SECTION K

FRONT SUSPENSION AND FRONT HUBS

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Section K.1

INDEPENDENT FRONT SUSPENSION

Description

The independent suspension is of the 'wishbone' type. It consists of a single armed Armstrong double-acting shock absorber, bolted to its support bracket, at its upper end. The single arm is towards the front of the car and is secured to the swivel pin trunnion link by a fulcrum pin and metalastik rubber bushes. The bottom end of the swivel pin is secured to the outer end of the lower links by a fulcrum which is cottered in position.

The inner arms of the lower links are fixed to brackets by metalastik rubber bushes and fulcrum pins.

A rebound buffer is fitted to the bottom of the coil spring top bracket and a smaller rebound buffer under the shock absorber arm.

A spring seat is secured to the lower links by four bolts, flat washers and self-locking nuts, thus keeping the spring compressed.

Checking for wear

The following tests should be made to check for wear in various components of the suspension unit.

(1) Wear of the swivel pin, its bushes, or both, may be checked by jacking up the car until the front wheels are clear of the ground. Grip two parts of the tyre diametrically opposite in a vertical plane and endeavour to rock the wheel in that plane. If any movement is felt at the wheel, the swivel pin, its bushes, or both are worn.

(2) Vertical or horizontal movement of the shock absorber cross shaft relative to its body, denotes wear in the shock absorber bearings, and can only be remedied by fitting a new shock absorber. These bearings are best checked with the suspension dismantled, when with some freedom of movement it is possible to move the shock absorber arm which is attached to the cross shaft.

(3) The metalastik fulcrum pin bushes slowly deteriorate due to wear and weather conditions. They must therefore be renewed if softening of the rubber or side movement is evident.

(4) The threaded bushes of the screwed trunnion fulcrum pin in the lower links may develop excessive play due to wear. Dismantle the assembly, check and renew as necessary. The threaded bushes are not renewable by themselves, but only by changing the lower links.

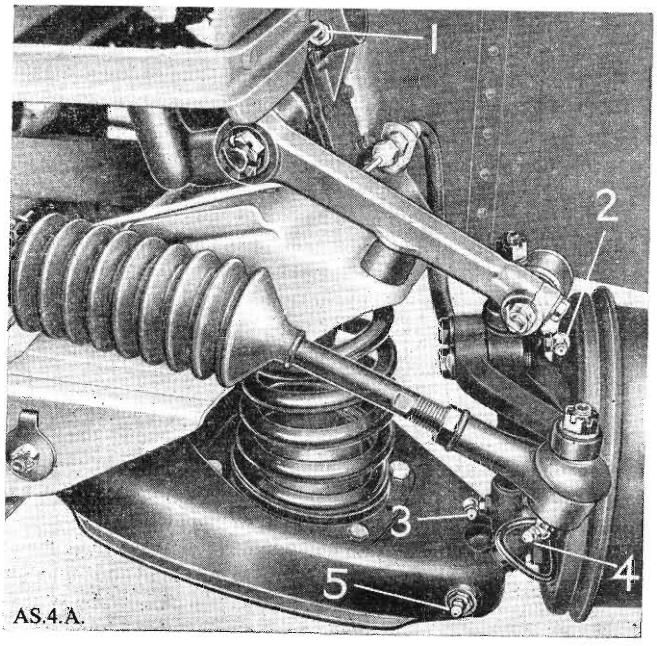


Fig. K.1. Front suspension lubrication.

1. *Swivel adjuster.*
2. *Swivel axle pin top bush.*
3. *Swivel axle pin bottom bush.*
4. *Tie rod end.*
5. *Lower link outer bushes.*

Section K.2

COIL SPRINGS

To remove

(1) Place a hard wood or metal block (1⅛-in. i.e. 2·86 cms. long) under the shock absorber arm to keep the arm off its rubber rebound buffer when the car is jacked up.

(2) Jack up the car on the side concerned and use Service Tool 18G 153 to screw up the spring seat after two diametrically opposite spring seat securing bolts have been withdrawn. Remove the nuts and washers, then screw back the centre bolt of the service tool to allow the spring to expand.

(3) When the spring has fully expanded lift off the tool and take out the spring, its seat and the bolts. In the absence of Service Tool 18G 153 two high tensile bolts about 4½-ins. (11·43 cms). long, threaded their entire length, will be required to allow the spring to expand.

Take out two diametrically opposite bolts in the spring seat, replace them with the long slave bolts which should be screwed up tight, release the two other bolts and nuts, and slacken the nuts on the slave bolts, a little at a time, until the spring is fully expanded. Now the nuts and slave bolts can be taken out and the spring removed.

