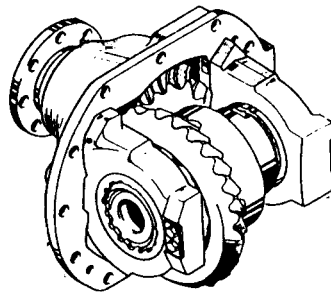




Axles

MAINTENANCE MANUAL

DP-265 Drive Gears



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NOTE ! This Manual is intended for use by experienced mechanics using safe procedures in properly equipped shops. Safety precautions should always be followed such as wearing safety glasses, using adequate lifting aids, and using tools and equipment in good condition. Sisu Axles, Inc., its agents, associates or representatives are not responsible for damage or injury occurring while working on their components.

1 DESIGN AND FUNCTION

1.1 DP265 DRIVE GEAR DESIGN

The axle primary gearing is composed of a pair of bevel wheels located among the drive gear between the axles.

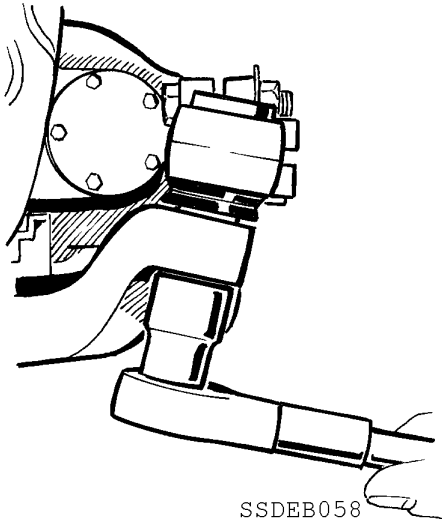
This drive gear is used in following axles:

- FSDP-09/10
- SSDP-10
- FRDP-10/12
- SRDP-14

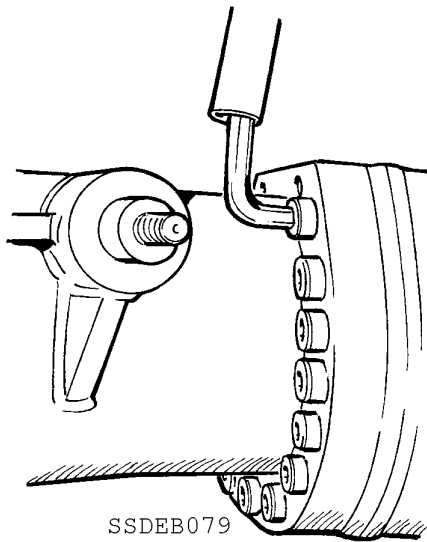
1.2 REMOVAL OF THE DRIVE GEAR UNIT

Supporting the vehicle with a trestle at the springs, raise the wheels off the ground. Unfasten the wheels. Let the oil drain out of the drive gear through the oil plug.

1. Unfasten the tie rod from the track arm. Unfasten the propeller shaft from the coupling flange.

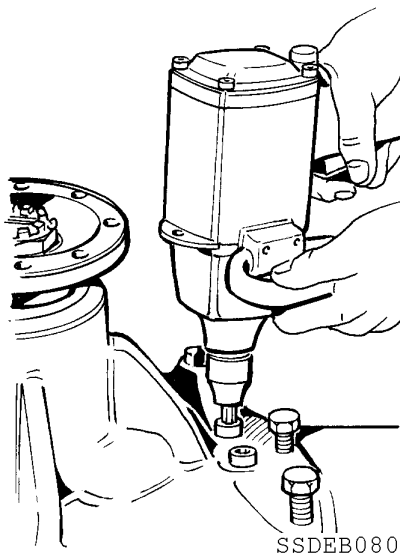


Picture 1



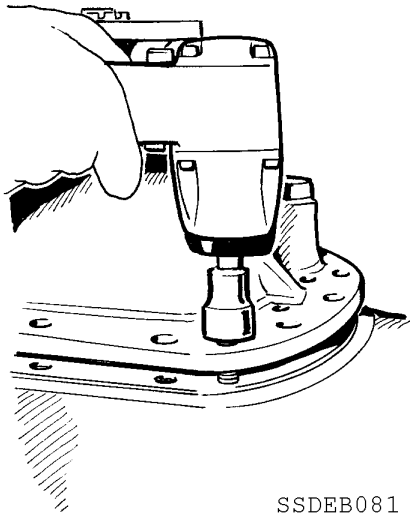
2. Unfasten the Allen bolts from the end of the axle housing and pull the swivel heads and hubs out about 200 mm.

Picture 2



3. Unfasten the drive gear housing anchor screws.

Picture 3

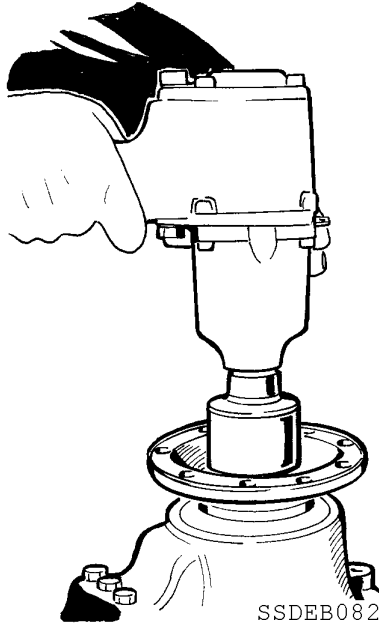


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4. Unfasten the drive gear from the axle housing by turning the extractor bolts (M16) in the threads located in the housing (closed with a plastic plug).

Picture 4

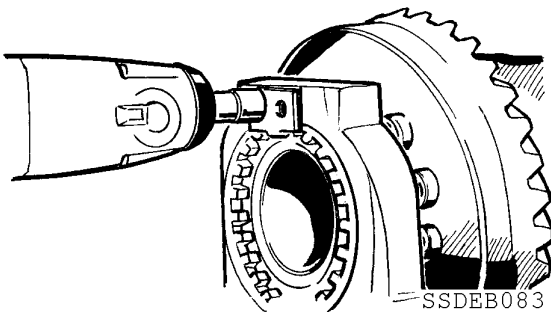
1.3 DISASSEMBLY OF THE DRIVE GEAR UNIT



Picture 5

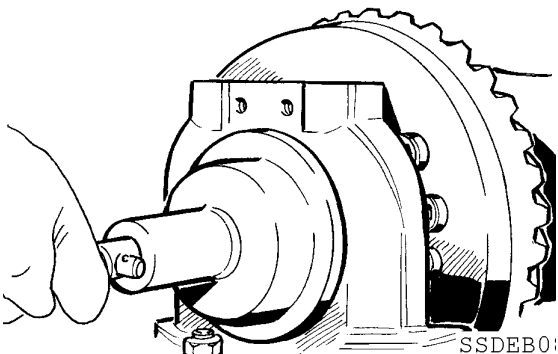
Fix the drive gear to a trestle.

