WINGET

NEWAGE 250, 350 & 400 SERIES AXLE SERVICE MANUAL

WINGET LIMITED
PO BOX 41
EDGEFOLD INDUSTRIAL ESTATE
PLODDER LANE
BOLTON
LANCS BL4 OLS
U.K.
Tel:++44(0)1204 854650
Fax:++44(0)1204 854663
E-mail service@winget.co.uk
www.winget.co.uk

LIST OF CONTENTS

Introduction

Winget Limited gratefully acknowledge the assistance given by Newage Transmissions Limited in the preparation of this manual, however neither Winget Limited or Newage Transmissions can be held responsible for any errors or ommissions.

The procedures described within this manual should enable experienced service personel to strip, repair and re-build Newage 250, 350 & 400 series axles fitted to Winget Site Dumpers and Forklifts in a safe and competant manner. The procedures are not intended to be used by personnel who are unfamiliar with the product or mechanically inexperienced.

It is assumed that personnel are aware of the Health and Safety Regulations which should be applied but the following should act as a reminder.

Whenever possible any repairs or service should be carried out in a clean environment. If work must be carried out on site or in the field steps should be taken to ensure that dirt or foreign materials cannot enter the assembly.

Ensure all work tools are in good condition and only use the correct tool for the job in hand.

Always wear safety spectacles when using soft or hard faced hammers, chisels, drifts or when using air tools. Wear safety spectacles when cleaning components or when grinding.

Do not misuse air lines and be aware of the damage compressed air can cause if misused.

Always make sure lifting equipment is in good condition and the Safe Working Load exceeds the weight of the component to be lifted.

Always use suitable supports i.e. axle stands or baulks of timber in conjuction with hydraulic jacks etc. Never rely on hydraulic jacks alone to support a machine.

Be aware of hot surface temperatures and take care when draining hot oils. Always dispose of waste oils in accordance with local and national regulations.

Whenever possible always disconnect the battery or battery isolator when working on the machine to prevent electrical shorts and unauthorised starting.

Refer to the operators handbook for a guide to the correct sequence for assembling components and sub-assemblies.

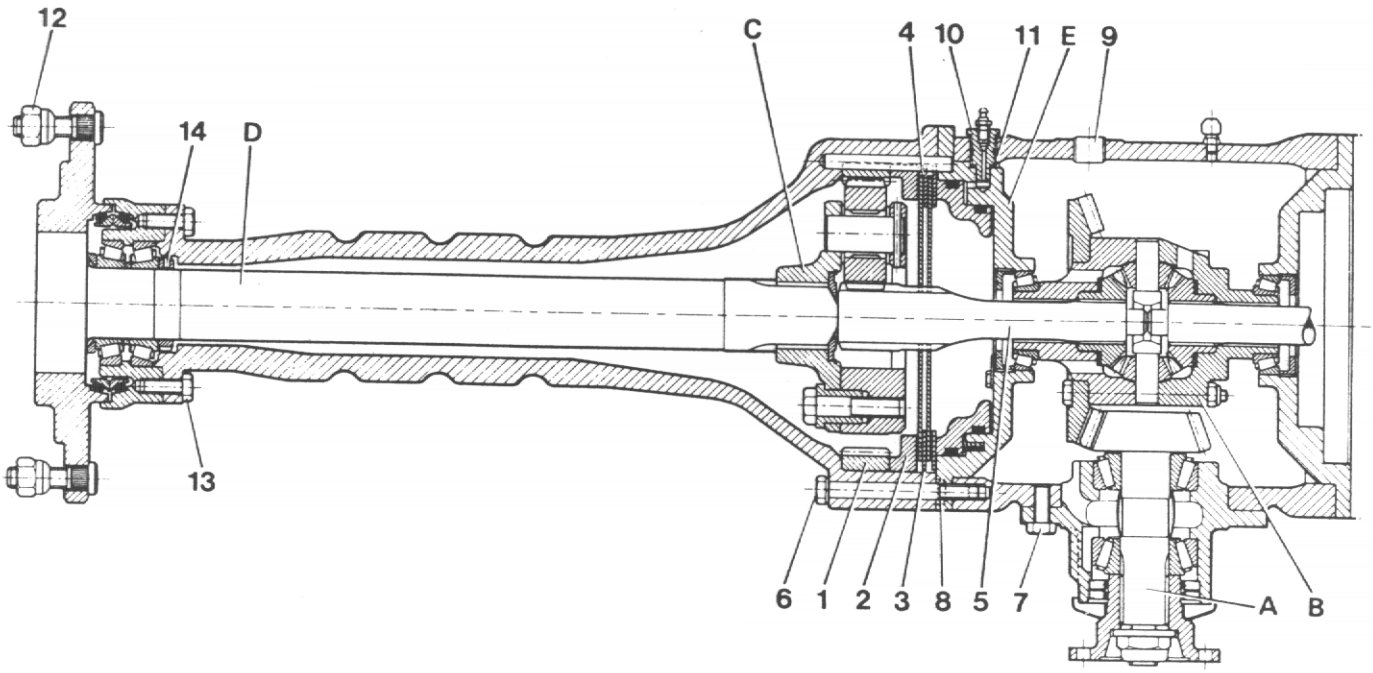
Oils, fuels, silicone sealer etc can cause skin diseases if allowed to contaminate the skin. Always apply barrier creams, wear suitable protective clothing or when contamination is unavoidable clean the area with soap and water as soon as possible. Do not use thinners or other solvents to clean skin.

Health and Safety is a matter of common sense. If common sense is applied correctly the risk of accidents can be reduced.