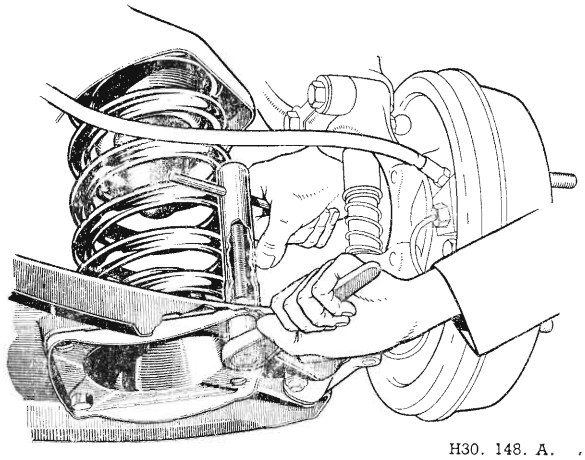


Fig. K.2. Using a pair of slave bolts to remove or replace a coil spring.

If the spring is cracked, weakened, broken or in any way differs from its specifications, it should be renewed.

To replace

(1) Offer the spring and seat into position, fit the spring compressor, put two guide rods in diametrically opposite holes to bring the spring seat and wishbone lower links into line and compress the spring by turning the centre bolt.

(2) When the spring has been compressed insert and tighten two of the bolts with their washers and nuts, withdraw the two guide rods and spring compressor, insert and finally tighten the two remaining bolts with their nuts and washers. Go over the four nuts to see that they have been fully tightened down.

Section K.3

FRONT SUSPENSION

To Remove

(1) Jack up the car and remove the wheel and coil spring as already described in Section K.2.

(2) Disconnect the steering side-tube from the steering arm by withdrawing the split pin and unscrewing the castellated nut. If the ball pin shank is tight in the steering arm slacken the nut but do not take it off, sharply tap the steering arm at the side tube end with a hammer, when it will be found to come away quite easily on removing the nut; alternatively use Service Tool 18G 59.

(3) Disconnect the flexible brake hose.

(4) Withdraw the split pins, undo the nuts, tap the fulcrum pins through the lower link inner ends and take away the two rubber bushes at the outer ends of the lower link inner brackets. The lower end of the suspension is now free.

(5) At the upper end remove the clamp bolt and shake-proof washer in the shock absorber arm, withdraw the split pin and release the castellated nut on the fulcrum pin. Tap the fulcrum pin off, and retrieve the rubber bushes. The suspension unit is now free and can be lifted away.

To Dismantle

(1) Secure the suspension by clamping the web of the lower links between a dummy baseplate at the bottom and a solid metal disc and bolt at the top.

(2) Take out the drum securing screw and withdraw the brake drum.

(3) Draw off the hub as described in Section K.7.

(4) Detach the backplate by removing its four bolts and shakeproof washers.

(5) Knock back the lockwasher and remove the two setscrews to release the steering lever.

(6) Extract the split pin and undo the castellated nut at the top of the swivel axle pin. Take off the trunnion and preserve the shims for use during assembly. Lift off the phosphor bronze oilite thrust washer and the swivel axle along with the dust excluder tubes and their spring, and the bevelled cork sealing ring at the bottom of the swivel axle pin.

Caption to Fig. K.3.

1. *Lubricator.*
2. *Swivel axle bush (top).*
3. *Steering side tube arm.*
4. *Lockwasher.*
5. *Setscrew.*
6. *Trunnion bush (bearing).*
7. *Trunnion link.*
8. *Trunnion fulcrum pin.*
9. *Oilite thrust washer.*
10. *Adjustment washer (shim).*
11. *Clamp bolt.*
12. *Rebound buffer.*
13. *Shock absorber.*
14. *Setscrews.*
15. *Rebound rubber bumper.*
16. *Coil spring.*
17. *Spring seat.*
18. *Bolts.*
19. *Simmonds nut.*
20. *Fulcrum pin.*
21. *Rubber bush (bearings).*
22. *Lower link bush (inner).*
23. *Rubber bush (bearing).*
24. *Special washer.*
25. *Lower link.*
26. *Welch plug.*
27. *Fulcrum pin (outer).*
28. *Screwed plug.*
29. *Lubricator.*
30. *Cork rings.*
31. *Cotter.*
32. *Swivel axle pin.*
33. *Dust excluder (bottom).*
34. *Spring.*
35. *Dust excluder (top).*
36. *Swivel axle.*
37. *Swivel axle bush (bottom).*
38. *Cork sealing ring.*

