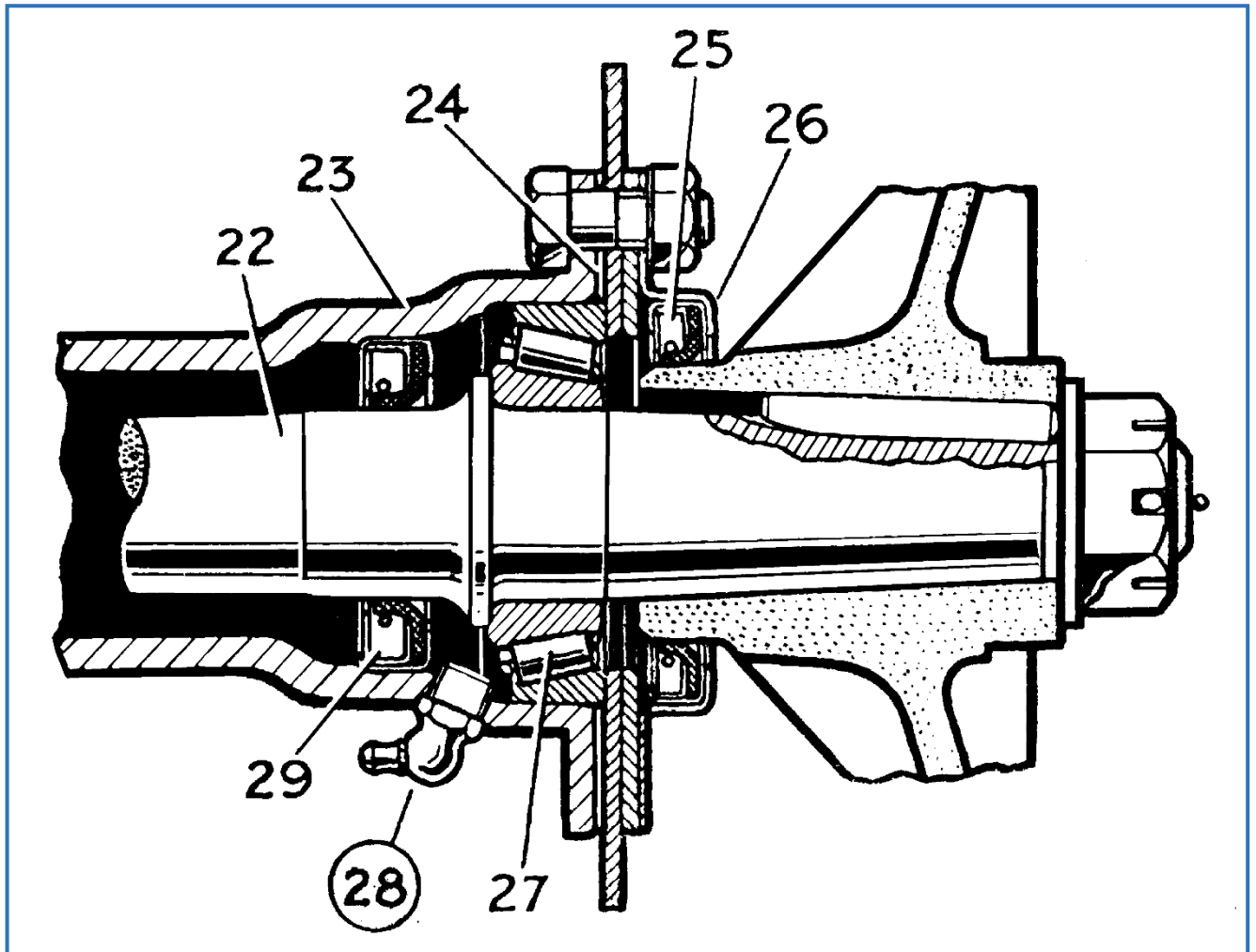


TECHNICAL NOTES SERIES

JOWETT JAVELIN – PA, PB, PC, PD & PE
JOWETT JUPITER – SA & SC



Rear Hub Assembly.