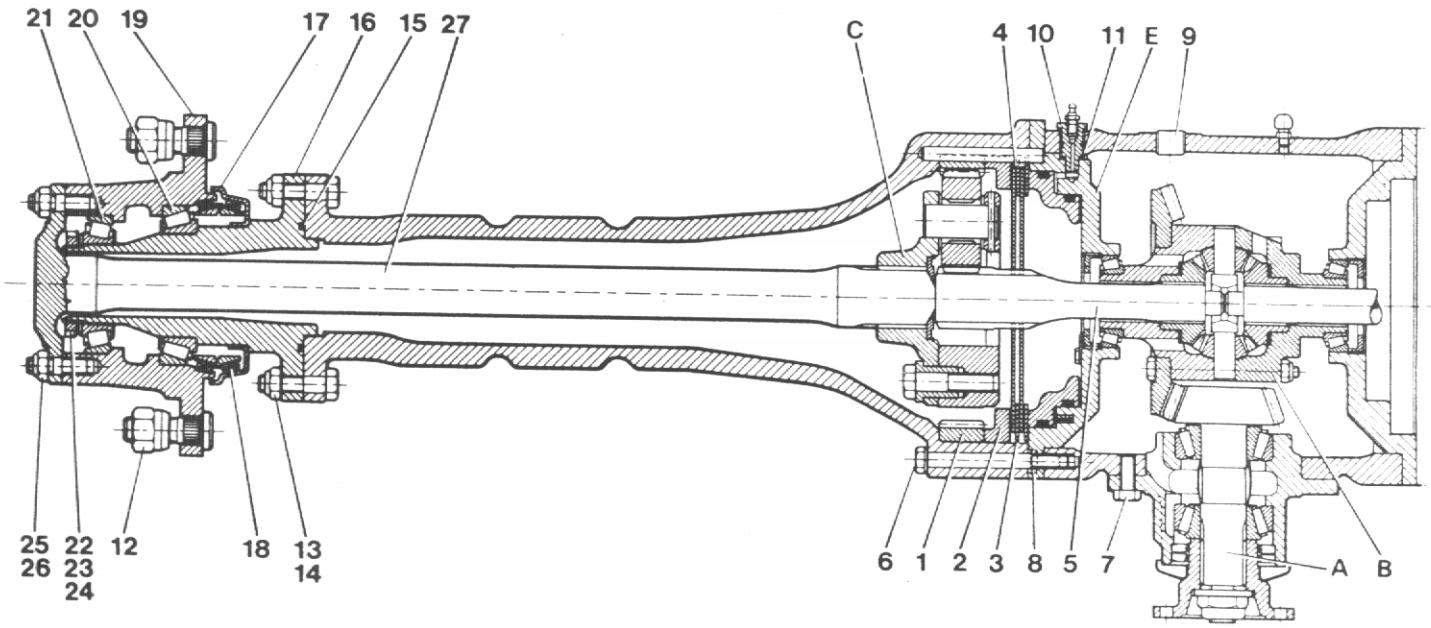
Spares for Newage Axles fitted to Winget Equipment can only be obtained from Winget Limited or one of our authorised distributors and not from Newage Transmissions Limited. Always quote your machines serial number and model together with axle serial number and model when ordering spare parts.

250, 350 & 400 Series axles are designed to operate under arduous conditions and providing they are regularly and correctly maintained they will provide long trouble free service.

Whilst every effort is made to ensure the contents of this manual are accurate Winget Limited and Newage Transmissions reserve the right to alter specification without prior notification and certain sections of this manual may then no longer apply.



TYPICAL AXLE 250 & 400 SERIES



TYPICAL AXLE 350 SERIES

FIG. A

DISMANTLING AND ASSEMBLING AXLE

Pinion Cartridge

(See Fig. A)

1. Remove drain plug (9) and drain axle oil, remove screws (7) and pull out cartridge (A), using easing screws if required.

(See Fig. B)

2. Remove nut (5) in coupling flange, (3) holding flange with special tool (AA). Remove flange and knock out pinion (2).

3. If front bearing is damaged or worn, remove cone and roller assembly by splitting cage and using a bearing puller to remove the cone.

4. If required, bearing cups (7) and oil seals (9) can be drifted out from the pinion cartridge.

   To re-assemble with new pinion, bearings, seals etc., the procedure is as follows:—

5. Press bearing cups and oil seals into cartridge.

6. Press front pinion bearing to pinion shaft.

7. Pack gap between seal lips ¾ way round with grease.

8. Assemble pinion to cartridge, push on spacer (8) and tail bearing drive flange, washer and nut. (Check drive flange, seal wear surface is free from damage.)

NOTE: If new bearings are fitted, a new collapsible spacer (8) must be fitted.

9. Tighten nut (5) holding coupling flange with special tool, until bearing spacer collapses 21 kpm (150 lb. ft. min.) and continue to tighten until all pinion end float is removed.

10. Turn nut until a drag is felt when turning the coupling flange and check the bearing preload using a piece of string wound round the flange and a spring balance (see Fig. C).

