Replacing Riley 9 Mk 1, 2 and 3 Kingpins and Bushes

Overview

This is a job that requires engineering facilities and it is recommended that if you do not have such facilities that you entrust the work to a shop that has the required expertise and facilities. By example, the original kingpins are a press fit in the axle eye and you will need a press capable of exerting 10 tons force to remove and refit the kingpins in the axle eye.

The design of these replacement kingpins has been revised, the new design has plain kingpins and the lubricant grooves are in the bushes. What you remove will no doubt look different to what is in the new kit, as on the original the grooves were machined in the kingpins and the bushes were plain.

Please read ALL these instructions before starting any activity on the parts replacement. If you have any points for clarification, please contact RRSL. Similarly, if you have any further useful pointers at the end of the activities please let us know.

Removing the current parts

1. Remember the axle is handed and needs to be fitted the correct way around to ensure the caster angles are not adversely affected. Mark the axle for the front before removal.
2. Similarly, the leaf springs are not symmetrical about the centre pin so mark so you can fit back in the same way as they were removed.
3. Remember that the kingpins have a larger diameter on the lower portion so you must push them out from the top.
4. Remove all the front brake components so you can get good access to fit the axle/swivel assembly remaining into the press.
5. We supply in the kit all the parts you should need to complete the rebuild.
6. Remove the steering arm from the bottom of each swivel, this should release the remains of the load carrying 5/8th inch ball and its wear pad.
7. Remove the swivel bush cap, there may also be the remains of a felt which will need to be removed.
8. Drive out the cotter pin, noting it is tapered, so drive in the right direction.
9. Appropriately support the assembly in the press so that force can be applied to the top of the kingpin and so drive it downwards. It may be necessary to make a fixture so that the press engages properly with the top of the Kingpin. If heat is found necessary, ensure that the components are only raised to a moderate temperature, so you do not affect the axle heat treatment.
10. Remove the bushes from the swivel. Care is again needed, and some form of puller is appropriate. These can usually be created from surplus bits of tube, threaded rod and sockets.
11. Repeat on the other side.

Fitting the new parts

1. The first task is to familiarise yourself with the parts in the kit. The top bush has a screw thread whist the bottom bush is larger in diameter and plain.
2. The next task is to check the condition of the eye's in your axle. The eye diameter must be in the range 0.7502 to 0.7497 to ensure the correct amount of interference fit. If it is larger than the upper dimension, then the axle eye must be reworked to restore the correct size.
3. The next activity is to inspect the upper and lower faces of the axle eye for significant damage. It is recommended that the ends of the eye are faced off square to the kingpin bore to redress any significant damage before Step 4 is started.
4. The next activity is to measure the components so that the number of shims required for under the **top bush flange** can be established. We have chosen to use shims to get the correct free vertical float on the swivel/stub axle to allow users to account for service wear on the axle eye and swivel faces.
    a. Accurately measure the depth of the axle eye (L1). This dimension is a nominal 2" but can vary between 1.990" and 2.010" or less if there is significant wear.
    b. Next measure the distance between the bottom of the top lug and the top of the bottom lug on the swivel (L2). This is a nominal 2.25" but typically will vary by +/_ 0.010"
    c. Then measure the thickness of the flanges on both bushes. The top (Ll3) will typically be 0.100/0.110" and the bottom (L4) similarly 0.100/0.110".
    d. Calculate the fitted clearance from these dimensions. So, say L1=2.000", L2 =2.251", L3 = 0.108" and L4 is 0.102" the fitted clearance would be

    Fitted Clearance = L2 – (L1+L3 +L4)

    = 2.251 – (2.000+0.108+0.102")

    = 0.041"

5. The next step is to select shims for under the flange on the **top bush (0.75" ID)** to achieve the desired fitted clearance range of 0.025/0.035". **Measure twice and then check is good advice,** as errors at this point could be expensive to recover, as you would need to press the bush out of the swivel should an error be found later. {Note: - the assembled fitted clearance is controlled by the shims fitted with the lower ball assembly.}
6. The next step is to fit the bushes in the housing. They are an interference fit so an appropriate press or sockets with threaded rod and a thick-shouldered washer are recommended. There is a lead on both bushes to assist fitment. Watch you do not damage the thread on the top bush. The bushes have an undercut between the body and the flange to ensure they seat properly onto the relevant flange face. Please check they do sit down completely on fitting or the measurements you made in step 4 will be wrong.
7. Ream to a close running fit on the supplied kingpins. Remember that the kingpin diameters will vary within tolerance so at this point **we are building up sets uniquely for the near or offside of the vehicle.** The required reamer is available from the Tools Secretary.
8. Check the kingpin in the appropriate bushed swivel to ensure you are happy with the fit at this point.