1. Unfasten the coupling flange nut cotter pin and open the nut.



Picture 6

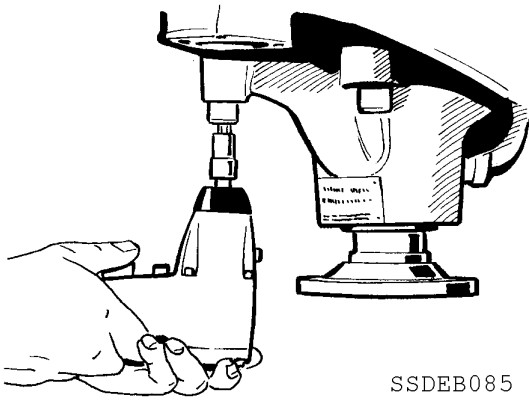
2. Unfasten the crown wheel bearings' lock washers.



Picture 7

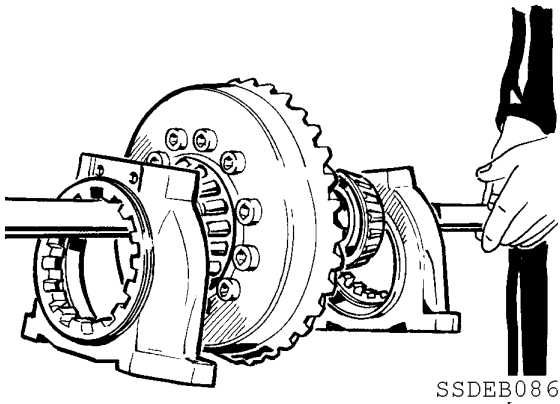
3. Using suitable drift and a hammer or special tool no. 7141-014-030, loosen the other crown wheel bearing by 3-4 cogs.

4. Unfasten the bearing housing anchor screws.



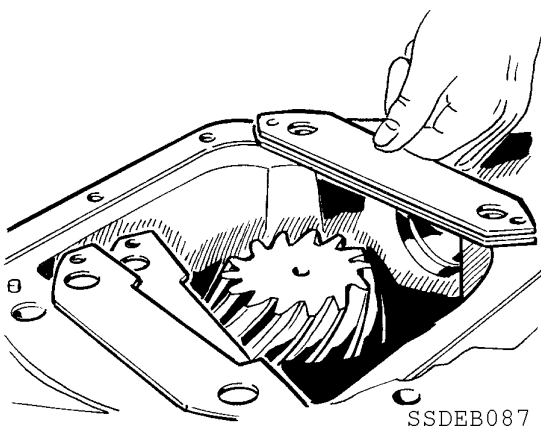
Picture 8

5. Lift the drive gear up and out of its casing.

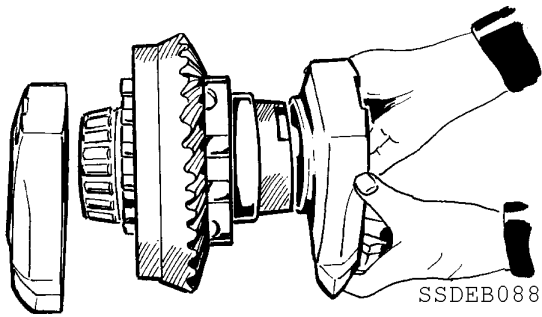


Picture 9

6. Unfasten the shim plates from the casing.
Note! When reassembling, use the same shim plates (clean the plates and put them aside for use).

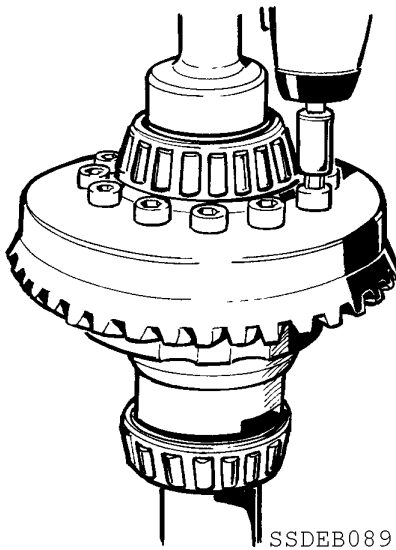


Picture 10



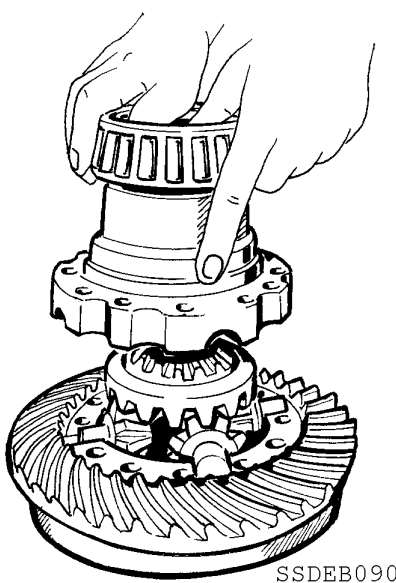
Picture 11

7. Unfasten the crown wheel bearing housing.



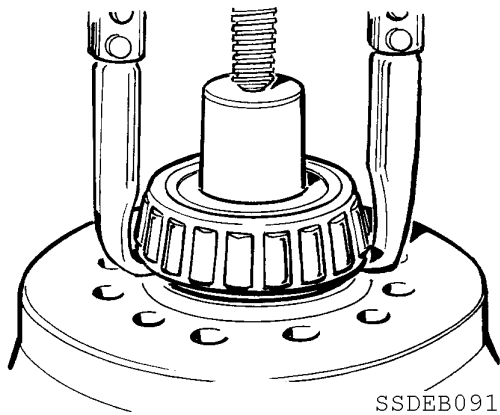
Picture 12

8. Attach the drive gear to the clamp, using suitable sleeves. Unfasten the crown wheel anchor screws.



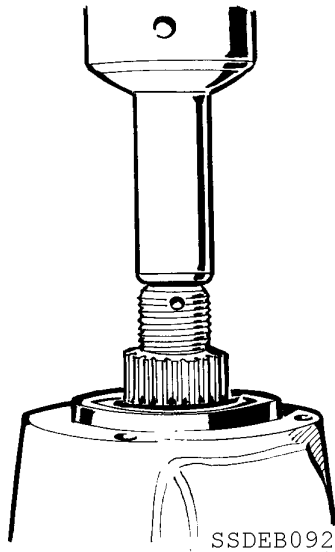
Picture 13

9. Split the differential gear housing.



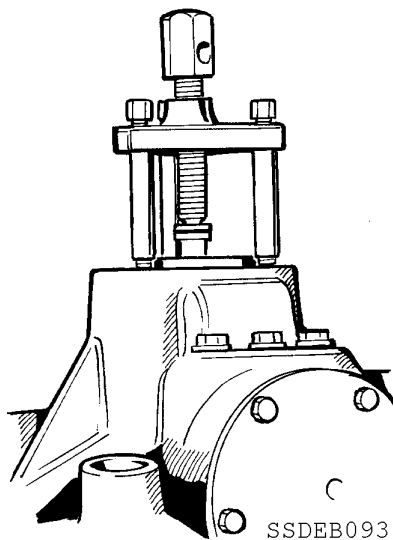
10. Unfasten the bearings from the halves of the differential gear housing, e.g. with a special extractor. Unfasten the crown wheel by compression.

