

III. Assembly

Differential:

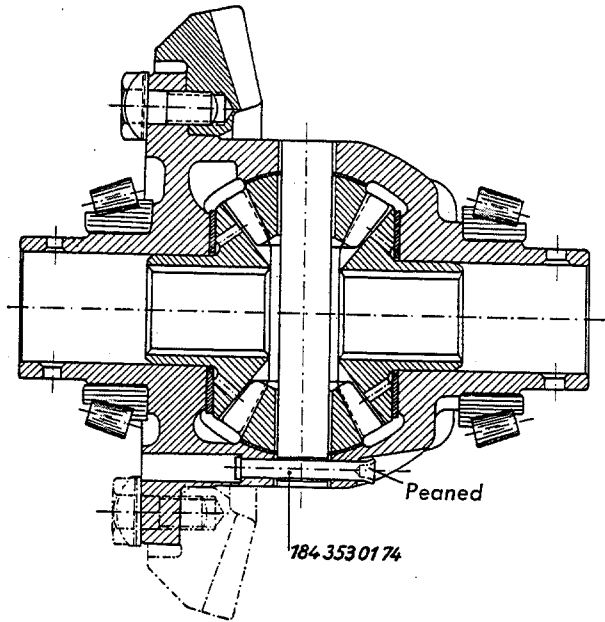


Fig. H 3/29

29. Install rear axle shaft gears with contact washers into differential housing. Watch out for marks "l" (left-hand) and "r" (right-hand). See Operation No. H 3, cf. 4, Note.
30. Place differential bevel gears with ball washers one after the other between the rear axle shaft gears until punch 187 589 08 61 can be inserted (Fig. H 3/30). It must be difficult to rotate the bevel gears and there must be no end play. Any play that may be present must be eliminated by means of thicker contact or ball washers. Be sure that the ends of the bevel gear teeth are flush.

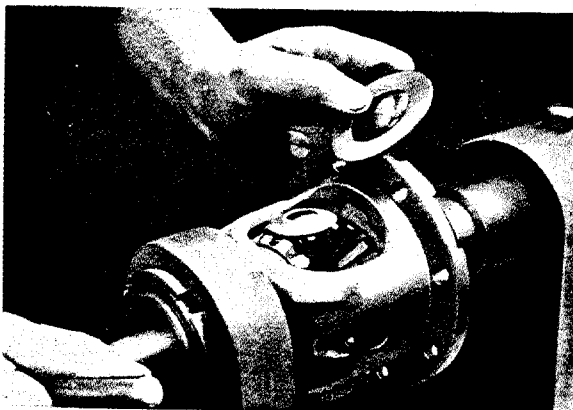


Fig. H 3/30

The contact washers are available with a thickness from 1.3 to 1.7 mm (0.051–0.067"), the thickness varying from 0.1 (0.004") to 0.1 mm (0.004"). The ball washers are furnished 1, 1.5 and 2 mm (0.04, 0.06 and 0.08") thick.

31. Insert differential gear shaft in the place of punch 187 589 08 61. Install retaining pin and pean well on the drilled side (Fig. H 3/31).

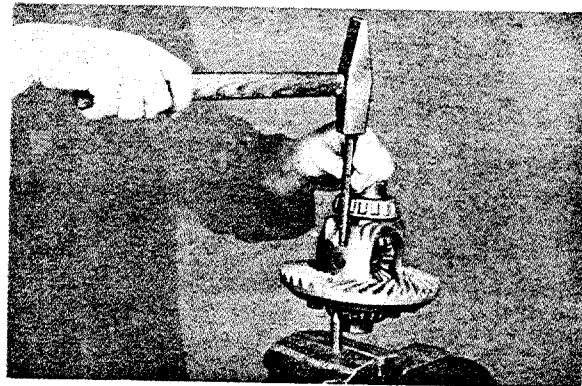


Fig. H 3/31

32. Press the two bevel roller bearings on the differential housing by means of punch 191 589 02 39.

Bevel Drive Gear Shaft

33. Push cylinder bearing on shank of bevel drive gear shaft. Install spacer sleeve, push thrust ring with beveled surface (see Fig. H 3/34) in direction of pinion head over the spacer tube and put on front inclined bearing. Then press the two bearings on (Fig. H 3/33). Press against the **inner race only**.
34. Install shoulder ring (beveled surface facing the three-arm flange) and threaded ring with pressed-in grease retainer, then grease sliding surface for grease retainer on three-arm flange liberally and push flange on groove of bevel drive gear shaft. Install slotted nut with lock plate and tighten to 16–18 mkg (115–130 ft.lb.). Make sure that bevel gear shaft can be turned easily.