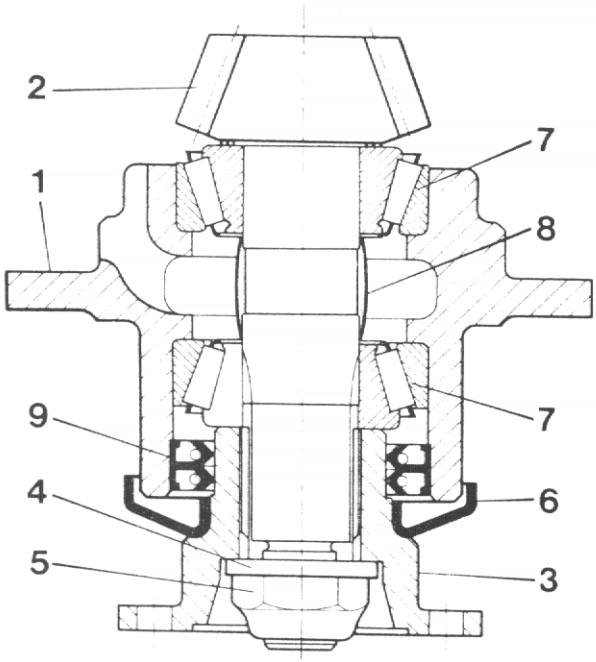


FIG. B

FIG. C

11. Pull the spring balance until the pinion turns smoothly and note the reading (should be 3.5—5.5 kg) for new bearings and (1.75—2.75 kg) for old bearings on the 250 Series and 350 Series axles, and 4.5 — 6.5 kg for old bearings on the 400 Series axle.

12. Gradually tighten nut and re-check until correct reading is obtained.

NOTE: Above preload figures should not be exceeded.

13. Assemble pinion cartridge to centre casing, applying sealer between shims, centre case flange and cartridge flange.

NOTE: Ensure cartridge oil slot is in correct position (see Fig. D).

14. Tighten screws holding cartridge to main case.

Crownwheel and Differential (Ref. B)
(See Fig.A)

1. Drain axle oil, remove screws (6) and pull off left hand axle arm assembly.
2. Remove brake feed and bleed adaptors (10).
3. Slacken screws (8) and remove brake cylinder (E) using easing screws if required.
4. Lift out crownwheel and differential assembly (B).
5. Slacken nuts (11) (See Fig. E), remove crownwheel and split differential unit.
6. Thrust washers (5) and (6) should be replaced if they show signs of damage or excessive wear.
7. Check all internal rubbing surfaces of diff. cases (1) for signs of wear.
8. Diff. bearing cone and roller assys. (9) can be pulled or drifted off diff. case halves.

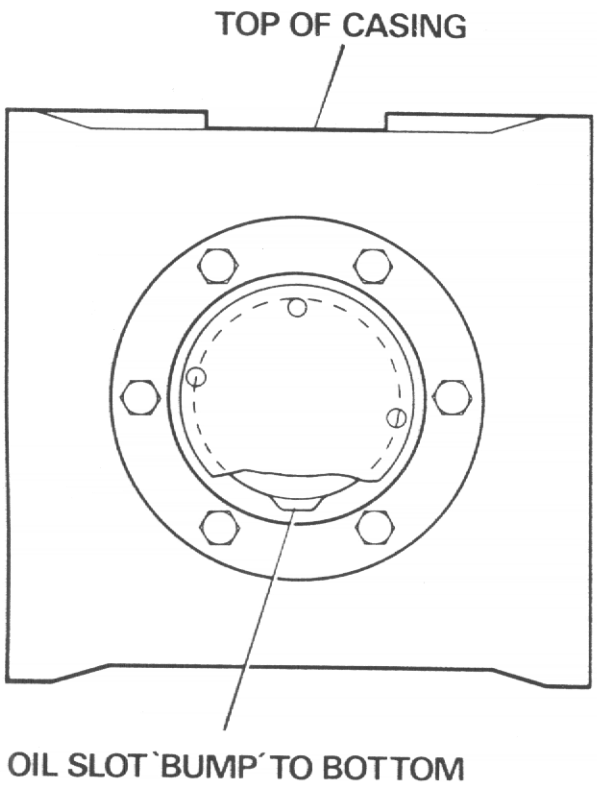


FIG. D

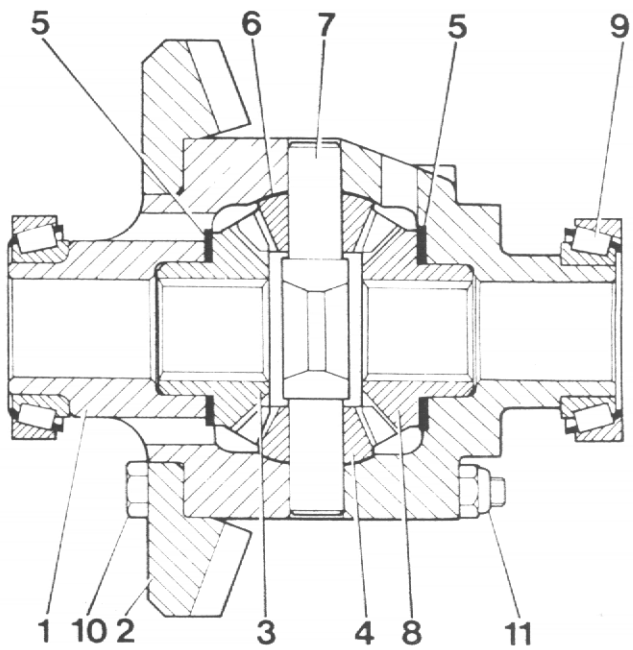


FIG. E

9. Re-assemble differential unit, ensuring that typed marks on diff. halves are aligned.
10. Assemble crownwheel, bolts (10) and torque up nuts (11).
11. Engage a sun gear (7) in a diff. gear and ensure that differential gears turn freely.
12. Press on new diff. bearings if required.
13. If diff. bearings are not replaced, then the diff. can be put back in the centre case and the brake cylinder replaced, without adjusting the bearing nuts (6). (See Fig. F)

14. If the diff. bearings are replaced, then it will be necessary to reset the crownwheel backlash and the bearing preload. (See Crownwheel and Pinion Set Up.)

15. Brake cylinder, centre case and axle arm flange faces should be cleaned, oil sealer scraped off and new sealer applied prior to re-assembly.

