SECTION G

THE DRIVE SHAFTS

GENERAL DESCRIPTION

Each of the two drive shafts employed has two principal members incorporating a Hardy Spicer constant-velocity bell joint. The hemispherical interior of the bell joint and the exterior of the inner ball race have six grooves machined in line with the shaft axis, and a ball cage carrying six steel balls is interposed between the two. The steel balls engage the grooves of both members to key them together and at the same time allow the members to hinge freely upon each other.

The joint is packed with special grease and the unit is enclosed in a sealed rubber boot. The inner end of the drive shaft is splined and has a pre-lubricated sliding joint sealed with a rubber boot.

Section G.1

DRIVE SHAFTS

Removing

To remove the drive shaft assembly from the vehicle follow the removal instructions given for swivel hubs in Section K.3.

The constant-velocity bell joint may be removed from the drive shaft for replacement as a unit or to have a Service kit fitted. Under no circumstances must individual components be replaced in the bell joint assembly.

Should a rubber boot enclosing the joint be damaged, with a consequent loss of lubricant, it is necessary to remove the joint from the shaft for dismantling and inspection of the components.

If a rubber boot is damaged in the workshop and dirt has not entered the joint, a new boot may be fitted after first repacking the joint with the recommended grease.

To fit a new boot the drive shaft must be removed from the vehicle.

Constant-velocity (bell) joint

The bell joint can be removed from the drive shaft for dismantling and inspection of the components.

Service kits are available which include the required amount of lubricant to service a bell joint.

When servicing of the joint becomes necessary, the procedure given in Section G.2 must be followed.

Sliding joint flange

On later models the sliding joint is prepacked with ¾ oz. (21 gm.) of Duckham's M-B grease (BMC pack AKF 1457) and sealed with a rubber housing seal; early models were fitted with lubricating nipple. When servicing the sliding joint or fitting a new seal, refer to Section G.2.

Section G.2

SERVICING

Dismantling the shaft assembly

(1) Clean the shaft of road dirt and grease and mount the shaft centrally in a vice fitted with soft jaws.

(2) Prise off the boot and housing seal clips or cut the soft iron wire, turn back the housing seal and slide off the joint flange. Remove the housing seal and the rubber boot: if they are worn or damaged replacements must be fitted on reassembly.

(3) The bell joint can only be dismantled after removal of the shaft; a round-section spring ring located in a deep groove in the extreme end of the shaft is expanded into the chamfered end of the inner race bore, and for shaft removal this must be contracted into the groove.

(4) Hold the shaft and joint vertically, the bell joint downwards, and give the edge of the outer race a sharp tap with a soft faced mallet (see Fig. G.1). This should contract the spring ring so that the joint can be drawn off the shaft. It should not be necessary to use heavy blows for this operation.

