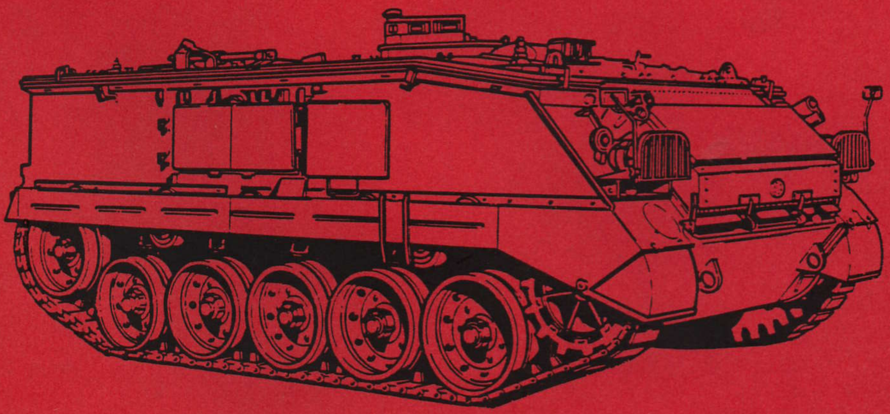
School of Electrical and Mechanical Engineering
BORDON HAMPSHIRE.

WARNING!
This is not a TQM authorised document — the information may have been superseded.

FV 430 SERIES



SEME REF NO: V2/18

CHAPTER 7

Suspension and Running Gear

LIST OF CONTENTS

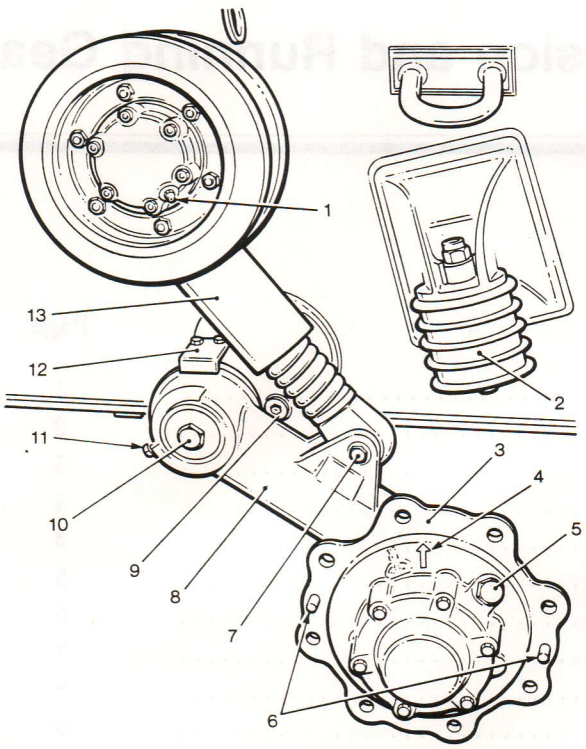
LIST OF ILLUSTRATIONS

7.1 INTRODUCTION

See Fig 7.1.

Each side of the vehicle is supported on five pairs of independently sprung road wheels, mounted on trailing axle arms. The axle arm's upward travel is limited by a rubber/steel bump stop. Each pair

of wheels are mounted on a hub which revolves on a stub axle. The axle arm pivots in two bushes in a bracket welded to the hull. The pivot tube of the axle arm is connected to a torsion bar which extends across the hull to a fixture on the axle arm bracket on the opposite side.



1. **Guide roller lubricating nipple**
2. **Bump stop**
3. **Road wheel hub**
4. **Arrow**
5. **Filler level plug**
6. **Wheel locating pins**
7. **Shock absorber mounting bolt**
8. **Axle arm**
9. **Torsion bar access plug, inner end**
10. **Torsion bar access plug, outer end**
11. **Locking screw**
12. **Retaining plate**
13. **Shock absorber**

Fig 7.1 Suspension Unit

7.2 AXLE ARM

See Fig 7.2.

To allow the axle arms to be positioned directly opposite each other the torsion bars are set at an angle, see Fig 7.2. This means that the axle arms are not interchangeable between sides of the vehicle. The front and rear axle arms of each side have a pair of flanges to accept the lower end of the shock absorber and a cutaway at the front of the arm to allow for sprocket ring clearance. This means that No 1 and 5 and No 2, 3 and 4 axle arms of the same side are interchangeable.