16. Replace brake cylinder and axle arm assembly, all screws and bolts being tightened to the correct torque.

Setting up Crownwheel and Pinion

1. Assemble pinion cartridge as described previously.

2. Assemble crownwheel and diff. assembly as described.

3. Assemble and seal one cylinder to main casing using screw (8) (See Fig.A). Push in diff. bearing cup and screw in lock ring (6) (See Fig. F).

4. Stand centre case on cylinder end and lower in diff. assembly, locating the diff. bearing halves together and ensuring that crownwheel and pinion are in mesh.

5. Seal and fit other brake cylinder and assemble bearing cup and lock ring.

6. Tighten lock ring until bearing end float is removed.

7. On pinion cartridge use a depth gauge to measure dimension 'X' from front face of pinion to cartridge flange (see Fig.G).

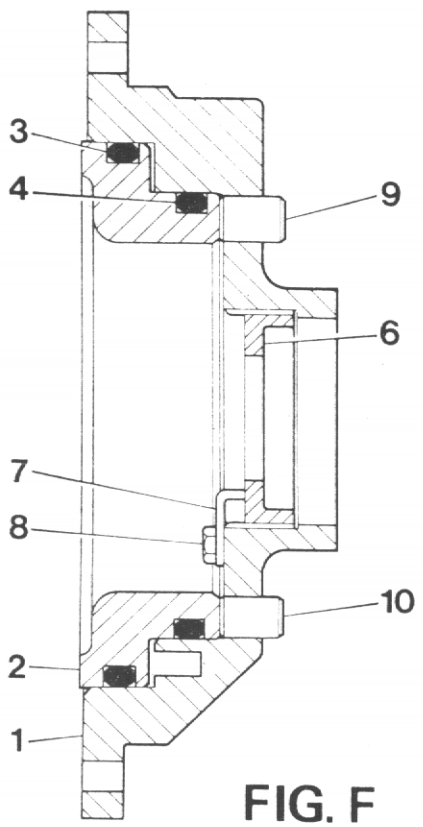


FIG. F

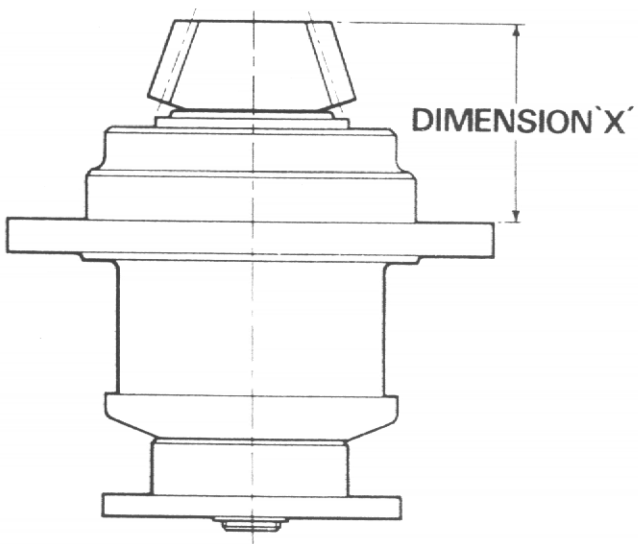


FIG. G

8. On centre case use a depth gauge to measure dimension 'Y' from pinion cartridge flange surface to ground diameter on differential casing (see Fig. H).

9. Read pinion mounting distance (M.D.) from front face of pinion. Pinion head thickness = (see front face of pinion), diff. case ground diameter = 129.50 mm.on the 400 series and 108.76 mm. on the 250 series and 108.76mm on the 350 Series. Calculate as follows:

$$\left(\text{M.D.} - \text{Head thickness} - \frac{\text{Diff. case dia.}}{2}\right) = \text{'A'}$$

('Y' – 'X') = 'B'

('A' – 'B') = Shim thickness to be placed between pinion cartridge flange and centre case flange.

10. Select shims, place on pinion cartridge and assemble cartridge to centre casing.

NOTE: It is required to know the spring balance reading required to turn pinion in its bearings, as described previously.

11. Adjust diff. bearing lock rings to give correct backlash between crownwheel and pinion. (See Page 12)

This can be measured by using a dial gauge with its pointer in a coupling flange hole (see Fig. J).

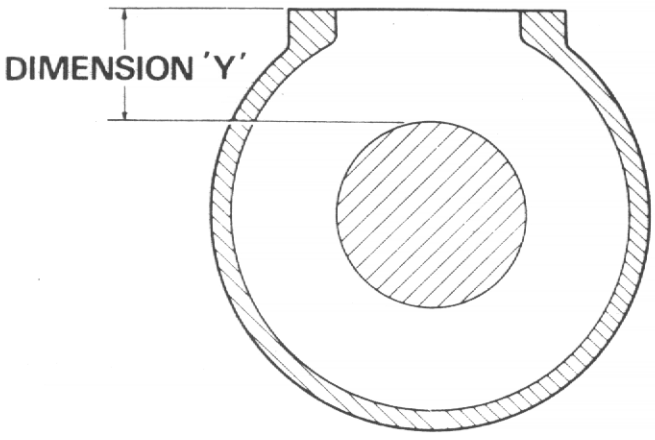


FIG. H

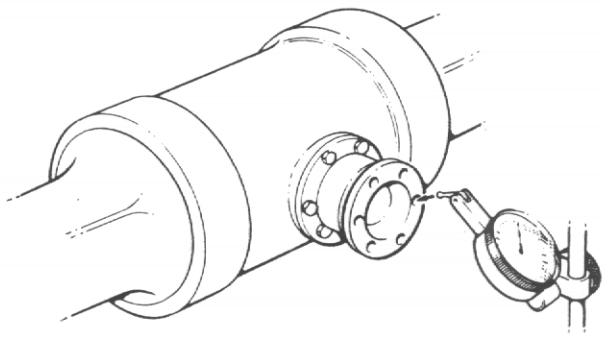


FIG. J

12. Tighten lock rings equally at each end of the differential to preload the bearings. The preload can be checked by turning the pinion coupling flange by means of string and spring balance as previously described. (Check that backlash is maintained.)