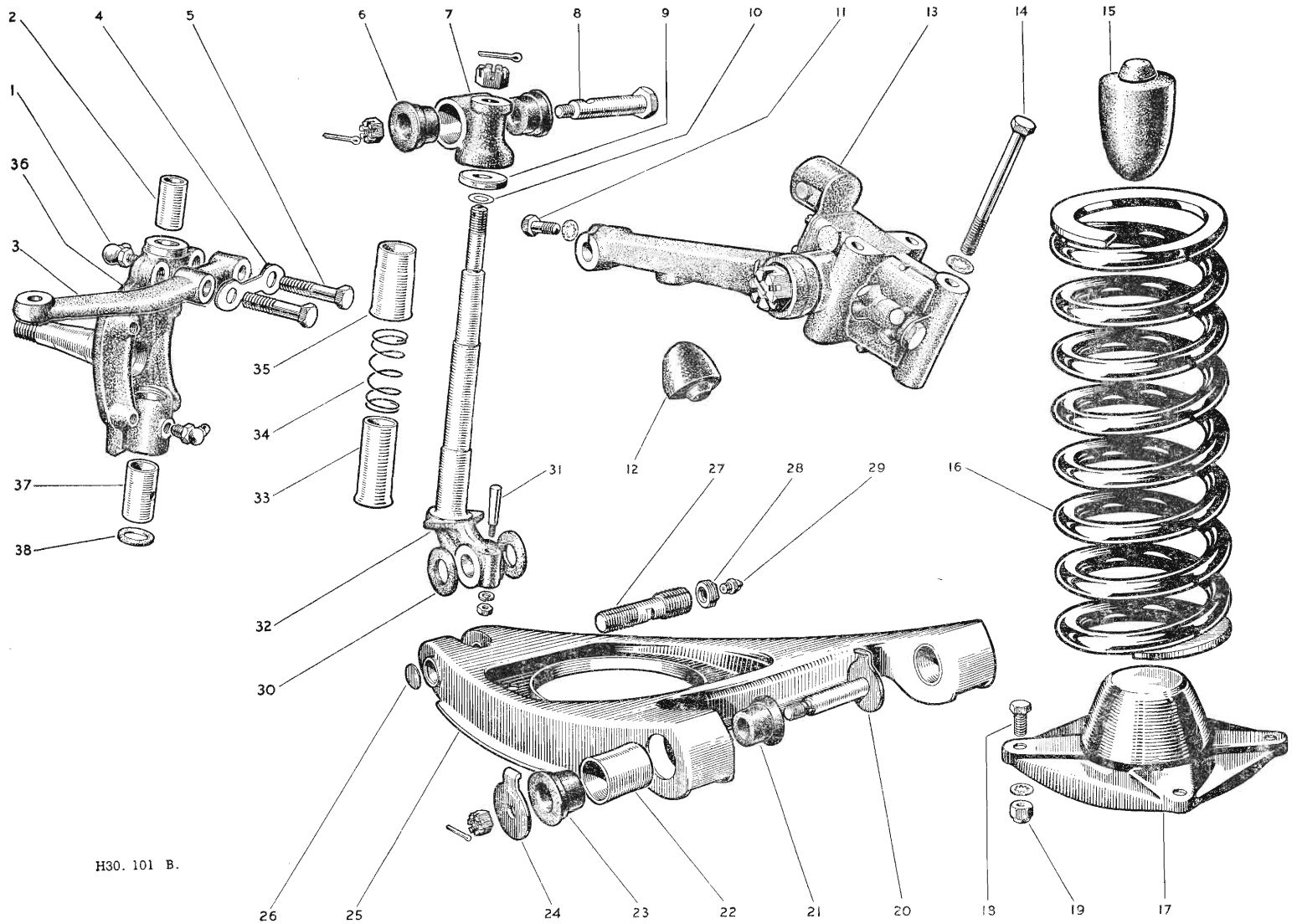


Fig. K.3 Exploded view of the front suspension

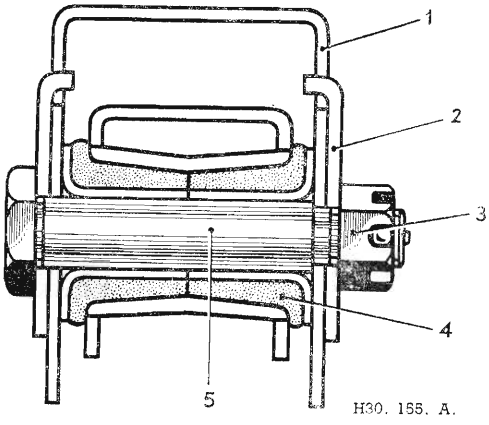


Fig. K.4. Lower link mounting (inner end).
1. *Mounting bracket.* 3. *Castellated nut.*
2. *Special washer* 4. *Rubber bush (bearing).*
5. *Fulcrum pin.*

(7) Slacken the nut on the cotter which is in the swivel pin lower trunnion and knock the cotter loose. Unscrew the nut, then remove the spring washer and cotter. Screw out the swivel pin lower trunnion oil nipple and its housing which also serves to plug the lower trunnion.