Picture 14



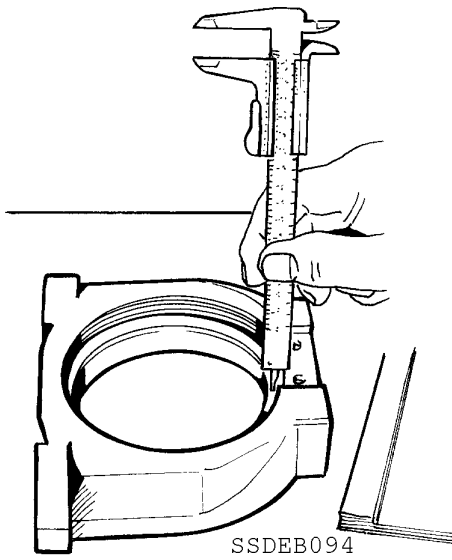
11. Unfasten the drive pinion by pressing. Make certain that the pinion is not damaged when it comes off. Remove the sleeve and spacers.

Picture 15



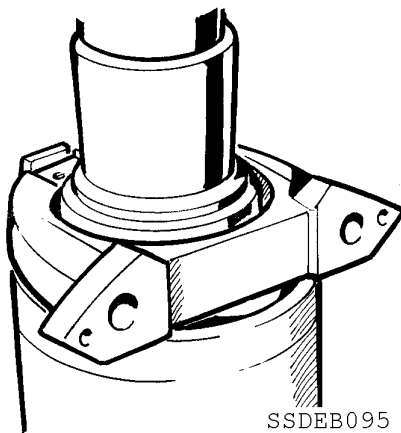
12. Unfasten the oil seal casing with an extractor. Press the outer races of the drive pinion bearings out of the casing.

Picture 16



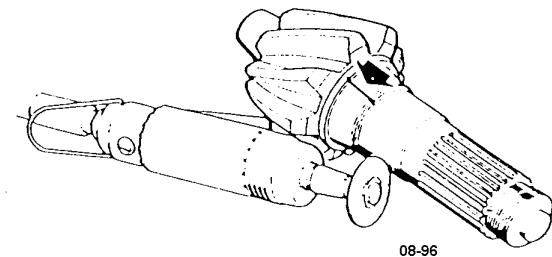
Picture 17

13. Measure the distance of the crown wheel bearings from the surface of the casing. Write down the measurement.



Picture 18

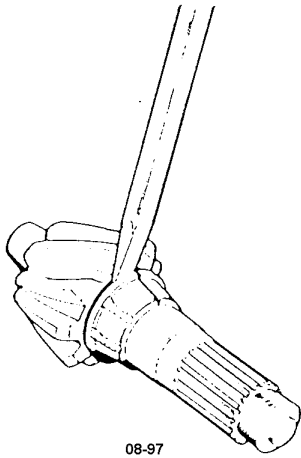
14. Press the bearing race out of the housing.



Picture 19

15. Remove the drive pinion bearing as follows: Split the bearing inner race with a cutting wheel.
16. Unfasten the bearing inner race and rollers.
17. Use the cutting wheel to make a groove in the surface of the bearing's inner race.

18. Split the bearing, either by striking it with a chisel or by welding a few nodes in the surface of the bearing, cooling it now and then with a damp cloth.



08-97

Picture 20

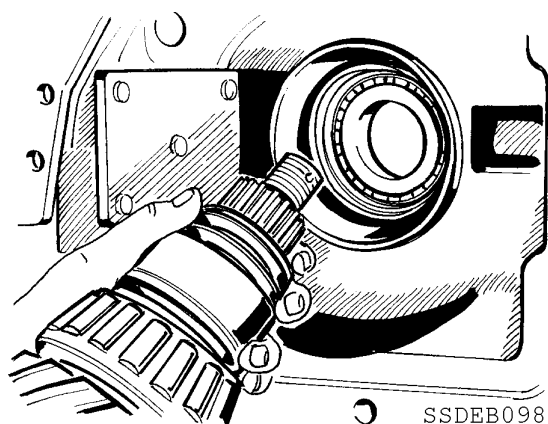
1.4 DRIVE PINION - ASSEMBLY

Table 1: Shims

Spare No.	SHIMS SPACERS Thickness/ mm
999 515 1066	0,30
999 515 1067	0,40
999 515 10668	0,50

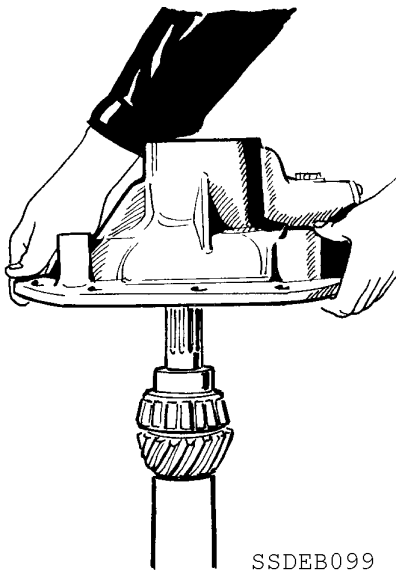
Table 2: Spacers

Spare No.	Length / mm
143 261 0111	31,20
143 261 0112	31,22
143 261 0113	31,24
143 261 0114	31,26
143 261 0115	31,28



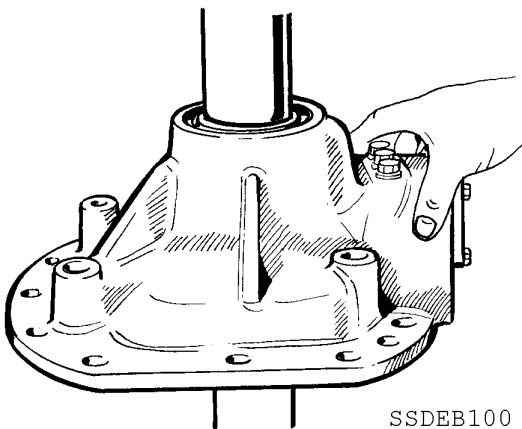
1. Press the drive pinion bearing into place. Press the outer races of the bearings into place in the drive gear housing.
2. Fit the spacer and shims on the drive pinion axle.

Picture 21



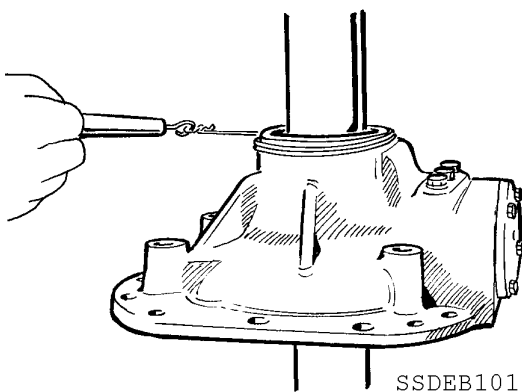
Picture 22

3. Set the drive pinion on top of a suitable counterpart (not a special tool) in a press. Fit the drive gear casing on the axle.