13. The additional spring balance load for the diff. bearings is shown.

14. Slacken and remove screws holding pinion cartridge in place and pull out cartridge. Brush on some paint, Engineers Blue etc. to a few crownwheel teeth and replace the pinion cartridge.

15. Turn the coupling flange a few turns in both directions then slacken screws and lift out.

16. Examine the contact on both sides of the crownwheel teeth and check that it is similar to that shown in fig. S and is similar to original factory marking shown on teeth.

17. If marking is satisfactory, replace pinion cartridge with sealer on flange surfaces and torque up screws.

(See Fig. F)

18. Put lock tabs (7) in place in cylinders and tighten screws (8). (Ensure that screws have locking compound applied.)

19. Bend over locking tabs into slots in lock rings (6).

Planetary Gears (Ref. C)

1. Drain axle oil and remove axle arm as explained previously.

(See Fig. A)

2. Lift out sun shaft (5), brake plates (2, 3 & 4) and planetary assembly.

(See Fig. K)

3. Check planet gear (3) end float using feelers. (Should not be greater than 2mm.)

4. Remove lock wire where used, slacken bolts (7) and tap bolt heads to split planetary assembly.

5. Lift off planet gears (3), thrust washers (5) and needle bearings (9).

6. Inspect all parts for wear or damage and replace if required.

7. If planet pins (4) are worn, remove by drifting out spring pin (10), and push planet pin from hole in planet carrier (1).

NOTE: On re-assembly, tap in spring pin until flush with outside of planet carrier and peen over edge of hole.

8. To assemble, place gears, washers, bearings etc. on planet pins and locate carrier drive flange (2) on planet pins and push both halves together.

9. Push dowels (6) home, tighten bolts and fit lock wire if required.

(See Fig. A)

10. If annulus (1) shows signs of wear, remove using puller (BB) and fit new part. (Ensure that new annulus is fully home in its location bore.)

11. Check axle shaft (1) (see Figs. L & N), splines for wear or damage and if satisfactory, locate planetary on splines.

12. Re-assemble sun shaft, brake plates, etc. clean axle arm and brake cylinder flange faces, re-seal and assemble axle arm as previously described.

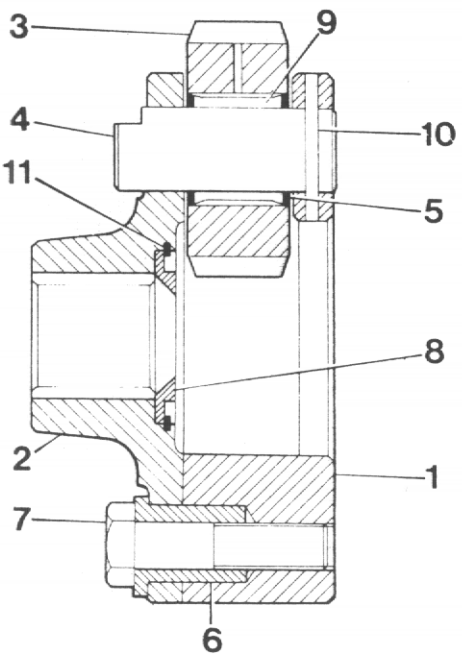


FIG. K

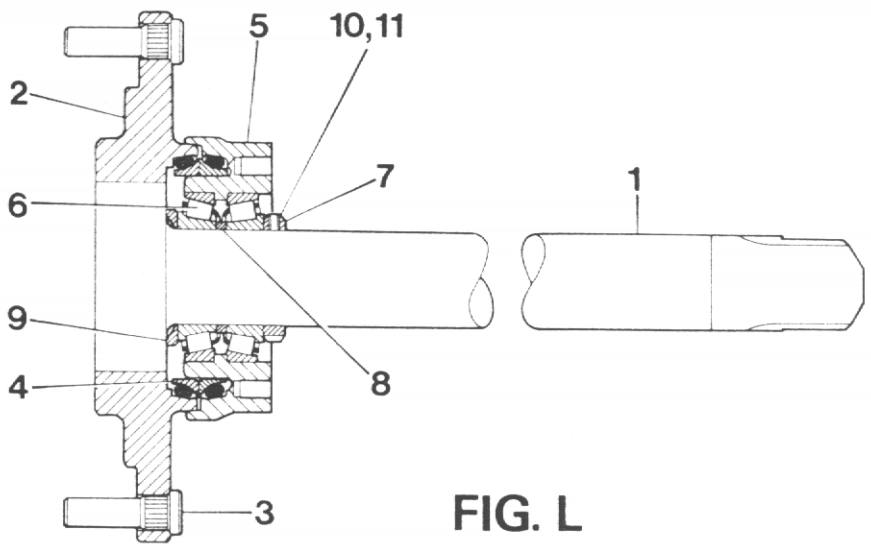


FIG. L

Brakes

1. The dismantling procedure is the same as for the planetary gears.

2. When the sintered plates and the fixed plates are removed from the axle arm, examine both for excess wear. The thickness of the sintered plate should not be less than 4mm. The thickness of the fixed plate should not be less than 2mm.