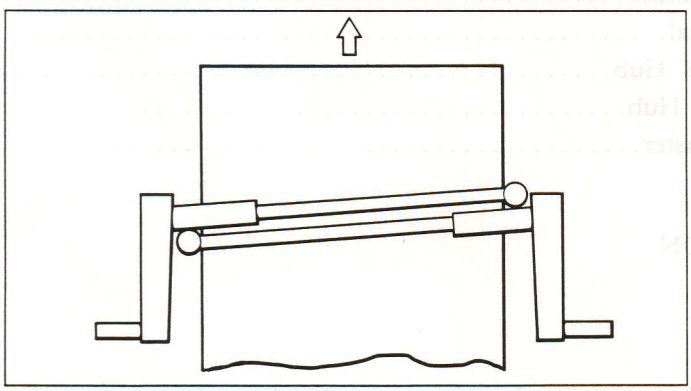


Fig 7.2 Angled Torsion Bars

7.3 TORSION BARS

See Fig 7.3.

These are preset during manufacture and stamped with the letters L or R to denote which side of the vehicle they should fit.

Presetting is the 'twisting' of the bar in the direction of bump. This improves its performance as a spring.

After manufacture the bars are coated between the splined sections with an epoxy paint which dries to a hard black finish.

To provide a vernier adjustment for setting axle arm height, the inner (anchored) end of the torsion bar has 42 serrations, and the axle arm end has 44 serrations.

The inner end of the torsion bar has an annular groove machined in it to accept two pins, which are fitted into the anchor block, anchoring the bar. A tapped hole is provided in the bar at the anchor end for fitting purposes. The outer end has a threaded stud to accept a self-locking nut.