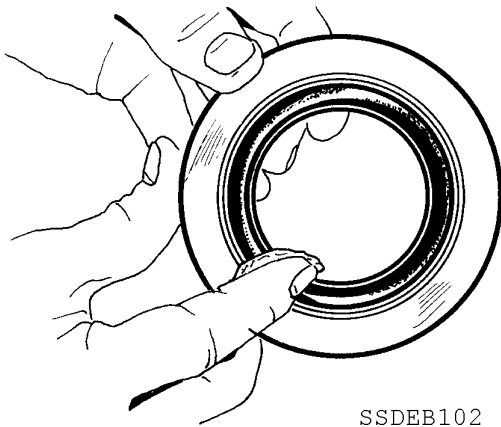
Picture 23

4. Fit the drive pinion axle bearing by compressing (special tool 7144-204-3200) turning the casing round at the same time. If it turns with difficulty, unfasten the drive pinion and fit more shim plates.



Picture 24

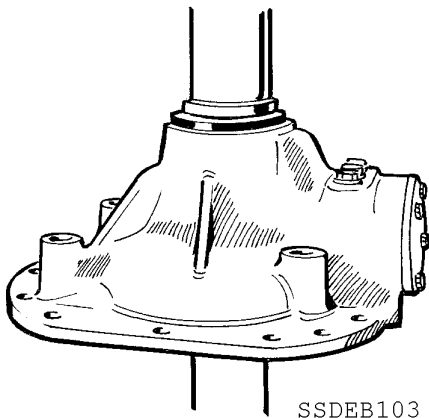
5. Compress the bearings, using a force of 160 kN, and measure the power required to turn the housing with a spring balance. The bearing clearance is OK when the power required is 65.....85 N. If necessary, adjust the clearance by changing the shim plates or sleeve.
6. If there is no press available, fit the coupling flange without gaskets and tighten the nut with 1200 Nm torque for taking resistance measurements.



SSDEB102

7. Fit a new gasket in the gasket housing and lubricate it carefully with grease. Put sealing compound around the housing.

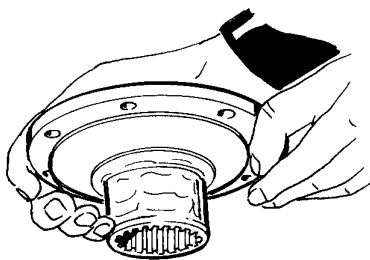
Picture 25



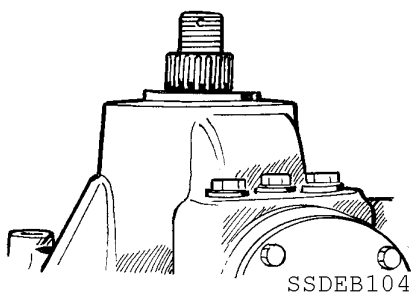
SSDEB103

8. Press the gasket housing into place.

Picture 26

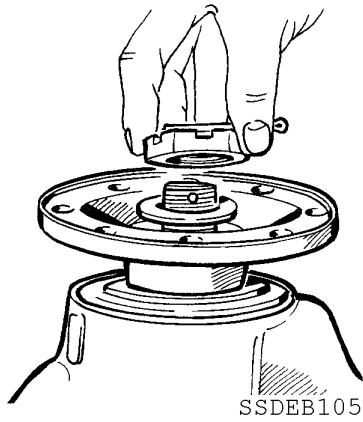


9. Lubricate the seals of the coupling flange with grease and fit the flange. Use a press if necessary.



SSDEB104

Picture 27



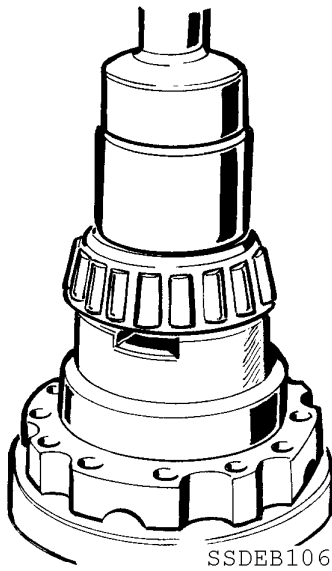
10. Fit the washer and tighten the nut with 1200 Nm torque. Secure with a cotter pin.

Picture 28

1.5 ASSEMBLY

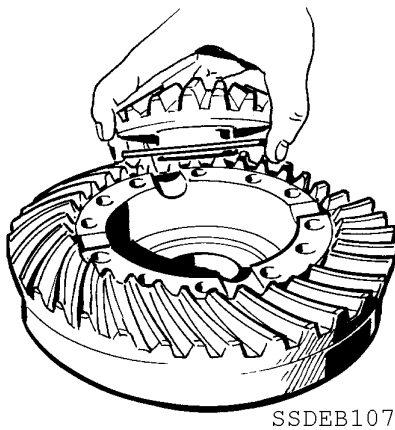
Before assembly, clean and check the parts carefully.

1. Press the bearings into the halves of the differential gear housing.



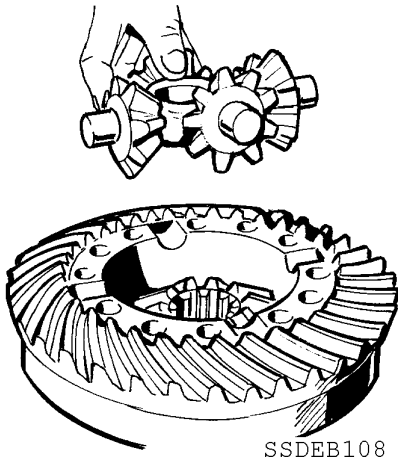
Picture 29

2. Begin the assembly of the differential gear with the half that has internal cogs (on the crown wheel side). Lubricate and fit the thrust washer. Fit the gear wheel.



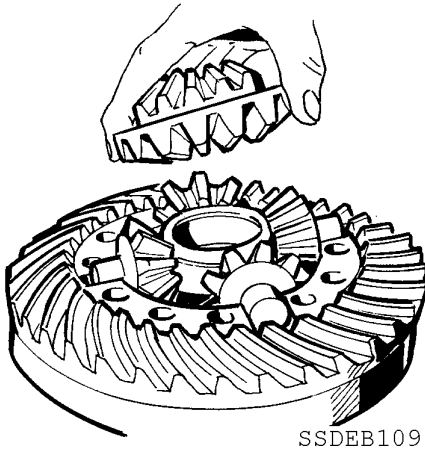
Picture 30

3. Fit the differential gear pinions on the differential spider, and fit the differential spider together with its cogwheels.