(8) Unscrew the swivel pin lower trunnion fulcrum pin, remove the swivel pin and cork sealing washers, and knock out the welch plug.

Section K.4

EXAMINATION FOR WEAR

Swivel Pin

(1) Carefully examine the swivel pin for wear by checking for ovality with a micrometer.

(2) If the pin does not show any appreciable wear renewal of the swivel bushes may effect a satisfactory cure.
The top bush should be flush with the top, and the lower bush flush with the bottom of their respective housings reamer the bushes with Service Tool 18G 155.
The two dust excluder tubes can easily be removed by telescoping them and lifting them out.

Lower Link Bushes

(1) If it is found that the fulcrum pin can be moved backwards or forwards in the lower links threads, they should be renewed.

(2) Try a new fulcrum pin and if excessive wear is still evident renew the bushes. The bushes are not renewable by themselves but only by fitting new lower links.

Shock Absorber

(1) The cross shaft bearings of the double acting hydraulic shock absorber may have worn sufficiently to permit vertical or horizontal movement of the cross shaft. If such wear is apparent, renew the shock absorber complete.

(2) The shock absorber should also be carefully examined for any leaks and tested for effective damping. Damping can be tested by moving the shock absorber arm up and down to the extremes of its stroke. Resistance should be felt throughout each stroke.

(3) If the resistance is erratic it may either mean that the fluid level is low or that there are air locks. To rectify, remove the filler plug and maintain the fluid level to just below the filler plug opening, while the arm is moved up and down through several full strokes. If this treatment does not effect a cure the shock absorber must be renewed as a complete unit.

Removing Worn Bushes

Place the swivel axle on the anvil of tool 18G 154 (larger diameter bush at the top), insert the drift and screw the adjusting plug up to the swivel axle to give it maximum support. Position the swivel axle and anvil on the table of a press and apply even pressure to remove both bushes.

Fitting and Broaching New Bushes

As the top and bottom bushes differ in internal diameter it is necessary to fit and broach one bush at a time.

Using the anvil of 18G 154, place the smaller guide bush (Code 3) flange downwards into the adjusting plug, replace the pad on top of the anvil (recess upwards) and hold the swivel axle in position for fitting the larger diameter bush. Carefully position the bush (lining up oil holes) and pass the drift through the bush, swivel axle and anvil until it locates in the large guide bush at the bottom of the anvil. **Note:** The bushes have a lead ground off at one end to enable them to easily enter their housings.

Use a press to apply a steady pressure on the drift; the new bush will then be pressed squarely into position.

This bush must now be broached; to do this, invert the swivel axle, position the larger bush support adaptor (Code 2) on the anvil of tool 18G 155, and hold the swivel axle in position so that the bush locates on the support adaptor. Insert the larger diameter broach through the small bush housing bore until it locates in the new bush. Now slide the smaller guide bush (Code 3) over the broach and position it in the small bush housing bore.

Check alignment and correct positioning of components before broaching by the application of a steady pressure on top of the broach.

The small bush must now be fitted using tool 18G154. Place the smaller guide bush (Code 3) flange upwards, into the adjusting plug in the anvil and hold the swivel axle in position with the broached bush at the top. Place the new bush in position and pass the drift through the bushes and swivel axle. When it has been determined that the oil holes are in line apply a steady pressure to the drift, until the bush is in position.

This bush must now be broached. With the small support adaptor (Code 4) in position on the anvil of 18G155, rest the swivel axle on the support adaptor with the bush to be broached lowermost.

Insert the smaller diameter broach from the top, so that it locates in the smaller diameter bush (at bottom), then pass the large guide bush (Code 1) over the bush until it locates in the larger diameter bush. Check that all components are in alignment and correctly positioned and press the broach through the bush.

Section K.5

FRONT SUSPENSION

To Reassemble

(1) File the lower link inner trunnion on both sides, remove bits of weld and see that the fulcrum pin is not tight in the threaded bushes or in the lower swivel pin trunnion.

(2) Position the two new cork rings one on the inside of each lower link outer screwed bush. Cover each cork ring with a thin flexible metal disc to protect the cork rings from being damaged when the swivel pin is inserted. Now slide the swivel pin between the two metal discs with its cotter hole towards the lower link inner bushes, and draw the discs out by gripping with a pair of pliers.