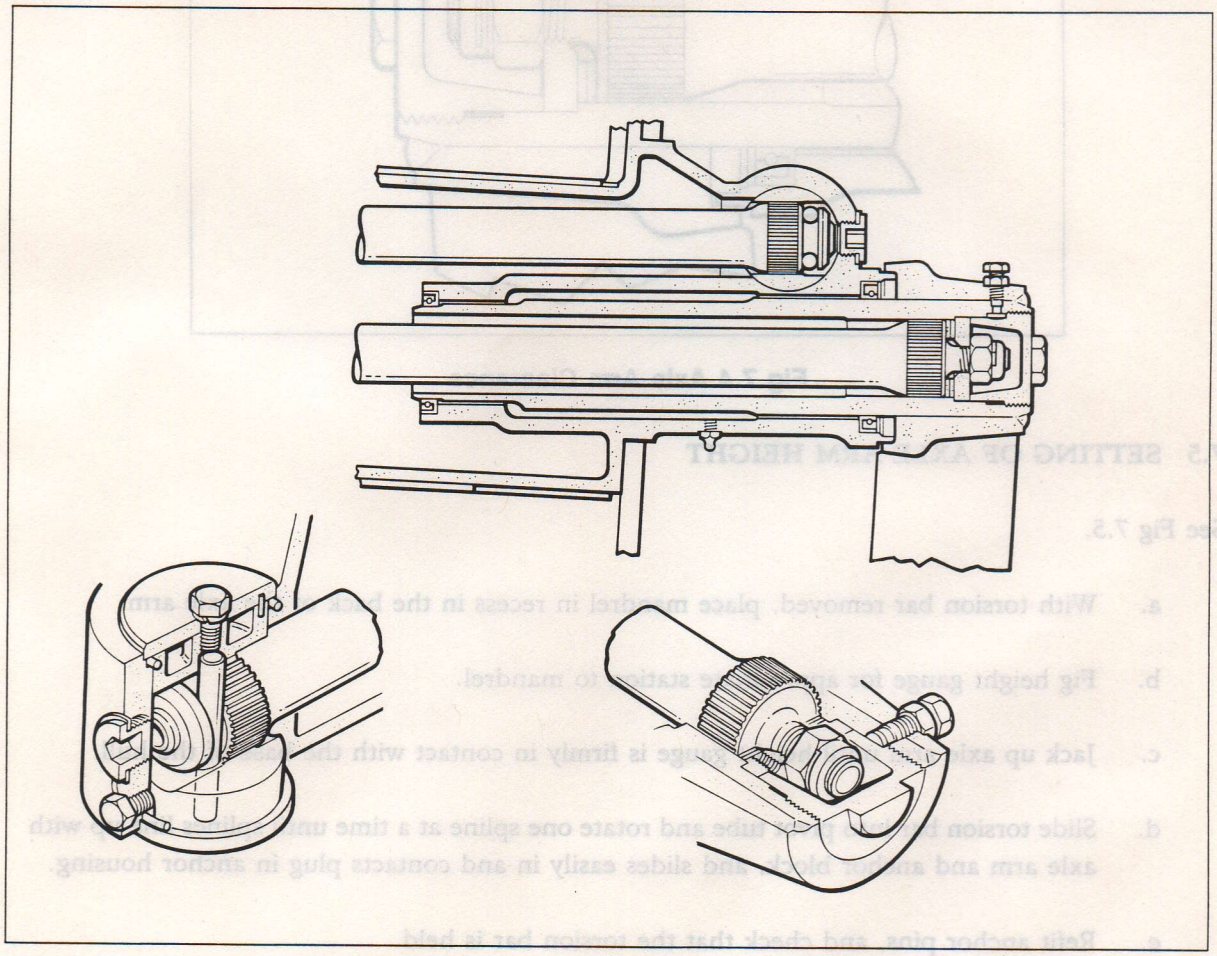


Fig 7.3 Torsion Bar Location

7.4 AXLE ARM CLEARANCE

See Fig 7.4.

As torsion bars twist they tend to shorten, therefore, there must be a clearance between the axle arm and housing to allow for this. The clearance is achieved by shims inserted between the end of the torsion bar and a double diameter washer secured by a locknut. The washer prevents the axle arm from being removed from the splines.

To prevent the axle arm from riding back and forth on the splines, there is an end cap screwed into the arm, the inner end of the cap abutting on the double diameter washer.

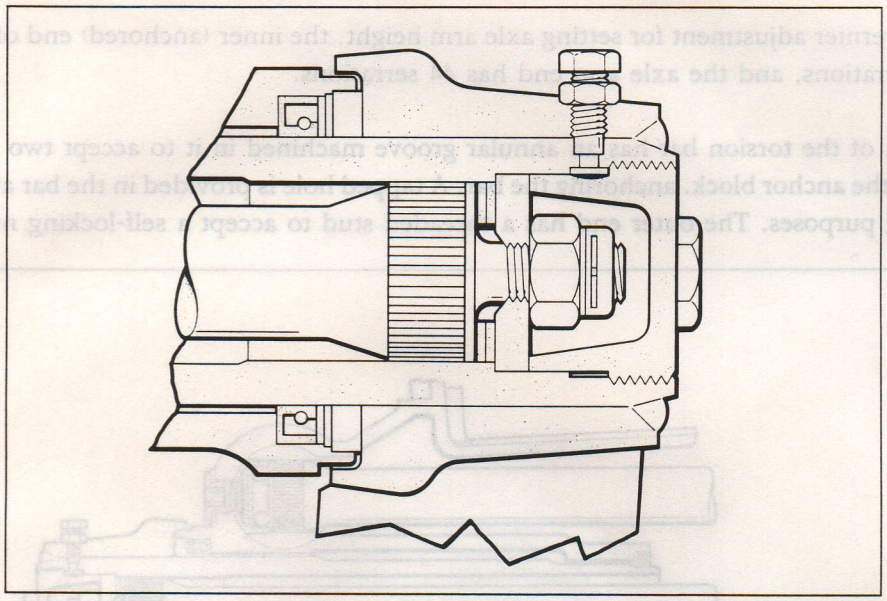


Fig 7.4 Axle Arm Clearance

7.5 SETTING OF AXLE ARM HEIGHT

See Fig 7.5.

a. With torsion bar removed, place mandrel in recess in the back of the axle arm.

b. Fig height gauge for appropriate station to mandrel.

c. Jack up axle arm until height gauge is firmly in contact with the base of the hull.

d. Slide torsion bar into pivot tube and rotate one spline at a time until splines line up with axle arm and anchor block, and slides easily in and contacts plug in anchor housing.

e. Refit anchor pins, and check that the torsion bar is held.

f. Fit shims to the torsion bar at the axle arm end, to obtain a clearance of 0·080″ min in between the axle arm pivot tube and hull bracket.