3. To check the piston/cylinder assembly it is not essential to remove the cylinder from the centre case, but if required, remove brake feed and bleed fittings (10), screws, (8) (see Fig. A) and lift out cylinder from centre case using easing screws if required.

(See Fig. F)

4. Pull the piston (2) from the cylinder and examine the seals (3 & 4) and cylinder walls for signs of damage.

5. When refitting the piston to the cylinder ensure that the 3 springs (5) are in place in their holes in the rear of the cylinder.

6. Clean and seal cylinder and centre case flange surfaces and bolt cylinder in place with screws (8). (See Fig. A)

7. Examine brake plate splines for damage before assembling to sun shaft.

NOTE: When plates are assembled to sun shaft, ensure that holes line up to ensure an oil passage through the plates.

8. Assemble all brake plates and axle arm as previously described.

9. Re-fit, brake bleed and feed adaptors (10) if removed, ensuring that sealing washer (11) is properly located. (See Fig. A)

IMPORTANT NOTE

The axle utilises a hydraulic braking system and 2 different types of hydraulic fluid are used.

1. A conventional synthetic brake fluid system; (fluid to SAE J1703) the fluid is contained in a conventional master cylinder reservoir.
(Note: Piston/cylinder seals 3 & 4 (See Fig. F) will be blue in colour).
2. A mineral brake fluid system; the fluid is contained in the vehicle hydraulic tank.
(Note: Piston/cylinder seals 3 & 4 (See Fig. F) will be black in colour).

For the conventional brake fluid system, the following note applies;

IMPORTANT
It is essential that all cylinder bores, pistons, and seals, are kept clean and free from all lubricating oils. The seals can be lightly coated with brake fluid to SAE J1703 prior to assembly.

For the mineral fluid system, the following note applies;

IMPORTANT
It is essential that all cylinder bores, pistons, and seals are kept clean prior to assembly. They may be coated with one of the MINERAL hydraulic oils listed. They MUST NOT be coated with standard "vegetable" based fluid (SAE J1703).

Axle Shaft Assembly (400 series axle)
(See Fig. A)
1. Slacken and remove screws (13) holding assembly to axle arm.

2. Tap rear of wheel flange to remove shaft assembly from axle arm.

(See Fig. L)
3. Slacken screw (11) in shaft locking ring (7) and unscrew locking ring using special tool (CC).

4. Tap seal housing (5) to remove from axle shaft.

5. Inspect bearings, oil seals and shaft for signs of wear or damage.

6. If a new oil seal is required, it is advisable to fit using the special tool (DD). (See Fig. M)

7. If new shaft bearings are required, they are supplied complete with the shaft spacer and are preset to give the correct running adjustment. Remove the old bearing cups (6) from the oil seal housing and fit new parts. Assemble the oil seal halves to the wheel flange and the oil seal housing.

8. Assemble the bearing/seal housing assembly to the axle shaft and tighten the locking ring behind the bearings.

9. Tighten the screw (11), compressing the nylon insert (10) onto the threaded part of the shaft.

10. Clean the rear surface of the oil seal housing and the axle arm flange surface. Reseal, fit the shaft assembly to the axle arm and tighten screws (13). (See Fig. A)

Axle Shaft Assembly (250 series axle)
(See Fig. A)
1. Slacken and remove screws (13) holding assembly to axle arm.

2 Tap rear of wheel flange to remove shaft assembly from axle arm.

(See Fig. N)

3. Slacken screw (15) in shaft locking ring (7) and unscrew locking ring using special tool CC.

4. Tap seal housing (5) to remove from axle shaft.

5. Inspect bearings, oil seals and shaft for signs of wear or damage.

6. If a new oil seal is required, it is advisable to fit using the special tool DD (see Fig. M).

7. A single unitised taper roller bearing is used and if a new unit is required, then it is necessary to adjust shims (10 to 13) to provide the correct clamping load on the bearing. The procedure is as follows:—

   a) Remove old bearing from oil seal housing and fit new unit.
   b) On small end of axle arm, use a vernier depth gauge to measure from the end of the spigot location on the flange (see Fig. P). Let this dimension be 'X'.
   c) Measure the depth inside the oil seal housing, from the mating face with the axle arm to the end of the bearing outer race. Let this dimension be 'Y'. (See Fig. R)
   d) The amount of shims to go adjacent to the bearing = ('Y' – 'X') + 0.075 mm (0.003").
   e) Insert the necessary shims in the oil seal housing.

(See Fig. N)

8. Assemble the oil seal housing to the shaft (1) and tighten the locking ring (7).

9. Tighten the screw (15), compressing the nylon insert (14) onto the threaded part of the shaft.

10. Clean the rear surface of the oil seal housing and the axle arm flange surface. Reseal, fit the shaft assembly to the axle arm and tighten screws (13). (See Fig. A)

Stub Axle and Wheel Hub

1. To remove the complete assembly from the axle arm, remove nuts and bolts (13, 14) and pull out straight until the axle shaft disengages on its splines (27).

2. The assembly is the reverse of the above, the axle shaft splines being engaged first. Care should be taken to ensure that the 'O' ring (15) does not fall from its groove in the stub axle.

3. If it is only required to remove the hub (19) from the stub axle, first slacken nuts (26) and remove axle shaft using easing screws if required.

4. Release tab washer (24) slacken lock ring (23) using special tool (EE). Remove the lock ring, tab washer and tongued washer (22).
   Note: A new tab washer (24) must be fitted each time the assembly is dismantled.

5. Pull the hub assembly from the stub axle, tapping the rear of the wheel flange with a mallet if required.

6. The hub bearing cone and roller assemblies and cups can now be examined for wear or damage (20, 21). So also can 2 halves of the oil seal (18).
   Note: If the rubbing faces of the metal oil seal halves are damaged or scored, then the seal must be replaced.