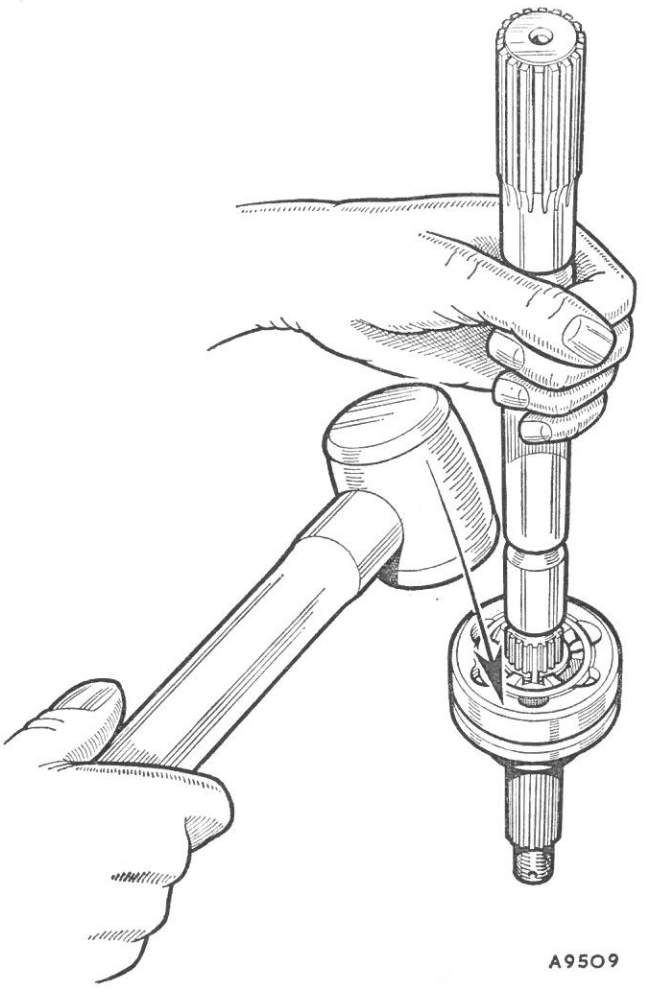

Fig. G.1

Drive the bell joint from the shaft at the point indicated

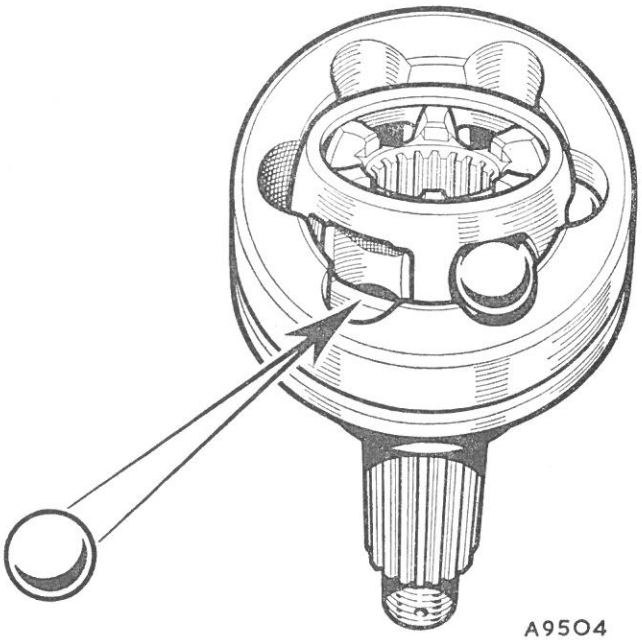

Fig. G.2

Tilt the inner race to remove or replace each ball in turn

Dismantling the joint

(5) The joint should be dismantled only if there is reason to believe that it is still serviceable.

(6) As the components are mated and have operated together, they must be kept in the same mating relationship. The relative positions of the inner and outer races and the cage should be marked with blue marker or a paint which will not wash off when the parts are cleaned.

(7) With the shaft withdrawn the inner race can swivel freely. Tilt the inner race until one ball is released (Fig. G.2). Note that the cage swivels through half the angle of the inner race. If the joint is sticky with grease each ball may be eased out in turn with a pointed tool.

(8) Swivel the cage into line with the axis of the joint and turn it until two opposite elongated windows coincide with two lands of the bell joint. One land will drop into a window, allowing the cage and race assembly to be lifted out (Fig. G.3).

(9) Swivel the inner race at right angles to the cage and turn it until two of the lands between the inner race tracks are opposite elongated windows in the cage. One land will drop into a window, allowing the inner race to be extracted from the cage (Fig. G.4).

Inspection

(10) Clean all parts thoroughly in petrol (fuel), paraffin (kerosene), or white spirit and dry off. In normal service wear should be distributed fairly evenly over all components and the joint will remain serviceable until the amount of end-float exceeds the acceptable wear maximum of ·025 in. (·64 mm.).

(11) Examine the six balls and if worn, rust-pitted, or bearing evidence of flatting, the joint assembly must be replaced.

(12) Inspect the inner and outer race tracks; these will be marked on the flanks where the balls roll, but should be free from indentation and the marking should be consistent.

(13) Inspect the inner and outer spherical surfaces of the cage and the corresponding surfaces of the inner and outer races; these will be polished by contact but must be free from any sign of 'picking-up'. The edges of the cage windows may show signs of wear towards the outer side. Wear at these points may cause knocking when the joint is operated at high angles.

(14) Carefully examine the shaft for cracks, and ensure that the square-section outer circlip is firmly in its groove.

Replacing the ball cage

The majority of cages used in the original assembly are of a standard size, although on some shafts two other non-standard oversize cages have also been used, and all three may be encountered in service.

It is important to note that a joint will only accept a replacement cage of the same size as the original.

To effect easy identification of cage sizes use Service tool 18G 1012. The fitting of a Service kit must not be attempted without this tool.

The three kits available are as follows:

Kit 'A', Part No. 18G 8000 (Standard).
Kit 'B', Part No. 18G 8002 (·004 in. oversize).
Kit 'C', Part No. 18G 8001 (·010 in. oversize).