(3) Screw the fulcrum pin in from the end of the lower link with the larger threaded bore, until its slot is in line with the cotter hole in the swivel pin; knock in the cotter pin and secure it with its nut and spring washer. If there is difficulty in knocking the cotter pin home, it is an indication that the slot and cotter hole are not properly lined up.

(4) Screw the threaded plug into the larger bore of the lower link outer bush and an oil nipple into it. Put a welch plug in the other end and suitably punch its centre to firmly fix it. Test the leakproof properties of this welch plug by pumping oil through the oil nipple. If oil leaks through the welch plug it should be removed and a new one fitted.

(5) Slip a new chamfered cork sealing ring over the swivel pin, chamfered end down, and smear the swivel pin with oil. Fit the two dust excluders and their spring in the order in which they are shown in fig. K.3 to the swivel axle. Screw the two oil nipples into the swivel axle. Slide the swivel axle on to the swivel pin and ensure that full lock is obtained on both sides. Place the phosphor bronze thrust washer over the swivel axle. Put an ·008-in. shim (·008-in. (·2032 mm.) and ·012-in. (·3048 mm.) shims available) on to the swivel pin, followed by the trunnion with its bore towards the hub when it is fitted. Tighten the castellated nut. Resistance should be just felt when the swivel axle is moved from lock to lock and there should be no vertical movement of the swivel axle. Increase thickness of the shims to loosen and remove to tighten, depending on whether there it too much or too little thrust.

(6) Now fit the back plate assembly to the swivel axle. The flexible brake hose is to the rear and the bleeder nipple pointing to the front. The backplate is secured by four setscrews and shakeproof washers. Finally fit the hub, as explained in Section K.7, and the brake drums.

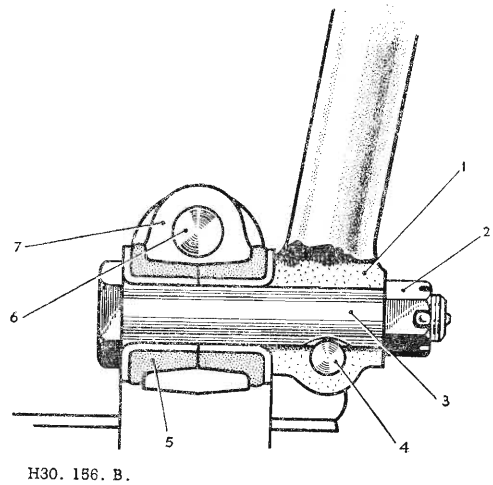


Fig. K.5. Trunnion link/shock absorber arm assembly.
1. *Shock absorber arm.*
2. *Castellated nut.*
3. *Fulcrum pin.*
4. *Clamp bolt.*
5. *Rubber bush (bearing).*
6. *Swivel axle pin.*
7. *Trunnion link.*

To Replace

(1) Wet the spring rebound bumper and push it into its hole in the bottom of the shock absorber mounting plate and the shock absorber arm rebound buffer in the top.

(2) Wet two of the large rubber bearings and put one from inside each lower link. Lift the two arms into position, insert the fulcrum pin from the inner end so that its washer registers, position the two remaining rubber bearings from outside the lower links, locate the special washer, tighten the castellated nuts, insert and turn back the split pins.

(3) With the block still under the shock absorber arm proceed to connect the top end.
Insert the two small rubber bearings in the upper trunnion eye, tap the fulcrum pin from the rear to go through the bearings and shock absorber arm, and see that the notch in the fulcrum pin is to the top. Tighten the castellated nut till the notch is in line with the clamp bolt hole in the shock absorber arm, split pin the castellated nut and tighten the clamp bolt on to its shakeproof washer.

(4) Replace the coil spring (section K.2) and wheel and lower the car.

(5) The block can now be removed from under the shock absorber arm. Connect the flexible brake hose and bleed the brakes.

(6) Do not forget to check the castor and camber angles and swivel pin inclination. A Dunlop 'Wheel Camber, Castor and swivel pin Inclination Gauge' will be found useful.

Section K.6

CASTOR AND CAMBER ANGLES AND SWIVEL PIN INCLINATION

Description

The castor and camber angles and the swivel pin inclination are three design settings of the front suspension assembly. They have a very important bearing on the steering and general riding of the car. Each of these settings is determined by machining and assembly of the component parts during manufacture. They are not therefore adjustable.

However should the car suffer damage to the suspension affecting these settings, the various angles must be verified to ensure whether replacements are necessary.