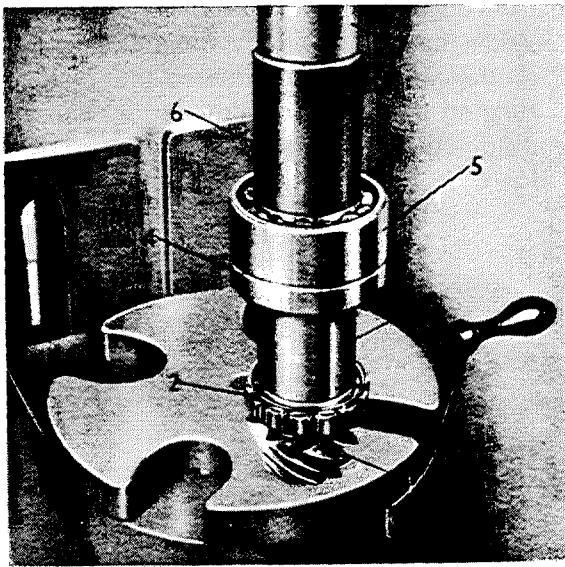


Fig. H 3/33

- | | |
|--------------------|--------------------|
| 1 Bevel drive gear | 5 Inclined bearing |
| 2 Cylinder bearing | 6 Length of pipe |
| 3 Spacer tube | 7 Spindle of press |
| 4 Thrust ring | |

Use washer 187 589 06 61 to press the grease retainer into the threaded ring. Before installing the retainer, coat it with a sealing compound.

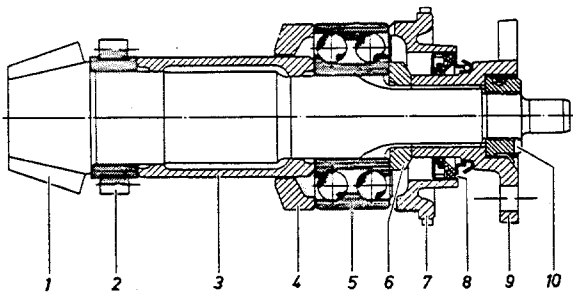


Fig. H 3/34

- | | |
|--------------------|--------------------|
| 1 Bevel drive gear | 6 Shoulder ring |
| 2 Cylinder bearing | 7 Threaded ring |
| 3 Spacer sleeve | 8 Grease retainer |
| 4 Thrust ring | 9 Three-arm flange |
| 5 Inclined bearing | 10 Slotted nut |

35. Check three-arm flange for true run. The permissible lateral out of true checked at outer diameter of flange is 0.03 mm (0.0012"). See also Operation No. G 3/73.

Pean lock plate into groove of three-arm flange and slotted nut.

Installation of Bevel Gear Shaft:

36. Install rear snap ring with hook into the housing watching out for proper seat. The hook must engage the groove cast into the housing (Fig. H 3/36).

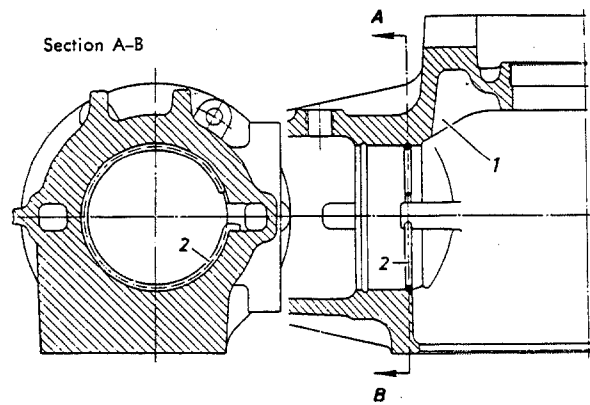


Fig. H 3/36

- | | |
|---------------------|-------------|
| 1 Rear axle housing | 2 Snap ring |
|---------------------|-------------|

Press in outer race of cylinder bearing with punch 191 589 01 39 and install front snap ring in front.

Note: In housings of the former design no such groove is provided. In the case of a rear axle overhaul drill a hole of 8 mm (0.315") dia. and a depth of 10 mm (0.4"), if the hole does not already exist (see Fig. H 3/36a). Install the snap ring in these housings in such a way that the hook engages the hole.