7. The hub bearing can be drifted out if required.

8. Inspect the bearing journals on the stub axle (16) for signs of wear or damage.

9. To fit new oil seal halves to the hub and oil seal housing (17) the use of special tool (DD). is recommended (See illustration). Coat the rubbing faces of the seal with axle oil prior to assembly.

10. To reassemble the hub, to the stub axle, push the hub, bearings and seal assembly along the stub axle, against the bearing shoulders.

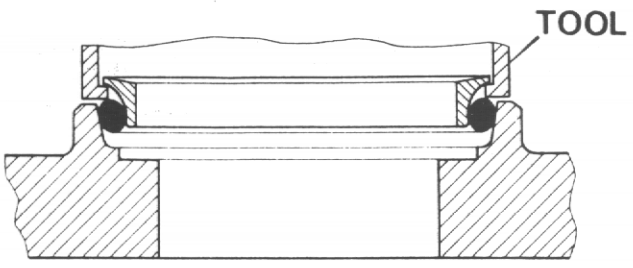
11. Assemble lock ring, tab washer and tongued washer and tighten lock ring to a torque of 14 kpm (100 lbf). Back the nut off an amount equal to the width of 2 tabs on the washer, and bend over a tab into a slot in the lock ring. Ensure that the hub will turn freely on its bearings.

12. Examine the axle shaft splines for damage, clean the flange face of old sealer and also the mating hub face, and then assemble the shaft to the hub.

13. Tighten nuts (26).

14. If the oil seal housing (17) becomes damaged, it is necessary to first remove the wheel hub. The unit can then be drifted from its seating on the stub axle.

15. To fit a new unit, the seating on the stub axle should first be cleaned and new "Loctite" grade 275 applied to the stub axle and seal housing surfaces. The housing can then be pressed or drifted into place.



TOOL DD

FIG. M

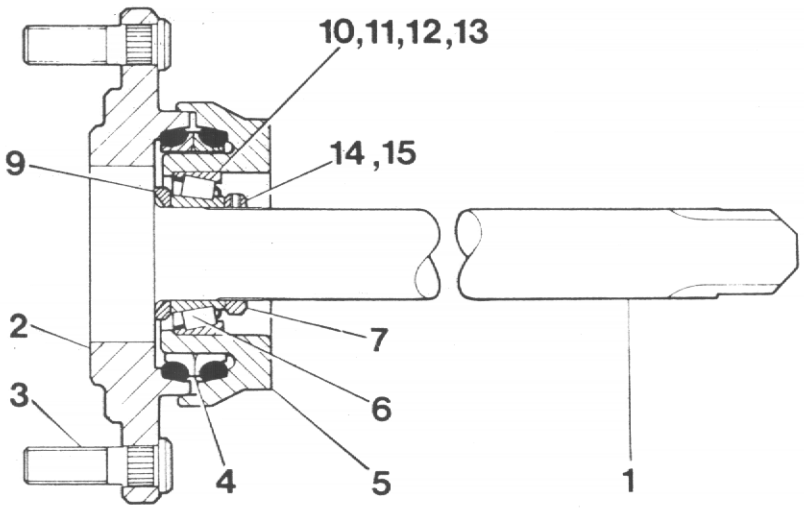


FIG. N

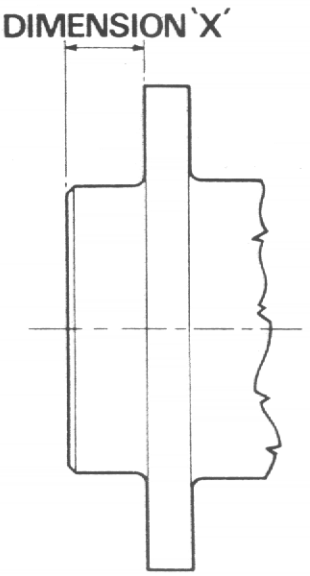


FIG. P

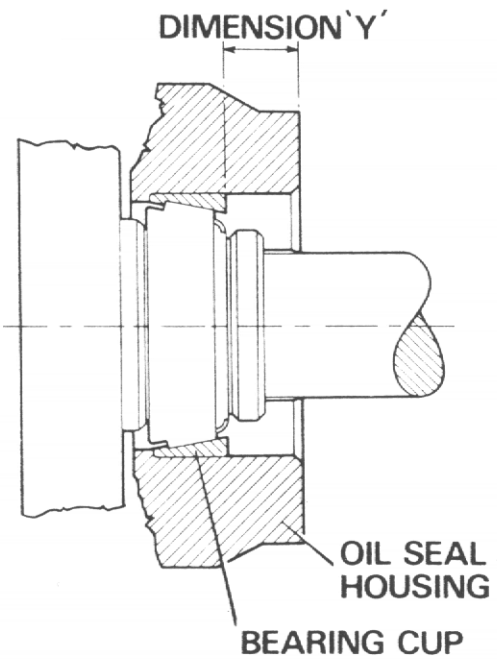


FIG. R

Surfaces to be Sealed with Liquid Sealant
Use "Loctite Plastic Gasket" Grade 275
"Avdelbond" Grade 120/121 OR Similar

1. Pinion cartridge flange to main casing.
2. Brake cylinder flanges to main casing.
3. Axle arm to brake cylinder.
4. Oil seal housing to axle arm flange.
5. Cover plate to top of main casing.

Apply a thin film of sealant to one of the surfaces, having first cleaned the surfaces concerned. Assemble the parts and tighten fasteners.
Having dismantled an assembly, scrape old sealant off the surfaces, clean and apply fresh solution.