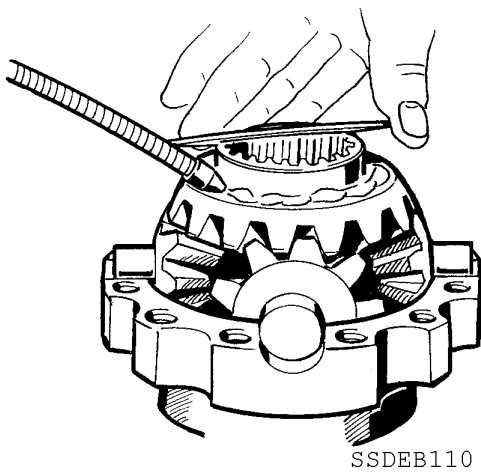
Picture 31

4. Fit the gear wheel.



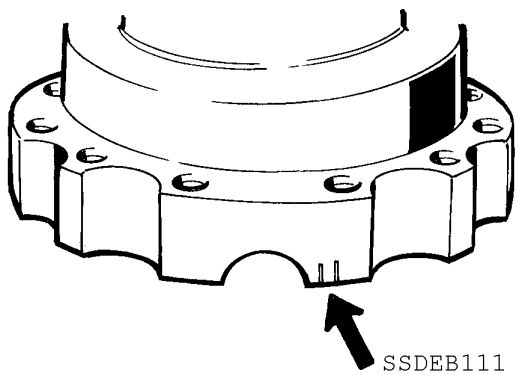
Picture 32

5. Lubricate the thrust washer carefully and fit it.



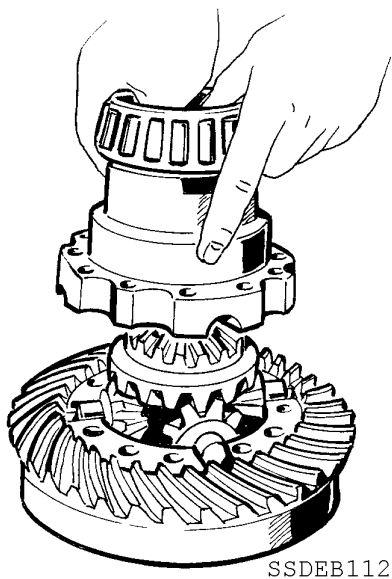
Picture 33

6. Note the positioning marks on the differential gear housing.



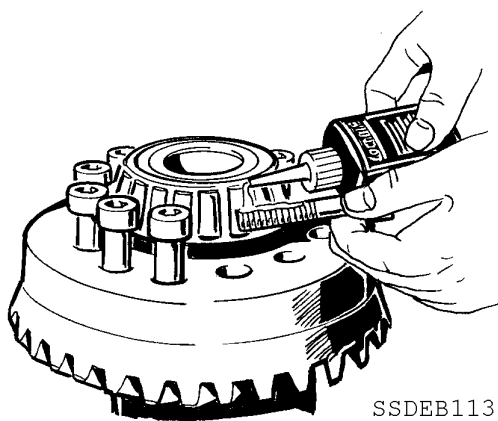
Picture 34

7. Fit the halves of the differential gear housing together.



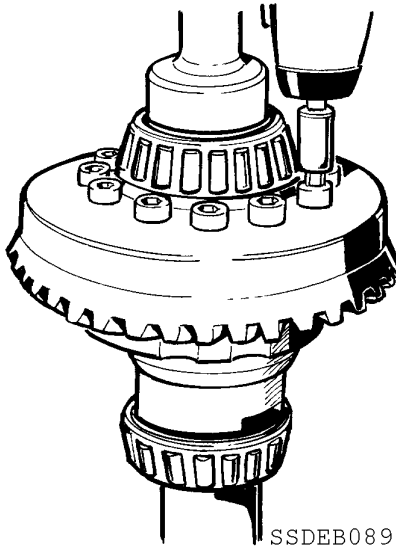
Picture 35

8. If the crown wheel has been off, heat it to approx. +150°C and fit it on by compressing. Use the locating pins. Spread adhesive on the threads of the bolt.



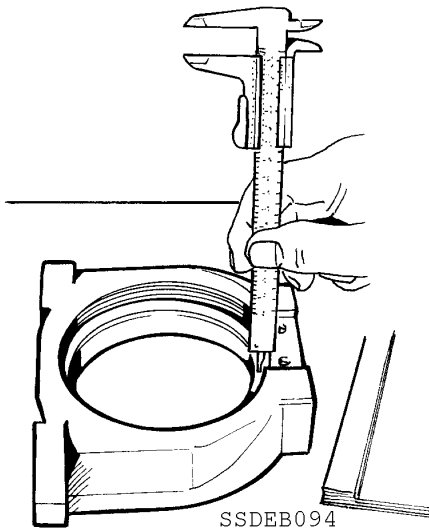
Picture 36

9. Tighten bolts with 320 Nm torque. Ensure that the differential gear wheels are able to rotate freely.



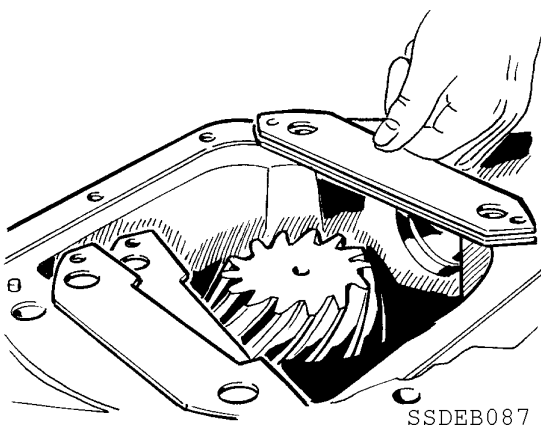
Picture 37

10. Clean the threads of the crown wheel bearing housings. Fit the outer race of the bearings about 1 mm higher than they were previously.

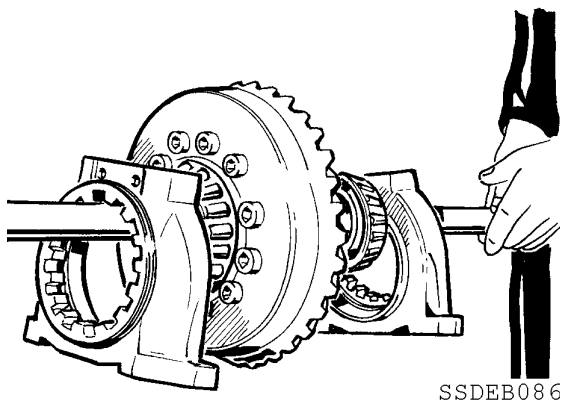


Picture 38

11. Fit the same shim plates as were used previously back into the drive gear housing.

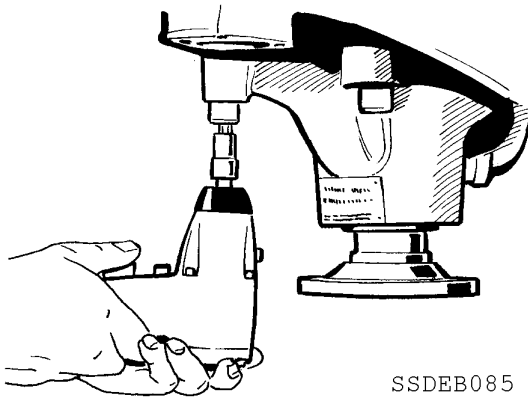


Picture 39



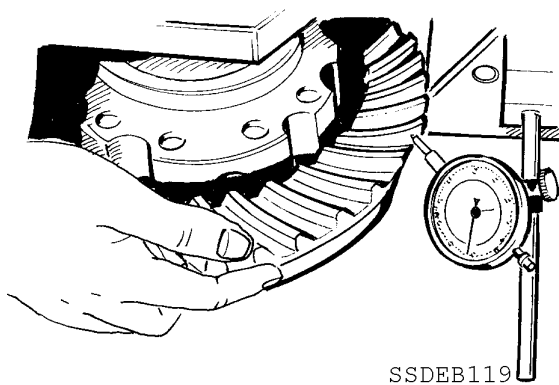
12. Fit the drive gear into the housing.