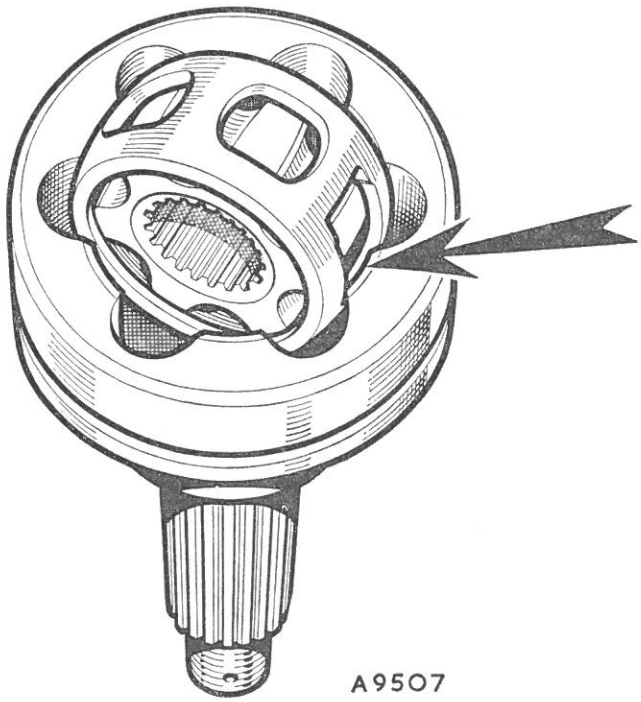

Fig. G.3

Removing the cage and inner race assembly from the bell joint

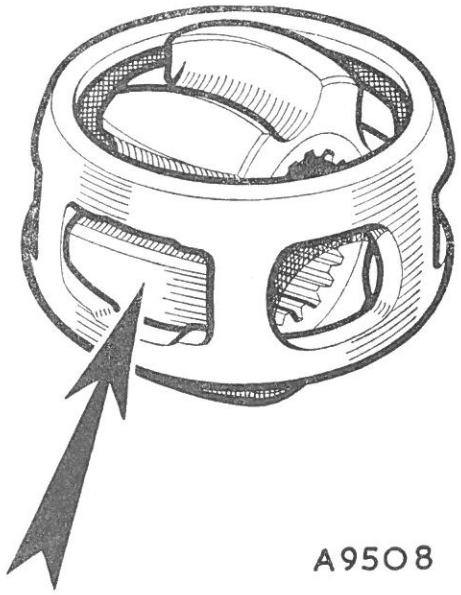

Fig. G.4

Manoeuvre the inner race in the cage to the required position to allow it to be extracted

It is extremely difficult to check the ball cage internal dimensions and a gauge, Service tool 18G 1012, must be used to determine the size of the cage fitted.

(15) The small bore of the gauge is a clearance fit over a standard inner race ·004 in. (·100 mm.) oversize. The larger bore of the tool is a clearance fit over a standard cage but will not accept a cage ·010 in. (·25 mm.) oversize.

(A) If the inner race passes through the small bore of the gauge, and the cage passes through the larger bore the joint size is 'A'.

(B) If the inner race will not pass through the gauge, the joint is size 'B'. The cage should also be checked but must be accepted by the gauge.

(C) If the inner race passes through the gauge, but the cage will not pass through, the joint is size 'C'.

NOTE.—Should the gauge 18G 1012 not accept the inner race or cage, the joints must be replaced as a unit.

Reassembling the joint

(16) This is an exact reversal of the dismantling procedure. All components should be lightly lubricated with Duckham's M-B grease (BMC pack AKF 1457). The components should go together easily and no force should be required.

(17) Insert the inner race into the cage by introducing one of the lands into an elongated window in the cage (Fig. G.4).

(18) Insert the cage and inner race assembly into the bell joint by fitting one of the elongated windows over one of the lands in the outer race (Fig. G.3). The three parts can now be turned or swivelled freely in relation to each other.

(19) Locate the cage and inner race in their original position relative to the bell joint (as marked before dismantling).

(20) Keeping this relation between the parts, tilt the cage until one ball can be inserted in a window. Repeat this operation with the remaining balls (Fig. G.2).

(21) Ensure that the inner race articulates freely with the cage in the bell joint, but care must be taken not to release the balls.

(22) The joint should be filled with the remainder of the pack of Duckham's M-B grease before inserting the shaft.

(23) Fit a new rubber boot if necessary, smearing the inside with Duckham's M-B grease. Take care when easing the boot over the circlip on the shaft.

Assembling the shaft to the joint

(24) Replace the round-section spring ring with a new one (Fig. G.5). If replacing the shaft, fit a new circlip.