Legend: 22 Axle Shaft; 23 Axle Housing; 24 Hub Bearing Shim; 25 Hub Oil Seal; 26 Hub Oil Seal Container; 27 Hub Bearing; 28 Grease Nipple, 29 Axle Shaft Oil Seal.

– PART XXX –

REAR HUB BEARING REPLACEMENT TECHNIQUE

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Compiled by Mike Allfrey – 12th November, 2015.

REAR HUB BEARING REPLACEMENT

Introduction

Without too much doubt, the rear hub bearings, no matter which Jowett model, are the most neglected item on the motor vehicle. We may grease them occasionally, but do we really service them? When the high ratio differential was installed into my Jupiter's rear axle, it was amazing just how worn the hub bearings were. The same has been discovered on my Javelin, which is being readied for the big one at Armidale. A spare axle was dismantled in this area and its hub bearings were found to be beyond re-use.

Very likely, it is a good idea to have a thorough examination of the bearings each time the brake drum is removed for brake servicing. It is but a simple matter to withdraw the half shafts once the brake backing plates have been removed. All that is required is a good slide hammer that will screw onto the threaded axle shaft. The club has a slide hammer to fit full hydraulic brake type half shafts for loan.

It is always a good idea to clean out all traces of the old grease and inspect the inner oil seal at this time.

In this article a full hydraulic brake system axle has been used.

Section Through Rear Hub

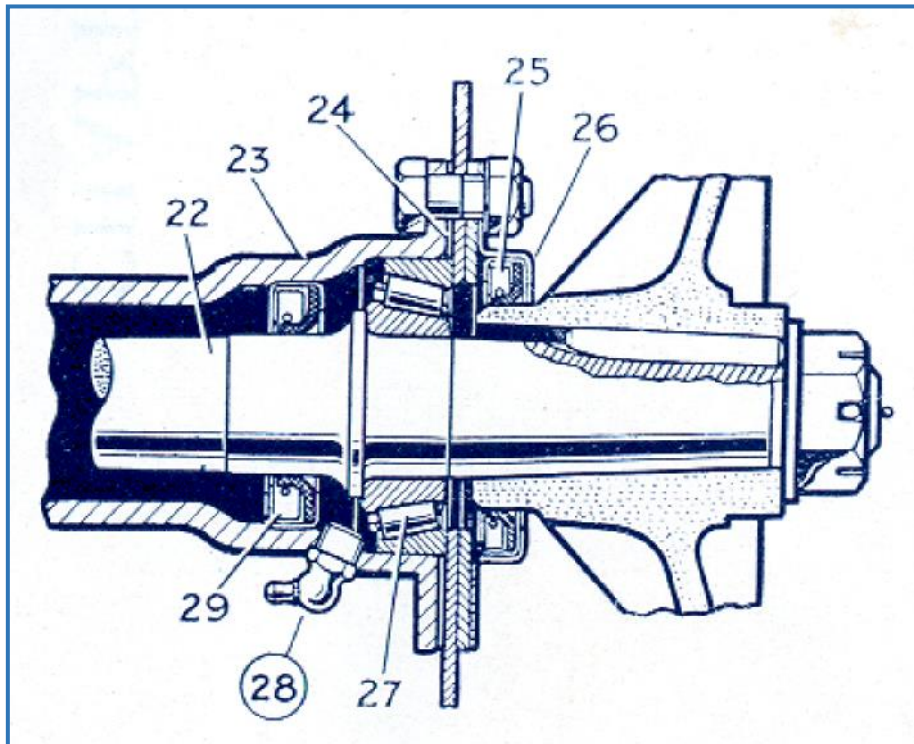


Figure 1. Item number identification is used in text.