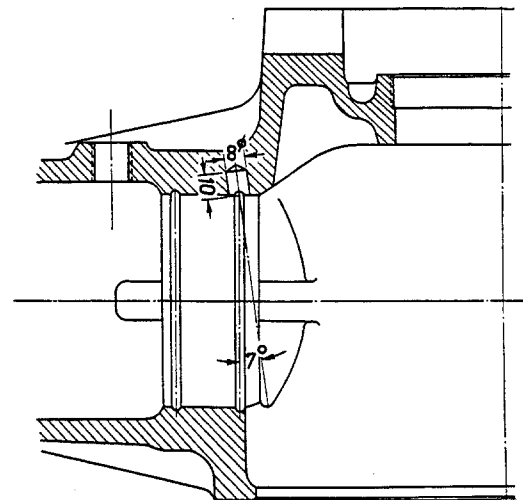


Fig. H 3/36a

Dia. 8 mm (0.315") 10 mm (0.4")

If for one reason or the other it is not possible to provide the hole subsequently, the rear snap ring must be provided with a left-hand twist of about 10 mm = 0.4" (Fig. H 3/36b) and installed in the housing in this condition to prevent that the ring slips out of the groove.

37. Turn the two side adjusting screws about halfway in.

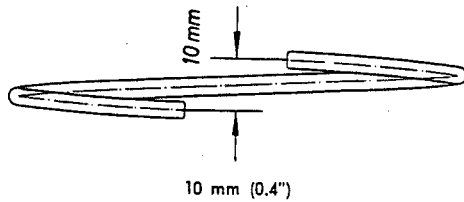


Fig. H 3/36b

38. Place adjusting washers on threaded ring, install bevel drive gear shaft into the housing and tighten threaded ring with wrench 191 589 05 07 (see Fig. H 3/6).

39. Now tighten the two adjusting screws evenly (Fig. H 3/39).

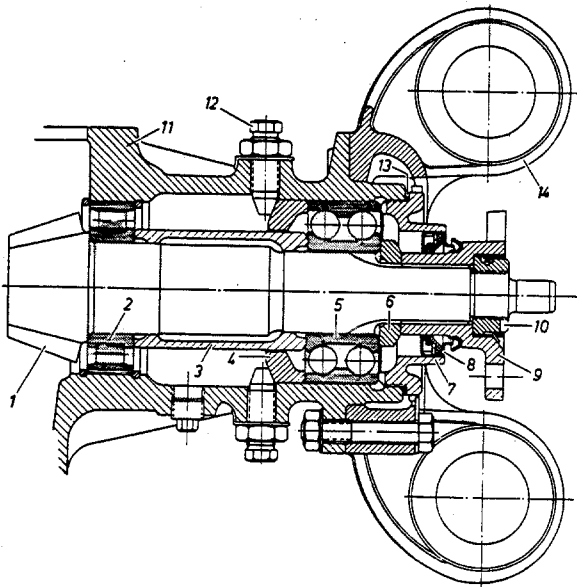


Fig. H 3/39

- | | | |
|--------------------|--------------------|-------------------------|
| 1 Bevel drive gear | 6 Shoulder ring | 11 Rear axle housing |
| 2 Cylinder bearing | 7 Threaded ring | 12 Adjusting screw |
| 3 Spacer tube | 8 Grease retainer | 13 Adjusting washers |
| 4 Thrust ring | 9 Three-arm flange | 14 Rear axle suspension |
| 5 Inclined bearing | 10 Slotted nut | |

Adjustment of Bevel Gear Drive:

40. When installing a set of new or relapped gears the same distance of the gears with reference to each other and the same tooth backlash as determined on the test tool must be maintained in the rear axle housing. Measure the accurate distance between

front edge of pinion and center of ring gear. When the two installation dimensions given on the ring gear are adhered to, optimum running properties of the gear set will be obtained. The adjustment is made as follows:

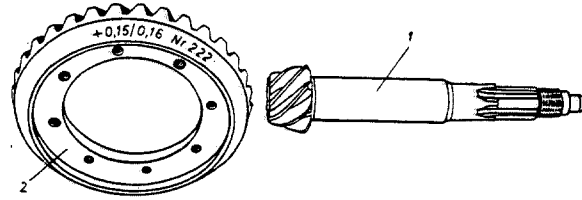


Fig. H 3/40

- 1 Bevel drive gear 2 Ring gear

41. Set tool 191 589 02 23 to zero position by means of the adjusting disc having a diameter of 131.06 mm (5.1583"). See Fig. H 3/41. Fix the adjusting screw of the tool by means of the check nut in such a way that the adjusting disc can just be turned without difficulty. However, no light gap should be visible.