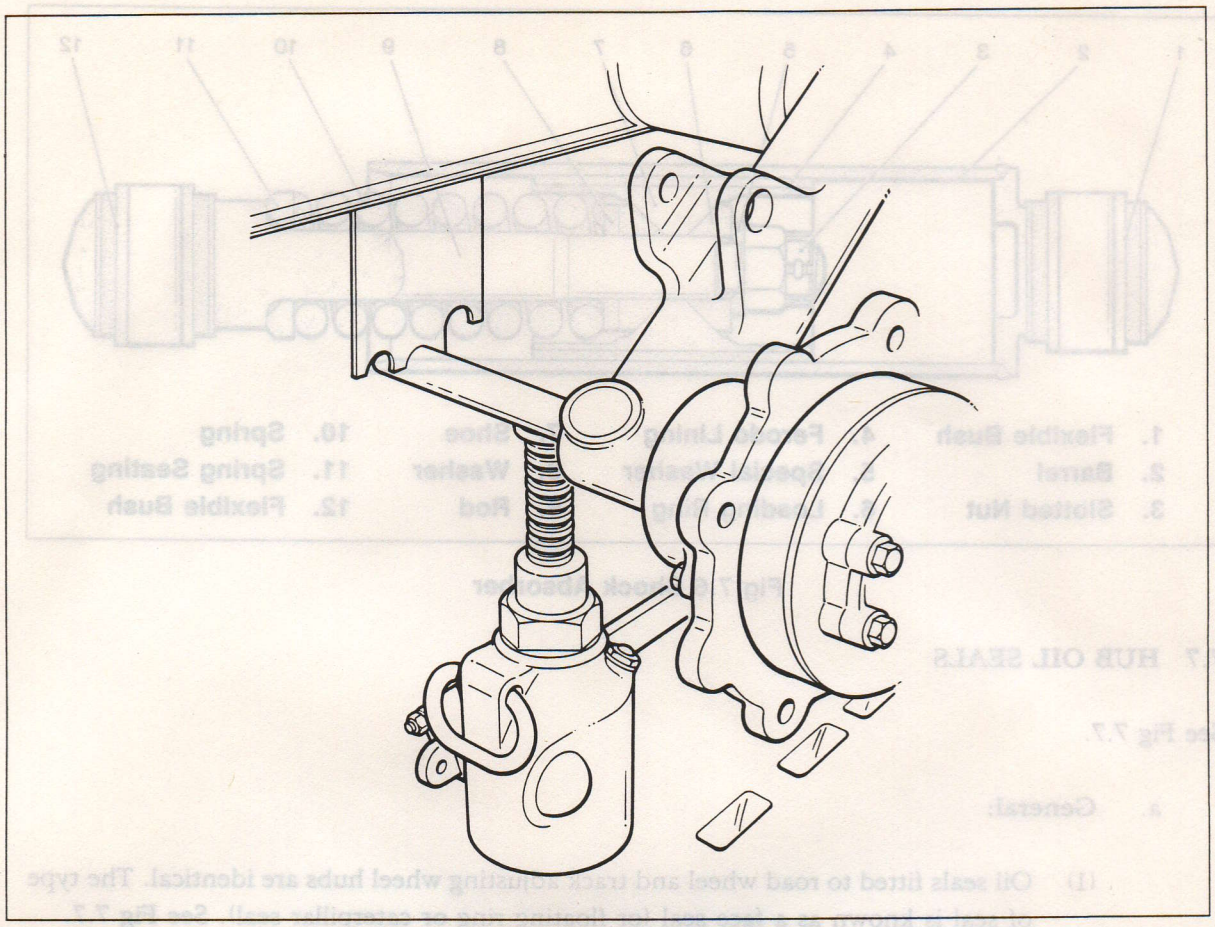


Fig 7.5 Setting Axle Arm Height

7.6 SHOCK ABSORBERS

See Fig 7.6.

On all FV 430, except FV 434 vehicles, the shock absorbers are a friction type. They are fitted between each front axle arm and final drive, and at the rear between the rear axle arm and top roller bracket. On the FV 434 vehicles the shock absorbers are of the hydraulic type with a built in 'lock out' device, and are fitted direct to the hull at their uppermost point.