Picture 40



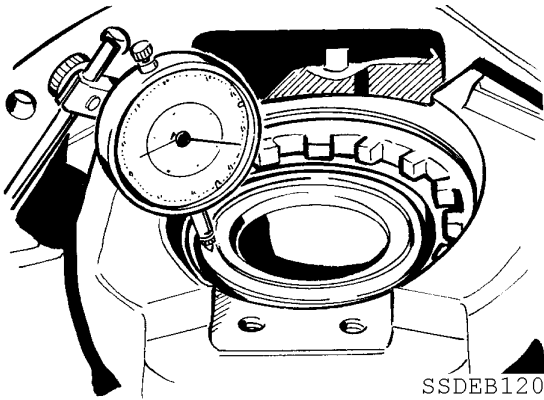
13. Tighten the crown wheel bearing housing bolts with 630 Nm torque, at the same time checking that the housings meet the locating pins.

Picture 41



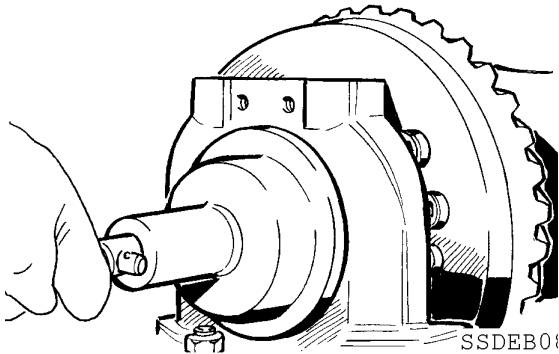
14. Turn the drive gear on the trestle so that the bearing on the crown wheel side is underneath. Turn the axle, and tighten the bearing adjustment nuts with special tool no. 7141-014-030 at the same time. Attach the dial gauge vertically against the crown wheel cog, and adjust the backlash to 0,15-0,35 mm with the adjustment nuts.

Picture 42



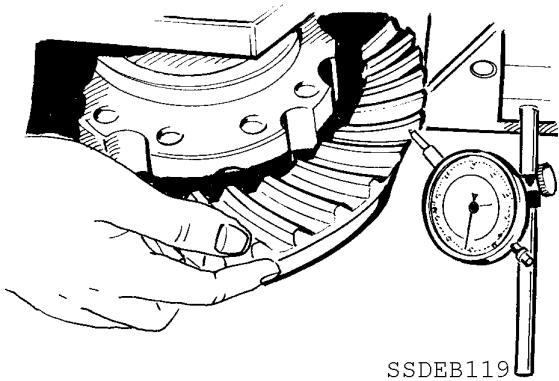
Picture 43

15. Place the indicator of the dial gauge against the inner race of the upper bearing. Turn the axle a couple of times and zero the dial. Turn the drive gear 180° on the trestle. If the bearings are loose, tighten them with the adjustment nuts. Once again, rotate the drive gear 180° and continue until the clearance has gone.



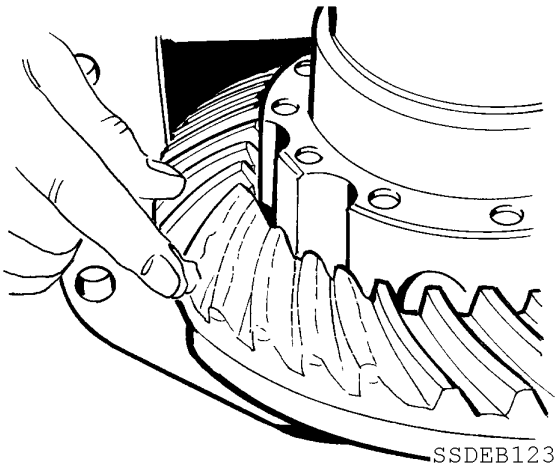
Picture 44

16. Tighten the bearings a little more by turning one of the adjustment nuts 0.5-1.5 cogs. Use for this suitable drift and a hammer (or tool no. 7141-014-030) Check that the nuts are in such a position that the lock washers can be fitted.



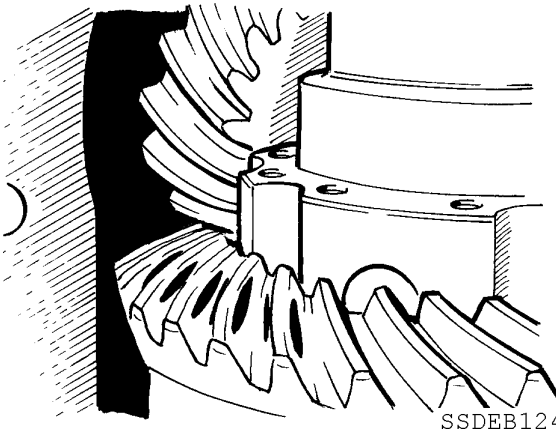
Picture 45

17. Check that the backlash is still 0.15-0.35 mm. If necessary, adjust by turning both adjustment screws an equal amount and in the same direction.



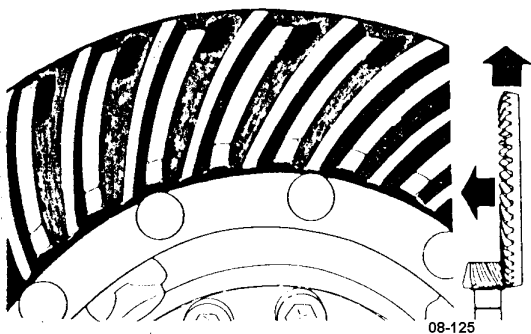
Picture 46

18. Check cog contact with a colour test. Mark 3-5 crown wheel cogs with colour and rotate the drive gear one complete revolution by turning it at the coupling flange.



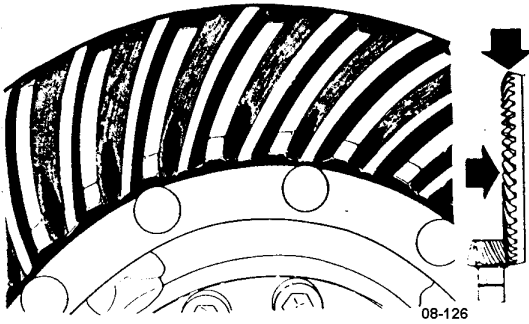
Picture 47

19. Correct cog contact can be seen from the picture. Correct contact is at the centre of the cog, both on the tension side and on the trailing side.