Camber Angle

This is the outward tilt of the wheel and a rough check can be made by measuring the distance from the outside wall of the tyre immediately below the hub to a plumb line hanging from the outside wall of the tyre above the hub. The distance must be the same on both wheels. Before making this test it is very important to ensure that the tyres are in a uniform condition and at the same pressure. Also that the car is unladen and on level ground.

Damage to the upper and lower wishbone arms may well affect the camber angle.

Castor Angle

This is the tilt of the swivel pin when viewed from the side of the car. This also is only likely to be affected by damage to the upper and lower wishbone arms.

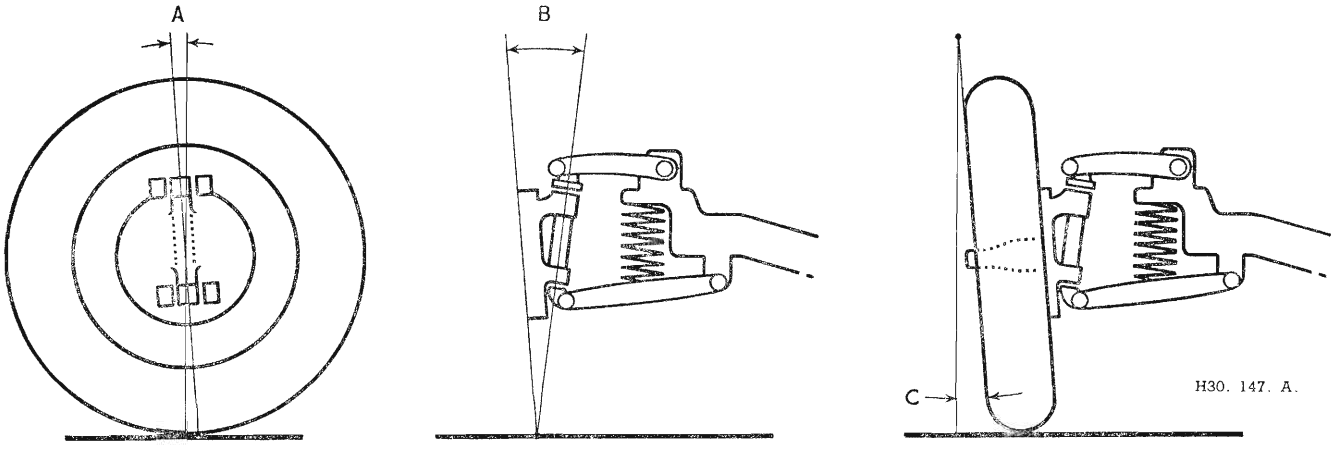


Fig. K.6.