This illustration shows a cross section through one rear hub assembly. The inner end of the shaft is supported by the differential carrier and end float is controlled by a spacer block that straddles the spider gear shaft, in conjunction with shims at each hub bearing. It should be noted that there are two oil/grease seals in each hub. The inner seal is provided to prevent rear axle oil from mixing with the bearing grease. The outer seal is a special seal the prevents grease from entering the brake drum. Another feature of this seal is that it prevents brake lining dust, which can be extremely abrasive when mixed with grease, from reaching the bearing lubricant.

Dismantling The Rear Hub Assemblies

Before any work is carried out, the car must be parked on firm level ground – preferably on a sound concrete floor. At this stage the hand brake should be firmly applied. The slotted nut that secures the brake drum to the axle shaft should be removed before the car is jacked off the ground. This nut should be tight and a suitable $\frac{3}{4}$ " drive socket and bar should be used to loosen it. Later rear axles feature UNF threads for these nuts. Be sure to place the nut and its special washer in a safe place.

1. Chock the front wheels front and rear, jack up the rear of the car and place chassis stands under the rear of the chassis side members. Allow the axle to hang with the wheels clear of the floor. Leave the trolley jack under the rear axle, to just take the axle weight, for support.
2. Remove the road wheels, release the hand brake, fully back-off the rear brake adjusters and, using a suitable puller, withdraw the brake drum from its taper and drive key. A puller is available from the club on loan.

Note: It is a good idea to thoroughly clean the threaded puller boss on the brake drum with a rotary wire brush, to clean away any rust or paint.

3. Inboard of the brake back plate, remove the hand brake clevis pins.

4. Carefully slacken-off the brake pipe union nut at the rear wheel cylinders. To conserve brake fluid, apply a clamp at the rear brake hose. Do not clamp the hose close to its ends, lightly clamp it in the middle.
5. Loosen off the four bolts and nuts that secure the brake back plate to the axle housing, remove the bolts and carefully withdraw the plate from the hydraulic pipe. Be careful not to bend the pipe. Wipe the end of the pipe and wrap in adhesive tape to stop dirt ingress.
6. Clean away excessive grease from around the hub bearing.
7. There are adjusting shims, Item 24, inboard of the brake back plate, carefully remove these and identify them for the side of the axle they came from.
8. Screw a slide hammer fully on to the thread at the axle shaft, Item 22, and with several smart, direct, blows withdraw the axle shaft and the bearing's outer race (cup). The bearing outer race is a snug, but not tight fit in the axle housing. Take care when withdrawing the axle shaft – most of its length is rough forged finish – so that the inner seal is not damaged.
9. Wash all parts in suitable cleaning fluid and dry. Inspect the bearing rollers and their track in the outer race, Item 27. Look carefully for pitting, roller flattening, roller indentations in bearing cup, rust erosion and abnormal wear pattern. If there is any doubt about the condition of the bearing – replace it with a new bearing assembly. Ideally, if one bearing requires replacement, then both bearings should be replaced.
Note: With an oil based felt tipped marker, identify the components from each side of the axle – LHS and RHS.
10. Examine the splined end of the axle shaft and check for twisted splines. Twisted splines indicate a partially shorn shaft and the shaft should be replaced.
11. Clean and carefully examine the inner seal assembly, Item 29, the leather lip should be smooth and there should be some spring to the lip. If the leather is damaged, replace the seal. This seal can be pulled out using a slide hammer with a suitable claw adaptor.

Comments On Bearing Replacement

It has to be appreciated that, in the vast majority of cases, the rear hub bearings have been in use for over sixty years, and in that time have been subjected to heavy loading at times. Consideration must be given to replacing the bearing if there is any doubt about its condition. Replacement during routine servicing can virtually eliminate the risk of bearing failure while on the roads and freeways. A rear wheel lock up at highway speed can be a daunting experience and should be avoided if at all possible.