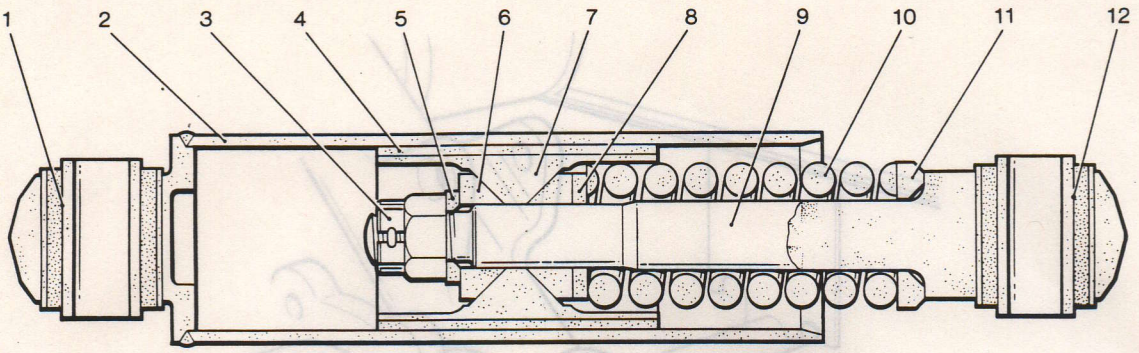
a. **Operation.** On bump the rod moves upwards momentarily compressing the spring, by action of the friction shoes being in contact with the outer tube. This compression of the spring relieves the pressure on the loading rings which in turn relieves the pressure on the shoes and so decreases shoe friction on the tube.

   On rebound the rod is pulled out by action of the axle arm. The top washer pulls on the loading ring, the spring reasserts itself and pushes upwards on the lower loading ring, forcing the shoes outwards onto the tube, giving maximum friction and resistance. This reduces suspension oscillations.

b. **Inspection.** To check if the shock absorbers are serviceable, drive the vehicle over rough ground, then examine to see if they are warm to the touch. Replace any that are cold.

   All mounting pins should be secure and have no play in threaded boss.

   Silent block bushes should show no sign of deterioration or movement.



1. Flexible Bush	4. Ferodo Lining	7. Shoe	10. Spring
2. Barrel	5. Special Washer	8. Washer	11. Spring Seating
3. Slotted Nut	6. Loading Ring	9. Rod	12. Flexible Bush

Fig 7.6 Shock Absorber

7.7 HUB OIL SEALS

See Fig 7.7.

a. **General:**

(1) Oil seals fitted to road wheel and track adjusting wheel hubs are identical. The type of seal is known as a face seal (or floating ring or caterpillar seal). See Fig 7.7.

(2) The object of the seal is to retain lubricant within the hub and to exclude dirt. The highly finished surfaces of the floating ring are held in contact by pressure exerted by rubber Torus seals. These Torus seals distort slightly when fitted into their mounting recesses. The inner face seal, with its Torus seal, is stationary as the Torus seal fits into groove of hub labyrinth. The outer face seal rotates with the hub, as its Torus seal locates in a recess of the hub oil seal housing.

(3) Efficiency of the seal depends entirely upon mating faces of face seals. These faces have a high degree of surface finish, which must be preserved. Ensure that surfaces are not scratched or nicked.

(4) A seal has reached the end of its useful life when the mating faces are more than ⅛″ wide.

b. **Fitting:**

CAUTION: Finger marks alone can cause sealing surfaces to deteriorate. Avoid touching finished surfaces, except with clean tissue, at every stage in dismantling and assembling.

To ensure satisfactory seal life, the following instructions must be rigidly observed:

(1) Whenever a seal is dismantled completely, new Torus ring seals **MUST** be fitted to **BOTH** halves of face seal.

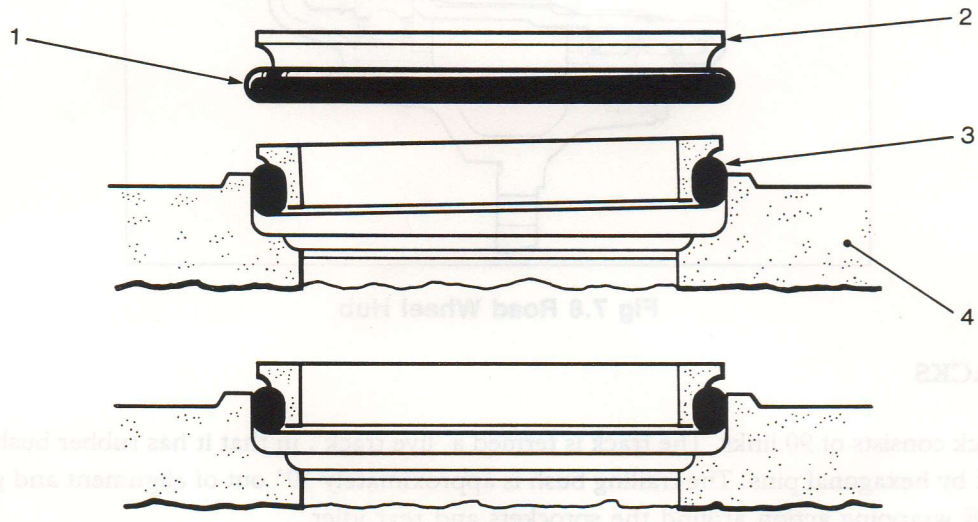
(2) A face seal that has been in use must **NOT** be mated with a new face, or with another used face seal. Once run together, they must remain mated, until scrapped together.