A. Castor angle—3°. *B. Swivel pin inclination*—6½°. *C. Camber angle* 1°.

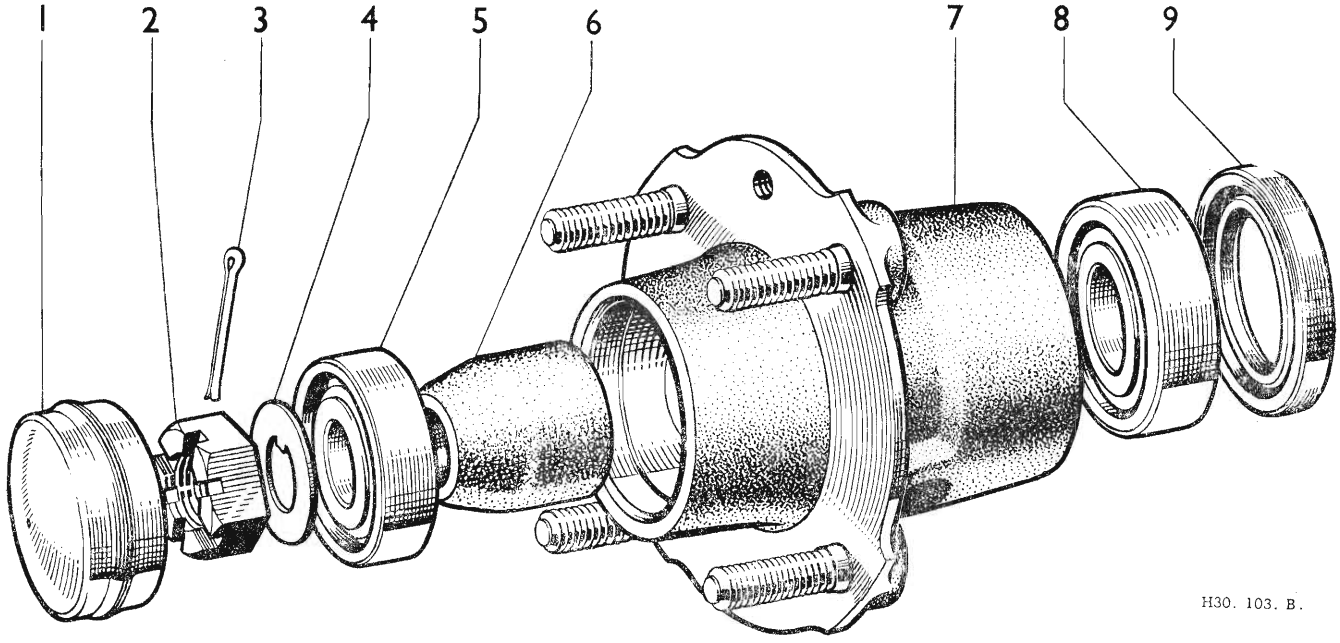


Fig. K.7. Front Hub Assembly.

1. *Hub cap.*
2. *Castellated nut.*
3. *Split pin.*
4. *Locating washer.*
5. *Outer bearing.*
6. *Distance piece.*
7. *Hub.*
8. *Inner bearing.*
9. *Oil seal.*

Swivel Pin Inclination

This is the tilt of the swivel pin when viewed from the front of the car and is again only likely to be affected by damage to the wishbone arms.

A useful service tool which can be used for checking these settings is the Dunlop 'Wheel Camber, Castor and Swivel Pin inclination Gauge'. Full details of this gauge can be obtained from the Dunlop Rubber Co. Ltd., Fort Dunlop, Erdington, Birmingham, England.

Section K.7

FRONT HUBS

To Check Wear

The inner and outer ball bearings of the front hub are non-adjustable, the amount of thrust on the bearings being determined by a collapsible distance piece. Wear in the bearings can be checked by jacking up the front of the car until the wheel on the hub in question is off the ground. Remove the wheel cap and hub cap, and rock the wheel in a horizontal plane. Movement between the wheel and hub as one unit and the swivel axle nut at the centre of the hub indicates wear in the hub bearings. A very positive movement indicates bearing renewal.

To Remove and Dismantle

(1) Jack up the car, remove the wheel cap and wheel. Release the screw in the counter-sunk hole and draw off the brake drum.

(2) Wipe away any excess grease, extract the split pin and release the castellated nut and washer Employ extractor 18G 146 to draw the complete hub assembly off the swivel axle.

(3) Should the inner bearing remain on the swivel axle it should be carefully extracted. It is usually only the inner race of the inner bearing that is left behind and removal will be found easier if the backplate is first removed.

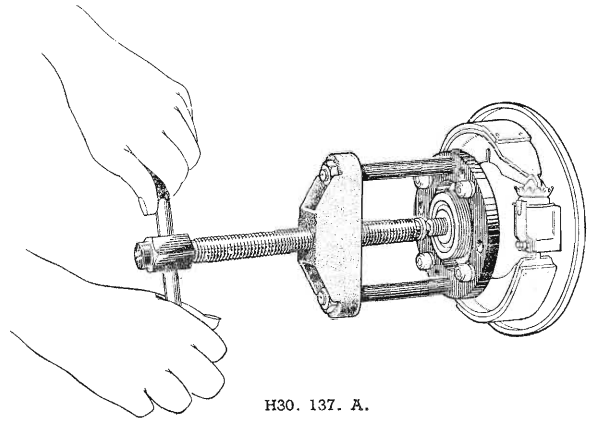


Fig. K.8.
Using Service Tool 18G 146 to extract a front hub.

(4) With the hub removed, the outer bearing and collapsible distance piece can be taken out by inserting a drift through the inner bearing and carefully knocking the bearing clear of the hub. Similarly the inner bearing and oil seal can be detached by drifting them off from the other side of the hub.

To Assemble and Replace

(1) Press or drift in the outer bearing with the side marked 'thrust' towards the centre of the hub, using adaptor 18G 134B with Service Tool 18G 134.

(2) Turn the hub over, pack it with recommended grease and place the collapsible distance piece in position with its domed end towards the outer bearing.

(3) As before press or drift in the inner bearing with side marked 'thrust' towards the distance piece, using adaptor 18G 134C with Service Tool 18G 134. Then press in the oil seal with its lipped end towards the inner bearing. The oil seal should be renewed if damaged in any way.

(4) Replace the hub on the swivel axle; place the drift (Service Tool 18G 7) over the outer bearing so that the pressure is evenly distributed over the face of the bearing. Drift the hub into position until the inner race bears against the shoulder of the swivel axle. A good way of knowing when the hub is home is by listening for the change in tone when knocking the hub on. It is a good policy to place a pilot cap over the threaded end of the swivel axle to protect the thread and also to prevent the outer bearing inner race from striking the shoulder at the end of the threads.