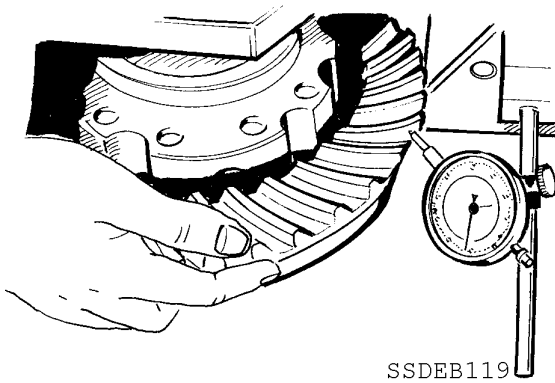
Picture 48

20. If contact is on the tension side of the crown wheel on the outer race (and on the trailing side on the inner race), the crown wheel must be shifted further from the drive pinion by changing to thicker shim plates under the crown wheel bearing housings. To maintain the correct backlash, the crown wheel bearings must be adjusted in such a way that the crown wheel comes closer to the drive pinion



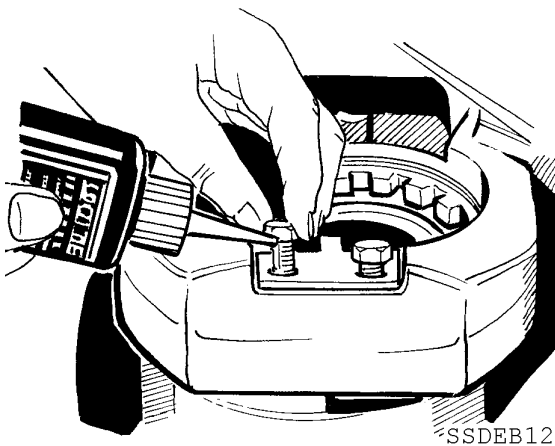
Picture 49

21. If contact is on the tension side of the crown wheel on the inner race (and on the trailing side on the outer race), the crown wheel must be shifted closer to the drive pinion by changing to thinner shim plates under the crown wheel bearing housings. To maintain the correct backlash, the crown wheel bearings must be adjusted in such a way that the crown wheel moves further away from the drive pinion.



Picture 50

22. If the drive gear cog contact has been adjusted, check that the backlash is still 0.15-0.35 mm.

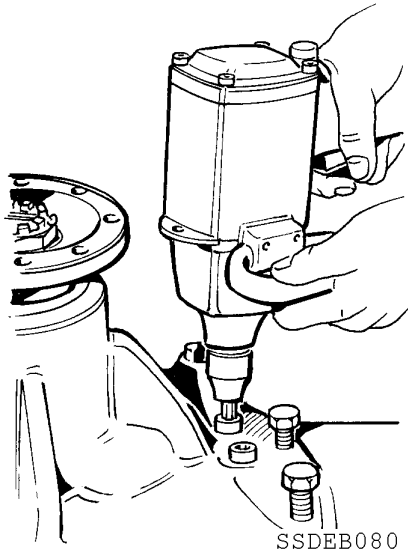


Picture 51

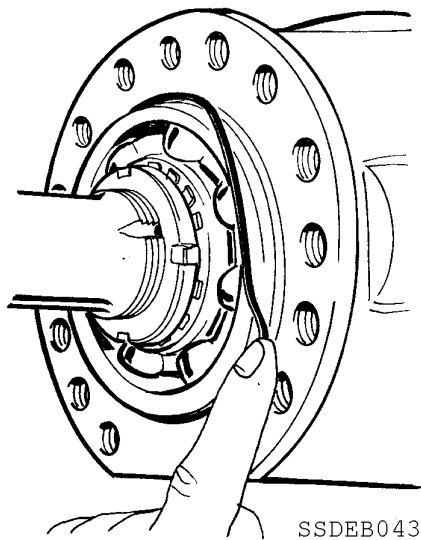
23. Fit the lock washers for the adjustment nuts, of the crown wheel bearings, apply adhesive to the bolt threads, and tighten the bolts with 21 Nm torque.

1.6 INSTALLATION OF THE DRIVE GEAR UNIT

1. Clean the old sealing compound off the surface of the seals carefully.
2. Apply sealing compound to the surfaces of the seals on the drive gear. Install the drive gear in the axle housing. Apply adhesive to the bolt threads and tighten the bolts with 240 Nm torque.

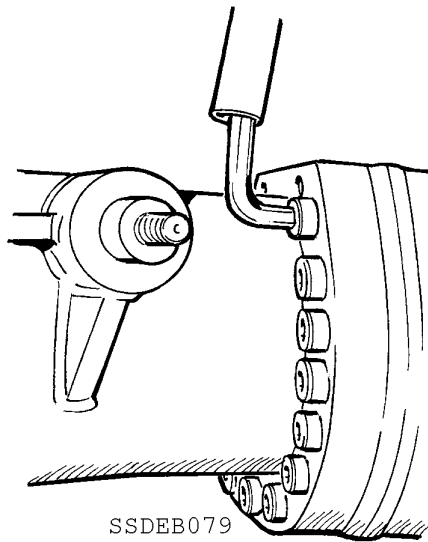


Picture 52



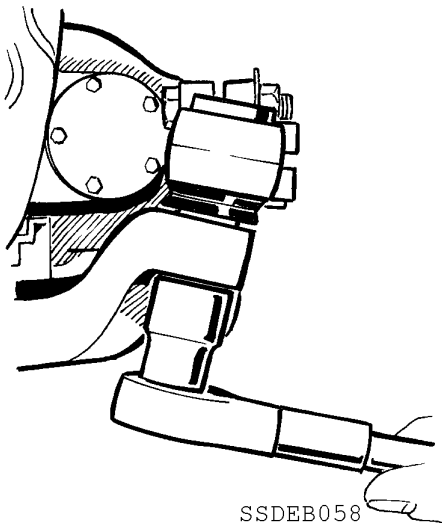
3. Fit a new o-ring to the outer race of the swivel head bearing. Spread sealing compound on the seals and install the swivel heads with their hubs in the axle housing.

Picture 53



4. Fit the washers, spread adhesive on the bolt threads and tighten the bolts with 210 Nm torque.

Picture 54



5. Fit the steering cylinder arms and the tie rod, tighten the ball joint nuts with 141 Nm torque. Secure with a cotter pin

Picture 55

1.7 DISMANTLING AND ASSEMBLY OF THE DIFFERENTIAL LOCK



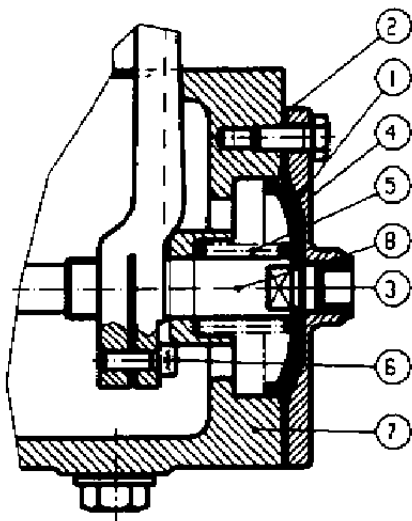
1. Remove the lock cylinder cover retaining screws (5 pcs) first and take the cover and the diaphragm under it away.