Having removed the axle shaft and washed it, the next step, if replacing the bearing, is to press the shaft out of the bearing cone assembly. This is a job best done in an engineer's hydraulic press. I took my shafts to AA Bearings & Oil Seals in Nunawading to purchase the bearings and have the old ones pressed off and the new ones pressed fully home against the shaft shoulder. Dennis at AA Bearings very obligingly offered to provide this service at nominal cost.

AA Bearings were able to supply the inner seals, on the originals the leather was just about non existent. All up, the bearings, seals and fitting charge came to just under \$160.00, which compared with the cost of a breakdown on the road, is very reasonable.

Bearing Installation

Some of us may find the rear hub bearing installation a little bit daunting, but in reality the shimming process is quite simple. It has to be said that the Javelin Maintenance Manual deals quite heavily with the importance of centralizing the half shafts and properly shimming the bearings to provide the required end float at the rear axle shafts. Would that Jowett Cars Limited had practiced what they preached! My Javelin had 0.100" worth of shims at the RHS and 0.015" at the LHS. The spare axle had a 0.030" shim at the RHS and 0.025" shim pack at the LHS. It is known that the axle bearings in my Javelin have never been removed. It makes one wonder about the tolerances during manufacture and the care taken to centralize the spacer in the differential!

I have developed my own method of working out the shim packs to provide properly located axle half shafts.

1. Make sure that the inner oil seal is fully home against its shoulder in the axle housing. Apply a smear of grease to the lip of the seal.
2. Make sure that the hub bearing cone is clean and well packed with clean grease. Apply grease to the entire surface of the axle shaft and carefully insert the shaft through the inner seal and, supporting the shaft, ensure that it engages with the differential side gear spline. Push the shaft fully home against the spacer.
3. Carry out steps 1. and 2. at the other side of the axle.
4. Apply a smear of light grease to the outer diameter of the bearing cup and to its bore in the axle housing. Install the bearing cups, making sure that they are tapped in square.
5. At the RH side, mount the hub bearing retainer plate with four bolts and nuts. Tighten the plate against the axle flange face to push the bearing cup fully home.
6. At the LH side, loosely mount the bearing retainer plate. Make sure that the nuts are free-running on the bolt threads. For this exercise, use flat washers only.
7. Carefully tighten the four bolts, equally, until slight pre-load can be felt at the shaft end. Pre-load will make the shaft feel tighter to turn. It should be noted that, while the bearing cup is being pushed into the housing, some creaking will be heard, this is normal. Once the cup is fully home, give both shafts a gentle tap with a soft hammer on their ends. Re-check that the bearing cup is fully home against the bearing cone.

Note: Do not confuse inner oil seal drag with axle shaft bearing pre-load. Get a feel of how easy it is to rotate the shaft prior to any pre-load being placed on the bearing.

8. Once pre-load is felt, slack off the four LHS nuts and re-tighten to just hold the bearing retainer plate against the bearing cup.
9. Using a good quality set of feeler gauges, measure the gap between the bearing retainer plate and the machined face of the axle housing flange.

This dimension will provide the total amount of shim pack required.

10. The specification for axle shaft end float is 0.006" to 0.008". It is probably better to aim for the lower end of the specification for the assembled axle. To the measurement taken at Step 9, add 0.006".

Example: Feeler gauge measurement was 0.060" + 0.006" = 0.066".

11. Divide the total by two, to furnish the shim pack for each side; in this example 0.033".
12. Slacken off the four RHS bolts, with the bearing cup pushed right in.
13. Remove the bearing securing plate from the LHS, apply a smear of grease to the shim faces, install the 0.003" shim against the axle flange face, and then a 0.030" shim against it over the bearing cup diameter. The thinner shim must always be placed against the axle face. This ensures, during final assembly, that the thicker shim sits on the bearing cup and permits the assembly to slide during adjustment.

Note: Use a 0 – 1" micrometer to verify actual shim thickness.