(5) Place the pegged washer on the swivel axle so that its peg locates in the slot. Screw the castellated nut up to the flat washer.

(6) Put the brake drum on and tighten its securing screw in the countersunk hole. Tighten a pair of wheel nuts on diametrically opposite studs and see that the brake drum is quite free of the brake shoes.

(7) Tighten the castellated nut to a torque wrench reading of 50 to 55 lbs. ft. (6·913 to 7·604 kg.m.). Rock the drum to check that play in the bearings has been taken out, and rotate it to ensure that the hub is correctly preloaded. Line up the nearest slot in the nut with the hole in the swivel pin, insert the split pin and lock the nut.

(8) Charge the hub with grease, drift on the hub cap and wipe off any grease that exudes through the little hole at its centre.

Replace the wheel, wheel nuts, lower the car, tighten the wheel nuts, and position the wheel cap.

Section K.8

SHOCK ABSORBERS

General Description

The shock absorbers are of the hydraulic double acting piston type. All the working parts are submerged in oil. They are carefully set before dispatch and cannot be adjusted without special equipment. Any attempt to dismantle them will seriously affect their operation and performance. Should adjustment or repair be necessary, they must be returned to their makers.

Maintenance

The maintenance of the hydraulic shock absorbers should include a periodical examination of their anchorages to the body frame. The fixing bolts must be tightened as necessary, (25 to 30lb./ft.)

The cheese-headed screws securing the cover-plates must be kept fully tightened to prevent leakage of the fluid.

When checking the fluid level every 6,000 miles (9600 km.) all road dirt must be carefully cleared away from the vicinity of the filler plugs before the plugs are removed. This is most important as it is absolutely vital that no dirt or foreign matter should enter the operating chamber.

The correct fluid level is just below the filler plug threads.

The use of Armstrong Super (thin) Shock Absorber Oil is recommended. When this is not available any good quality mineral oil to Specification S.A.E. 20/20 W is acceptable. This alternative is not suitable for low temperature operation and is deficient in various other ways.

To Remove

Jack up the car and place stands under the body in safe positions. Remove the road wheel and place a jack beneath the outer end of the lower wishbone arm and raise it until the damper arm is clear of its rebound rubber.

Remove the shock absorber arm clamp bolt and its shakeproof washer. Withdraw the split pin and release the castellated nut on the fulcrum pin (see Fig. K.5). Withdraw the fulcrum pin and retrieve the trunnion link rubber bushes.

Once the three securing bolts and their shakeproof washers have been removed the shock absorber may be taken from the car.

NOTE.—The jack must be left in position under the suspension wishbone while the top link remains disconnected in order to keep the coil spring securely in position and to avoid straining the steering connections.

To Replace

Replacement is a reversal of the above procedure, but attention must be given to the following points:

(1) The shock absorber mounting bolts should not be tightened beyond a torque wrench loading of 30 lb. ft. Overtightening beyond this point will be detrimental to the performance of the shock absorber.

(2) Before fitting the upper trunnion fulcrum pin, work the shock absorber arm three or four times through its full travel to expel any air which may have found its way into the operating chamber.

(3) The metalastic fulcrum pin bushes must be renewed if softening of the rubber or side movement is evident.

Section K.9

LOWER LINK MOUNTINGS

On later chassis, from Car No. 11126, the lower link inner fulcrum pins are secured by Nyloc (self-locking) nuts which replace the castellated nuts and split pins formerly used. In the event of the lower links being removed from the frame, NEW Nyloc nuts must be used to secure the inner fulcrum pins upon re-assembly.

Section K.10 FAULT DIAGNOSIS

Symptom	No.	Possible Fault
(a) Wheel Wobble	1	Unbalanced wheels and tyres
	2	Slack steering connections
	3	Incorrect steering geometry
	4	Excessive play in steering gear
	5	Broken or weak front springs
	6	Worn hub bearings
	7	Loose or broken shackles
(b) Wander		Check 2, 3 and 4 in (a)
	1	Front suspension and rear axle mounting points out of alignment
	2	Uneven tyre pressures
	3	Uneven tyre wear
	4	Weak shock absorbers or springs
(c) Heavy Steering		Check 3 in (a)
	1	Excessively low tyre pressures
	2	Insufficient lubricant in steering rack
	3	"Dry" steering connections
	4	Out of track
	5	Incorrectly adjusted steering gear
	6	Misaligned steering column
(d) Tyre Squeal		Check 3 in (a) Check 1 in (c)