9. By inspection of the components ensure that there will be no issues in seating the kingpins in the axle eyes. There is a relief radius on the junction of the ¾" and 1" sections of the kingpin and the relief on the bottom face of the **axle eye** must accommodate this. If you have any doubts, then appropriately countersink the bottom face of the axle eye.
10. As there is not a lot of wiggle room it may well pay dividends to fit the new steering arm retaining bolts at this time.
11. We next fit the swivels to the axle: -
    a. A press will be required and based on expected tolerance range a force of one to four tons will be required to complete the assembly.
    b. The ¾" body of the kingpin is stepped out where the kingpin houses in the axle, this is only around 0.002". This is an original feature and allows the bearing portion to have clearance in the axle eye.
    c. It is important that the flat on the kingpin is correctly oriented to the cotter hole before the assembly is started, as it is unlikely that the fitted kingpin can be turned to align the cotter. A length of 1/4" rod in the cotter pin hole and a straight edge held against the flat on the king pin will help obtain the correct orientation
    d. Lubricate the components before starting.
    e. It will be beneficial for the kingpin to be cooled in the freezer before fitting and the axle eye to be lightly warmed (<100 degrees C)
    f. Slowly press the kingpins into the swivel assembly taking particular care as the top of the ¾" portion starts to enter the bush in the top eye.
    g. Ensure that 1" portion of the kingpin butts up to the bottom face of the axle eye.
    h. Ensure the swivel rotates freely about the kingpin
12. Once fitted, confirm the expected vertical float exists. You set this in Step 4 & 5.
13. Fit the new cotter pin.
14. The next step is to shim the wear pad to ensure that the vertical load is being taken on the 5/8" ball and NOT on the flanges of the lower bushes.
    a. Fit the ball and wear pad into the bottom of the kingpin. Please note the hardened wear pad has a slight dimple in one face: fit the pad with this side touching the ball. A light grease will help retain these and note the wear pad must insert into the bottom of the lower bush.
    b. The next step is to work out what shims you need to produce a clearance of 0.010/0.015" between the bottom of the axle eye and the top face of the bottom bush flange. *You can if you like make this clearance smaller, but you may need further adjustment in service as the parts bed in.*
    c. Fit the steering arm and its gasket with say the thicker of the supplied shims under the wear pad. Then check to see if you have clearance between the *bottom of the axle eye and the top face of the bottom bush flange.*
    d. Continue to apply shims or adjust shims until you have a clearance in the range 0.010/0.015" between the bottom of the axle eye and the top face of the bottom bush flange.
    e. In this process ensure that you have not pushed the swivel up so much that you have removed all clearance between the top of the axle eye and bottom flange of the top bush or you will not be able to lubricate the assembly satisfactorily.

f. The gasket has been provided to fit between the mating faces of the swivel and steering arm to avoid lubricant loss through this joint. This is necessary as both mating faces are fly cut and have a rough finish.
g. Well lubricate the threads and the bearing face of the nuts and tighten to 35 lbf-ft.
h. Make a final check that when all is finally assembled that you have the required clearance between the bottom of the axle eye and the top face of the bottom bush flange

15. Fit the supplied felt in the top of the ¾" bush and fit and tighten the cap and lubricator. You may find that you need some PTFE tape or a tin fibre washer under the cap to minimise oil loss from this joint when lubricating.
16. Lubricate the assembly with SAE 140 grade straight oil. In service, this is best effected by jacking the wheels clear of the road to allow the swivels to drop slightly allowing a free passage of oil between the ball and its seat. (Remember each ball and seat takes half the front-end load of the vehicle). Check that the oil is freely flowing from both bushes adjacent to the axle eye.
17. Reassemble the axle onto the vehicle and reinstate the brakes. Confirming all looks satisfactory before going onto the road.
18. Periodically, when servicing the vehicle, check that there is still clearance between the bottom of the axle eye and the top face of the bottom bush flange with a feeler gauge when the vehicle is normally loaded on the road. If the clearance needs adjustment jack the front of the vehicle, remove the steering arms and apply further shims to reinstate the clearance. Please ensure you torque the arm retaining bolts as specified in 14g.