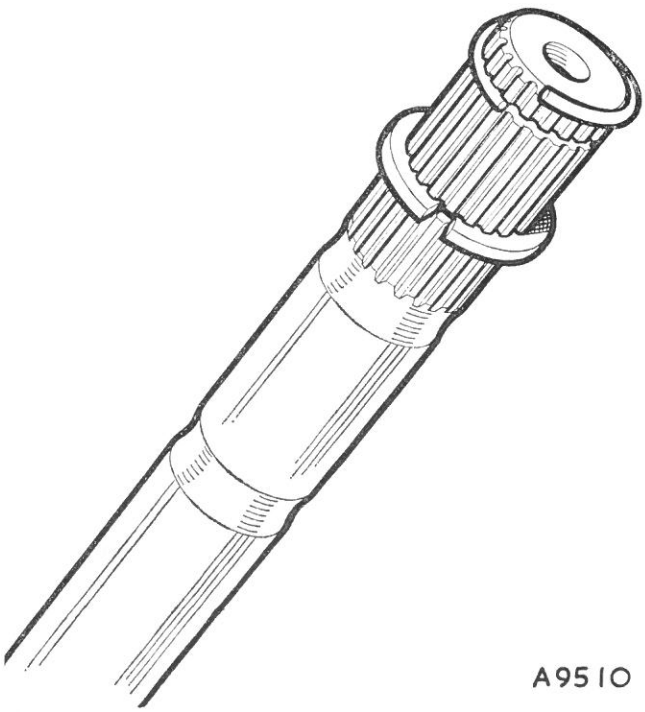

Fig. G.5

The splined bell joint end of the drive shaft showing the circlip and the round-section spring ring

(25) Hold the shaft in a vice and locate the inner race on the shaft. Press the joint assembly against the spring ring whilst locating the ring centrally and contracting it in the chamfer of the inner race with screwdrivers. With the spring ring centralized, a sharp tap on the end of the stub shaft with a soft-faced mallet will close up the ring, and the assembly can then be tapped on to the drive shaft. Make sure that the shaft is fully engaged, with the inner race against the circlip, and that the inner ring has expanded inside the joint.

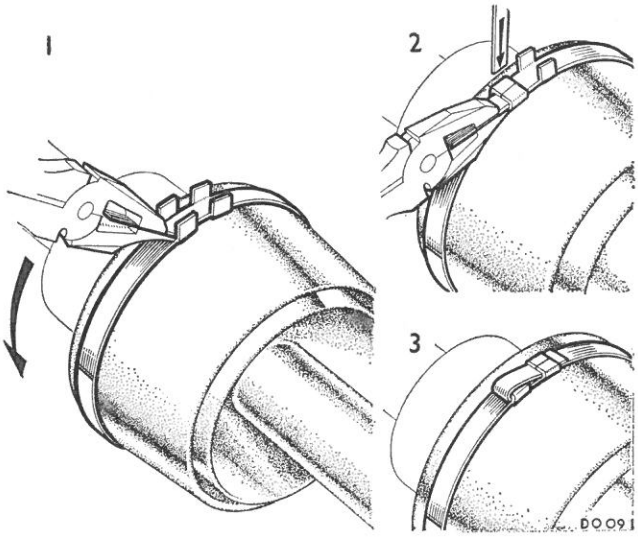

Fig. G.6

Fitting the clinching clips using Service tool 18G 1099

1. Pull the free end tightly between the tabs.
2. Hold in position and secure with front tabs.
3. Fold clip back over the folded tabs and secure the clip end.

(26) Slide the rubber boot over the bell joint until the radiused rib registers in the locating groove, and secure it with the large clinching clip using Service tool 18G 1099 as shown in Fig. G.6. This is fitted with the tab pulled through away from the direction of forward rotation. Locate the other end of the boot in the groove in the drive shaft and secure it with the small clinching clip using pliers 18G 1099.

(27) Lubricate the yoke end of the drive shaft and the inside of the yoke housing seal and slide the seal onto the shaft. Fill the cavity in the sliding joint yoke with $\frac{3}{4}$ oz. (21 gm.) of Duckham's M-B grease and fit the yoke to the shaft. Locate the seal into the groove on the shaft and the other end over the sleeve location. Push the shaft to the bottom of the yoke so that grease is driven into the seal. Hold the outer lip of the seal open to allow air and surplus grease to escape, ensure that the diameter of the bellows does not exceed 1·75 in. (44·5 mm.). Secure the yoke seal with clinching clips using pliers 18G 1099.

Refitting

(28) Refitting is a reversal of the removal procedure given in Section K.3.