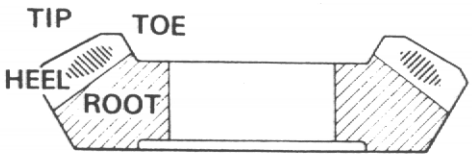
SPIRAL BEVEL GEAR TOOTH CONTACTS

CROWN WHEEL

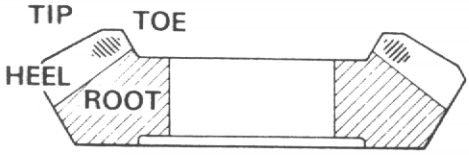
CONVEX FLANK & CONCAVE FLANK

Contact may vary, but generally is approx, in the tooth centre, equispaced between root and tip. The marking may be towards toe on some gears on both flanks, or marking crossed slightly i.e. towards toe on convex flank and heel on concave flank or vice versa.

If, compared to the factory tooth contact, the contact appears as shown below, then corrective action should be taken as follows:

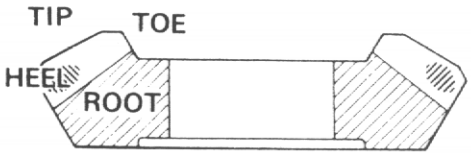


1 **CONVEX FLANK**
Contact further to toe and tip than factory marking.

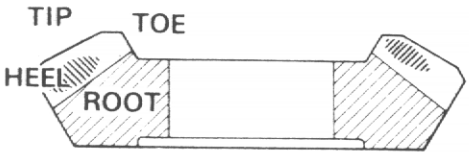


CONCAVE FLANK
Contact further to heel and tip than factory marking.

ERROR: Pinion too far out of mesh, recheck and decrease shims below pinion cartridge flange.



2 **CONVEX FLANK**
Contact further to heel and root than factory marking.



CONCAVE FLANK
Contact further to toe and root than factory marking.

ERROR: Pinion too far into mesh, recheck and increase shims below pinion cartridge flange.

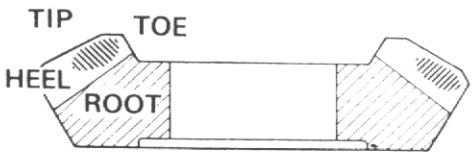


FIG.S

ADDITIONAL LOAD ON SPRING BALANCE FOR DIFFERENTIAL BEARING PRELOAD WHEN CROWN WHEEL & PINION ARE IN MESH.

400 Series.

No. Teeth Pinion	No. Teeth Wheel	Additional Spring Balance Pull (Kg)	
		New Brgs.	Used Brgs.
11	31	2.75–3.25	1.4–1.8
11	29	3.0 –3.4	1.4–1.8
18	33	4.0 –5.0	2.0–2.5

250 and 350 Series

No. Teeth Pinion	No. Teeth Wheel	Bolt Circle Dia. Coupling Flange (mm)	Additional Spring Balance Pull (Kg) New Brgs.	Used Brgs.
11	29	95	3.8–5.2	2.0–2.7
17	29	95	5.9–8.0	3.0–4.1
11	29	80	4.1–5.7	2.0–3.0
17	29	80	6.6–8.8	3.2–4.3

TORQUE SETTINGS FOR ALL FASTENERS (SERIES 250 & 350

Fastener Ref. No. Fig. A.	*Description*	*Tightening Torque* Kpm. (lb. ft.)	
(Diff. Assy.)	M10 Bolt + Nut	5.6	(40)
(Planetary Assy.)	M12 Bolt	10	(72)
(Brake Cyl. Assy.)	M12 Cap Screw	10	(72)
6	Axle Arm—Main Case Bolts	5.6	(40)
7	Pinion Cart.—Main Casing Screws	5.6	(40)
8	Brake Cyl.—Main Case Screws	5.6	(40)
10	Brake Pipe Adaptor—Brake Cyl.	2.7	(20)
12	Wheel Nut (18 mm)	28	(200)
	Wheel Nut ($\frac{7}{8}$" BSF)	42	(300)
13	Axle Arm—Oil Seal Housing (250 only)	5.6	(40)
14	Axle Shaft Locking Ring (250 only)		(350)

TORQUE SETTINGS FOR ALL FASTENERS (SERIES 400)

Fastener Ref. No. Fig. A.	*Description*	*Tightening Torque* Kpm. (lb. ft.)	
(Diff. Assy.)	M10 Bolt + Nut	5.6	(40)
(Planetary Assy.)	M16 Bolt	25	(180)
(Brake Cyl. Assy.)	M12 Cap Screw	10	(72)
6	Axle Arm—Main Case Bolts	10	(72)
7	Pinion Cart.—Main Casing Screws	10	(72)
8	Brake Cyl.—Main Case Screws	10	(72)
10	Brake Pipe Adaptor—Brake Cyl.	2.7	(20)
12	Wheel Nut (18 mm)	28	(200)
	Wheel Nut ($\frac{7}{8}$" BSF)	42	(300)
13	Axle Arm—Oil Seal Housing	10	(72)
14	Axle Shaft Locking Ring	62	(450)

LIST OF BACKLASH FIGURES FOR DIFFERENT RATIOS ETC.

400 Series

No. Teeth Pinion	Backlash Measured via Hole in Flange (mm)
11	0.31–0.39
18	0.21–0.26

250 and 350 Series

No. Teeth Pinion	Bolt Circle Dia. on Flange	Backlash Measured via Hole in Flange (mm)
11	95	0.27–0.36
17	95	0.17–0.23
11	80	0.22–0.30
17	80	0.14–0.19