(3) The utmost care must be taken to keep dirt and dust away from the finely finished surfaces. If a seal is assembled with dirt between faces, the seal will be rapidly destroyed.

(4) The recesses into which a Torus seal fits must be free of dirt, rust and grease or any obstruction which will prevent accurate bedding of Torus seal. Torus seals must not be twisted or strained, and must be absolutely dry.

(5) Fig 7.7 shows method of entering seal into housing. Finger pressure only may be used to enter seal in its groove. When seal is entered, dimension 'X' shown in figure must be checked at several points on periphery of face seal, to ensure that seal is squarely set in relation to the groove.

(6) Before mating finished surfaces, a thin smear of oil (OMD 80) must be applied with a clean paper tissue (do not allow this protective film of oil to come into contact with Torus ring seal). Mate surfaces instantly to avoid attracting airborne dust.



1. **Rubber Torus Seal**
2. **Metal Face Seal**
3. **Finger pressure point when fitting**
4. **Housing**

Fig 7.7 Hub Oil Seal

7.8 WHEEL HUB

See Fig 7.8.

The road wheel hub is supported on two bearings, one parallel roller and one ball bearing. The inner races of the bearings are separated by a distance piece.

On the inner end of the hub a seal carrier is fitted, carrying a face seal.

Newer hubs have an anti-static end cap, this was fitted to prevent static electricity from causing radio

interference and pitting of the bearings.

The road wheels are located onto the hub by two dowels and a mounting flange. These items must be in good condition, otherwise the road wheel bolts will not stay tight.

The wheel bearings are non-adjustable and should be renewed when the rim rock exceeds $^{3}/_{16}$".

a. **Testing after fitment.** This test is to ensure that the face seal has been fitted correctly. After the hub nut has been fully tightened, fit a road wheel. Attach a spring balance to a hole in the road wheel and a tangential pull of 4-5 lbs should rotate the wheel. Fill hub with oil to correct level and road test. After road test, re-check tangential pull, it should now be 2-3 lbs.

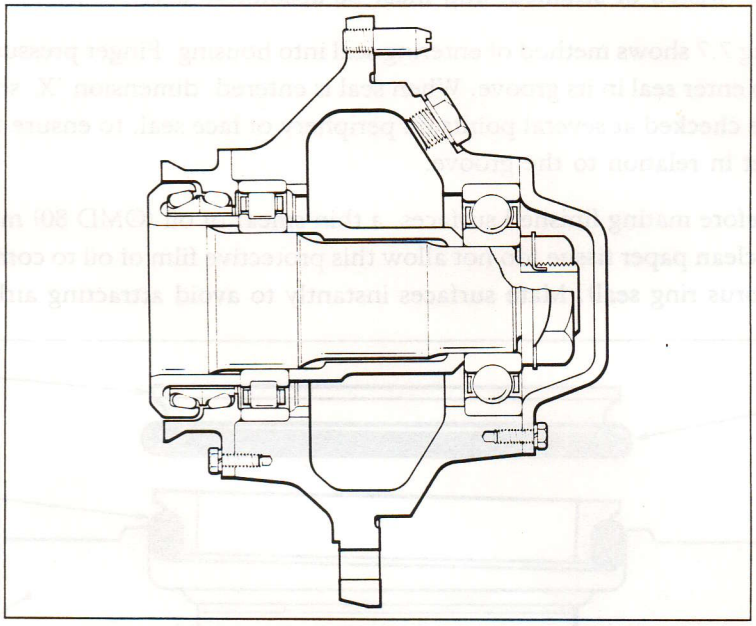


Fig 7.8 Road Wheel Hub

7.9 TRACKS

A new track consists of 90 links. The track is termed a 'live track', in that it has rubber bushed links connected by hexagonal pins. The trailing bush is approximately 10° out of alignment and gives the track a self wrapping action around the sprockets and rear idler.