Picture 56



2. Undo the diaphragm support cup screw and remove the cup and the spring.

Picture 57



08-010

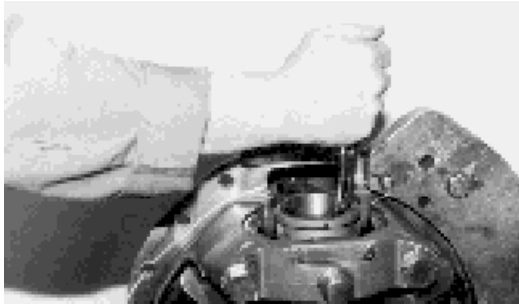
3. Loosen the fork lock screw (6) approx. 2 turns (access to screw trough casing hole under diaphragm).

Picture 58



4. Take the fork shaft out by rotating it anticlockwise by suitable open wrench.

Picture 59



Picture 60

5. When the shaft is removed loosen the slide bush lock screw and remove the snap ring.



Picture 61

6. Remove the fork and the slide bush with slide shoes.

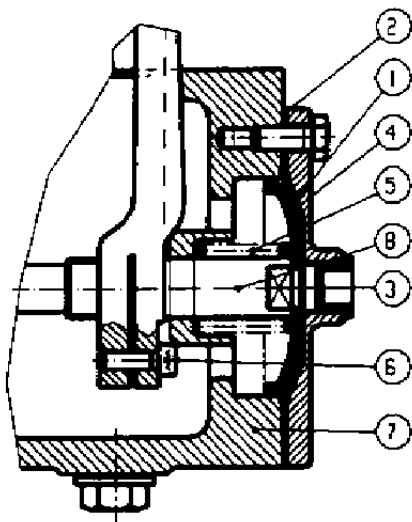
Inspect that all lock components are in good condition and they are not excessively worn. Replace all damaged components. Assemble by carrying out in reverse order the operations described for dismantling.

1.8 LOCK ADJUSTMENT

The operation mechanism of the differential lock have to be adjusted as follows:



While adjustment parts 1...5 have to be removed: (see figure62)



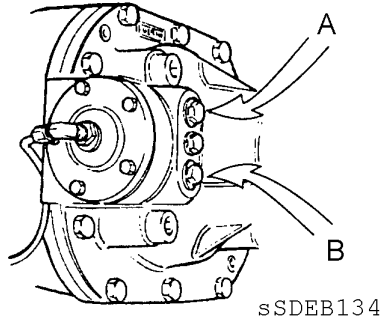
08-010

1. Engage the dog clutch of the differential lock by pushing the fork shaft all the way in.
2. Place the cup (4) on the shaft without retaining screw.
3. Adjust the fork shaft by rotating it so that the cup touches both the shaft end and the bottom of the casing.
4. Check again by rotating pinion and pushing the fork shaft (8) simultaneously if the shaft may go further in.
5. If the shaft and the fork went further in, pls. repeat operations from item 3.
6. Tighten the fork lock screw (6) to 35 Nm torque.
7. Install the cup and retaining screw and make sure that the cup rim touches the bottom of the casing.
8. So the adjustment is performed. Remove the cup once more and do assemble the lock. Tighten cup retaining screw to 30 Nm torque. Use sealant in the plug installation.

Picture 62

- | | |
|------------|--------------------|
| 1. Cover | 2. Diaphragm |
| 3. Screw | 4. Cup |
| 5. Spring | 6. Fork lock screw |
| 7. Housing | 8. Fork shaft |

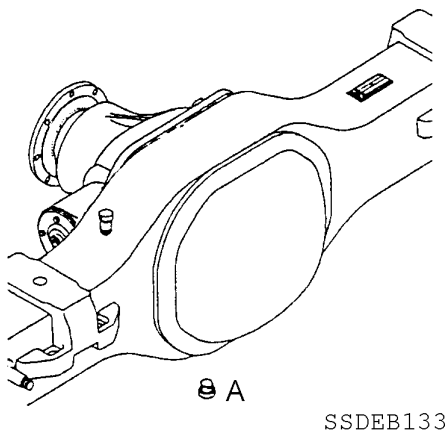
1.9 DRIVE GEAR - OIL LEVEL CHECK



1. The oil level must be even with the lower edge of the level plug. The surface plug is the lowest of the three oil plugs.

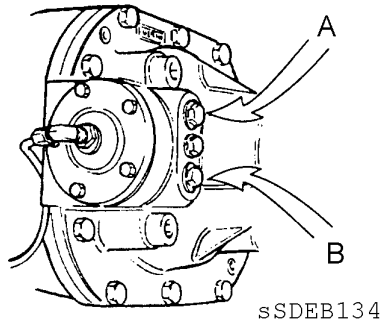
Picture 63
A Refilling
B Level check

1.10 DRIVE GEAR - OIL CHANGE



1. Change the oil immediately after driving, before the oil goes cold.
2. When oil is drained through the plug underneath the axle housing. When the oil is changed, the bottom plug magnet and the drive gear breather must be cleaned without fail.

Picture 64
A Oil drain plug



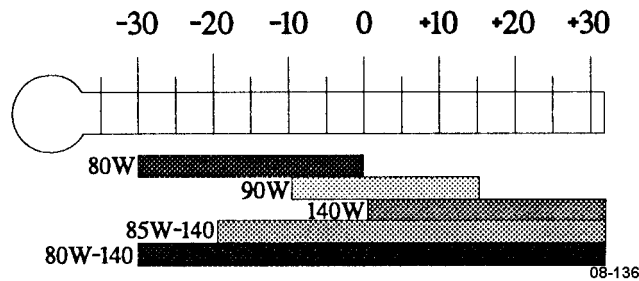
3. When changing oil, open both the level plug and the filling plug. Fill the drive gear with approx. 12 l of a recommended grade of oil up to the lower edge of the surface plug.

Picture 65
 A Refilling
 B Level check

1.11 OIL RECOMMENDATION

Oil grade: API GL 5

Viscosity: selected from the following chart according to the ambient atmospheric temperature. The same oil is to be used for both the drive gear and the hubs.



Picture 66 Recommended oil viscosity (SAE) according to the ambient atmospheric temperature.

2 TECHNICAL DATA

Drive gear

Oil volume (approx.)	12	l
Bearing clearance of drive pinion (torsional resistance with the bearings compressed at 160 kN and the resistance measured from the radius (R=approx. 68 mm) of the gasket housing)	65...85	N
Crown wheel bearing clearance (0.5—1.5 notches compression when the clearance is eliminated) 0,5...1,5 adjustment-notches		
Gear back slash	0,15...0,35	mm

Tightening torques

Coupling flange nut	1200	Nm
Crown wheel bearing casing bolts	630	Nm
Drive gear housing bolts	240	Nm (Locking liquid)
Crown wheel bearing adjustment nut lock washer bolts	21	Nm (Locking liquid)
Oil plugs	50 - 70	Nm



CAUTION - The use of the differential locks

- Engage only under conditions of poor traction
- Do not engage during downhill operation
- Engagement will affect steering
- Do not engage at speeds above 40 km/h (25 MPH)