14. Tighten the four LHS bolts, while keeping an eye on the RHS to ensure enough slack for bearing cup movement.
15. Remove the RHS bearing securing plate, apply a smear of grease to the shim faces, and install the 0.003" shim first, followed by the 0.030" shim. Tighten the bearing securing plate against the shim pack.
16. With a soft hammer, gently tap the ends of both shafts and check for end float. This should be 0.006" which is just discernable by feel while pulling and pushing the axle shaft by hand. The actual end float can be measured using a dial indicator.

Note: The axle shaft thrust spacer inside the differential has a slotted hole where it fits over the spider gears' shaft. This slot provides sufficient side movement to carry out the shimming process. The importance of end float at the axle shafts can not be stressed enough, if there is a pre-load condition, the bearings will run hot and there could be lubrication problems at the contact points at the spacer.

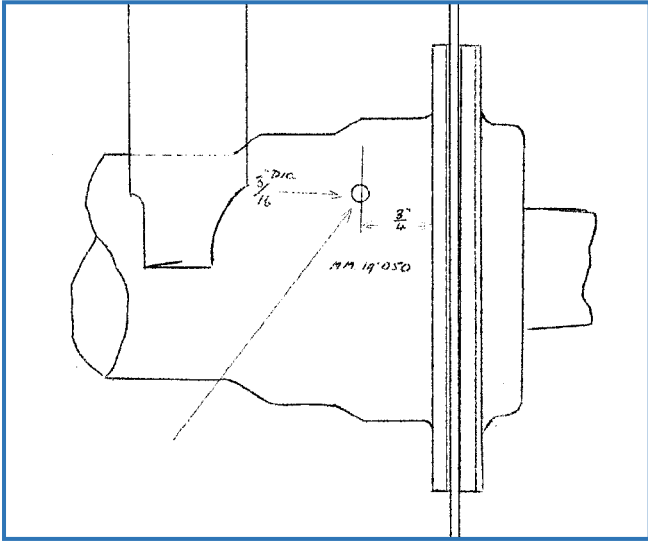
17. The re-assembly of the rear axle is a reverse procedure to that given for dismantling. Obviously, the brake system will have to be bled after re-connecting the wheel cylinders.

Note: Before the rear brake backing plates, the bearing securing plates and the rear hub oil seal bolts are tightened, the oil seal should be centralized. To do this, assemble the components loosely, install the brake drum to centralize the seal, and then tighten the four bolts. Remove the brake drum and fully tighten the four bolts to 28 lb. ft. torque.

All of the foregoing may sound daunting, but it is accurate and there is the peace of mind while driving with the knowledge that all is well with the rear hub bearings. Set out below is information provided by Jowett Cars Limited in their Service Bulletin Item Number 17. See Technical Notes Part III Service Bulletins – Javelin and Jupiter.)

"Cases have been reported where an over application of grease to the rear hubs has resulted in brake lining contamination and subsequent brake inefficiency. A $\frac{3}{32}$ " (2.4 mm) diameter grease relief hole will shortly be incorporated for all rear hub bearings at the rear and outer (hub) end of the axle casing tubes, as shown in the sketches below:"

When greasing rear hubs embodying this feature, hubs should be lubricated until grease just appears from the relief hole. Wipe away any expressed grease and leave the hole filled with grease, to prevent dirt and water ingress. Should an axle housing not have these grease level indication holes, it is worthwhile drilling them as shown in the illustrations below. Do this while the axle housing is clean, and any drill swarf can be easily removed with a small magnet.



Above: Figure 2. Location of the grease relief hole.

Right: Figure 3. Side elevation showing relief hole.

Note: These sketches are not to scale.

Personal Comment

It should be noted that axles seen with the relief holes in them, have smaller holes than the $\frac{3}{16}$ " diameter called for in Figure 2. If a $\frac{3}{32}$ " diameter hole is too small, it can be enlarged. It is, however, important that this hole be kept clear at all times.

Mike Alfrey.