The track links are fitted with renewable rubber track pad. Fitted between the link and pad is a polyurethane washer, this is fitted to reduce the incidence of track pad loss.

A modified bush is fitted to new tracks to reduce radio interference caused by static electricity generated in the vehicle running gear. The anti-static bush has a bronze wire brazed to the bush sleeve which passes through the rubber and contacts the track link. These tracks are identified by blue paint on the webs.

When a track is reduced to 86 links, it cannot be correctly tensioned and all adjustment is taken up, it is worn out and should be renewed. When the tracks are renewed, the set of sprockets will also be renewed.

a. **Track Tension.** With the vehicle fully laden there should be 1—1·5" of sag between the top rollers, with no sag between the final drive, rear idler and adjacent road wheels.

The track is tensioned by pumping grease into the track adjuster ram, which forces the idler arm to the rear.

7.10 TRACK SUPPORT ROLLER

See Fig 7.9.

There are two track support roller (TSR) assemblies fitted to each side of the vehicle. They support the top run of the track and the rear TSR brackets provide the top shock absorber mountings.

The TSR assemblies consist of a support bracket and an alloy hub, supported on a pair of ball bearings separated by a spacer. The bearings are non-adjustable and should be renewed when the end float exceeds $^{3}/_{32}$".

The stub axle is located into the bracket by a mills pin, which also provides a location for the track support bar.

The TSR hub is grease filled and uses a combination of outwards facing lip seal and labyrinth to keep out contamination.

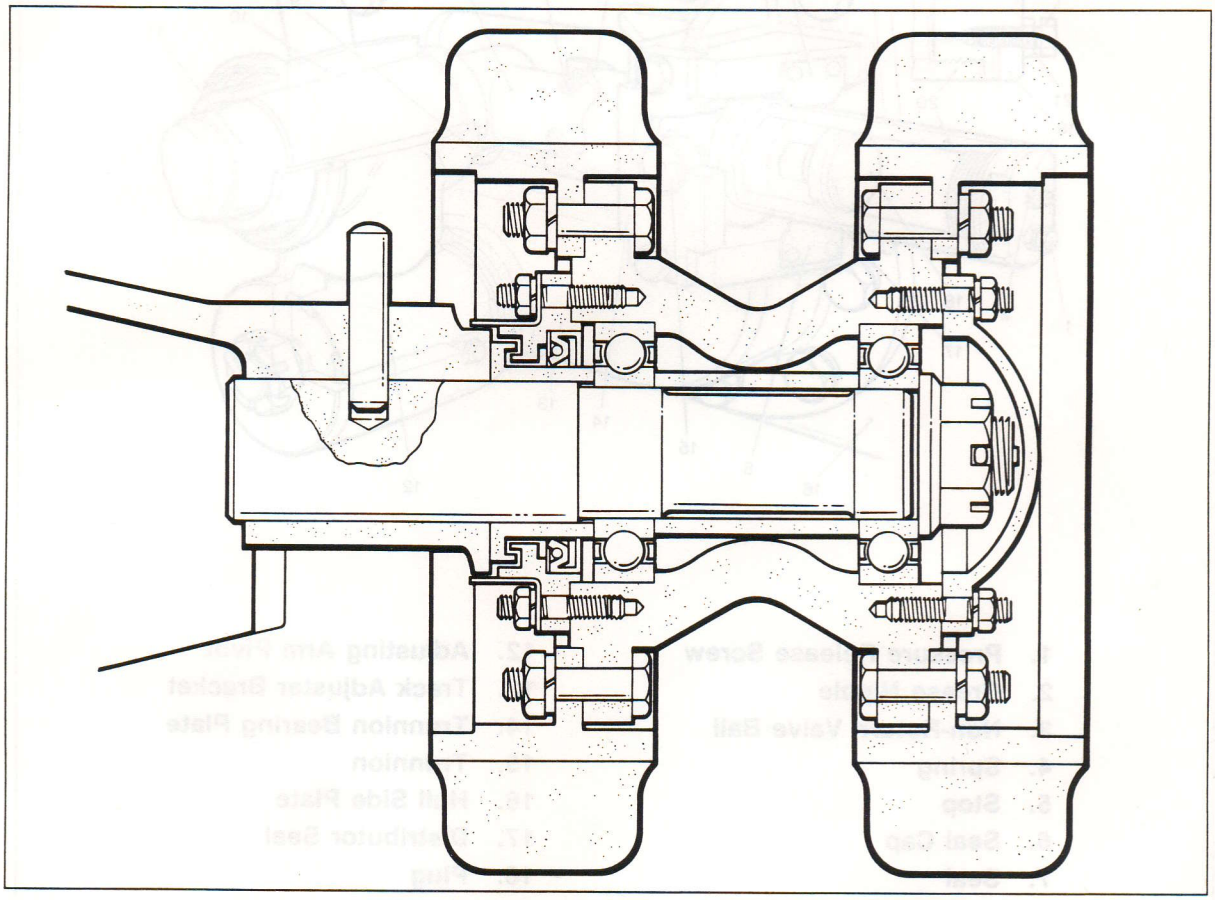


Fig 7.9 Top Roller Hub

7.11 TRACK ADJUSTER ASSEMBLY

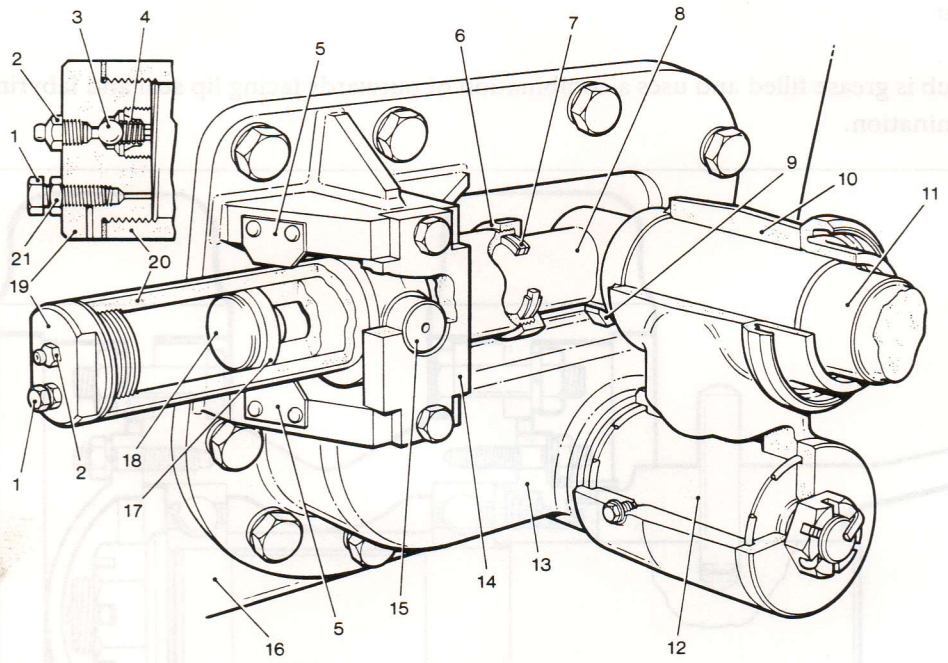
See Fig 7.10.

a. **Pivoted Adjusting Arm, complete with idler hub.** The adjusting arm is located on a steel pivot without any form of bushing, and is prone to seizure if not regularly lubricated. A stop is fitted to limit rearward travel of the adjusting arm.

The idler hub is similar to the road wheel hub, except that the wheels are separated by spacers fitted onto the retaining bolts. This requires the hub to have a deeper mounting flange and longer locating dowels.

b. **Grease Filled Ram.** When grease is pumped in via the nipple and non-return valve, the ram pushes the adjusting arm towards the rear, tensioning the track.

The ram should be inspected for a leaking non-return valve, corroded ram piston or leaking seals.



1. **Pressure Release Screw**
2. **Grease Nipple**
3. **Non-Return Valve Ball**
4. **Spring**
5. **Stop**
6. **Seal Cap**
7. **Seal**
8. **Ram**
9. **Stop**
10. **Adjusting Arm**
11. **Stub Axle**
12. **Adjusting Arm Pivot**
13. **Track Adjuster Bracket**
14. **Trunnion Bearing Plate**
15. **Trunnion**
16. **Hull Side Plate**
17. **Distributor Seal**
18. **Plug**
19. **End Cap**
20. **Cylinder**
21. **Locknut**

Fig 7.10 Track Adjuster