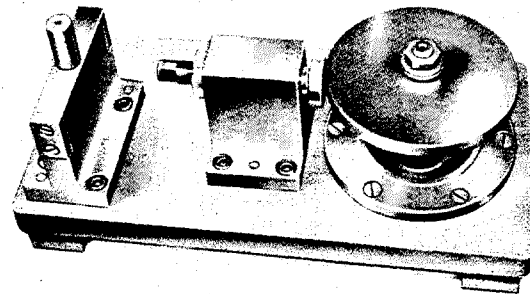


Fig. H 3/41

42. Exchange the measuring discs on tool 191 589 02 23 for a bracket with gauge holder (191 589 03 23) and a dial gauge. Clamp the dial gauge so in place that it is preset to 1 mm (0.0394"). Now locate the highest point of the adjusting screw face with the dial gauge and set the gauge to zero by turning the dial (Fig. H 3/42).
43. Insert bracket with gauge holder and dial gauge into the housing (Fig. H 3/43). Adjust the distance from bevel gear shaft to ring

gear as fixed on the test tool and stated on the ring gear.

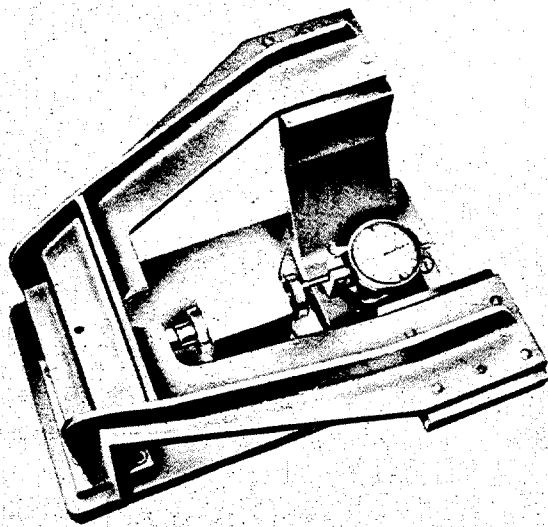


Fig. H 3/42

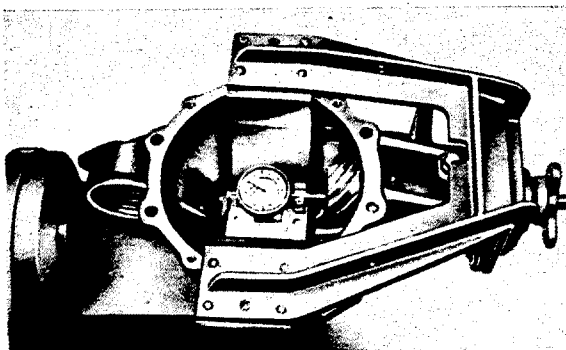


Fig. H 3/43

Proceed as follows:

Example 1

Specified distance $+ 0.23 \text{ mm}$ (0.00901").
As the dial gauge is preset to 1 mm (0.0394"), it must read 1.23 mm (0.04842") after adjustment has been effected. (The hand of the dial gauge moves in clockwise direction).

Example 2

Specified distance $- 0.23 \text{ mm}$ (0.00901").
As the dial gauge is preset to 1 mm (0.0394"), it must read 0.77 mm (0.0303") after adjustment has been effected. (The hand of the dial gauge moves in anti-clockwise direction).
The adjusting tolerance is $\pm 0.01 \text{ mm}$ (0.0004").

For adjusting the distance, $1.0 \text{ to } 2.0 \text{ mm}$ (0.04 to 0.08") thick adjusting washers are available, the thickness varying from 0.1 mm (0.004") to 0.1 mm (0.004").

Note: If no proper adjusting washers are at hand, a thicker washer must be ground down to the required size.

44. Screw threaded ring into housing (not too deep) and press in outer race of bevel roller bearing with punch 191 589 00 39. Install the differential.
45. Screw threaded ring into bearing flange as well and press in bearing race. Place bearing flange on housing and check whether flange fits without play. – If play is present, **the flange may break**, as one of the threaded rings is screwed in too deep. Now screw bearing flange to rear axle housing.
46. Measure the tooth backlash with tool 191 589 01 21. To adjust the backlash, turn the adjusting nuts with wrench 191 589 02 07.

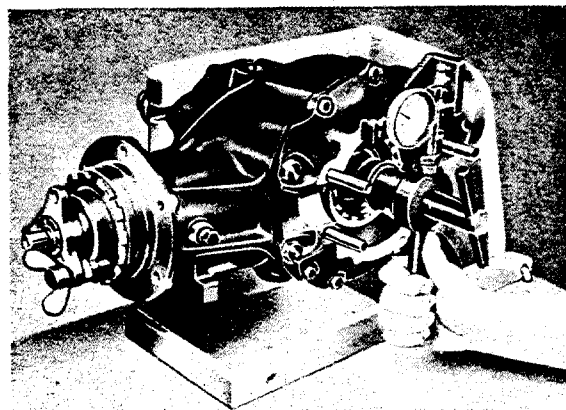


Fig. H 3/46

Proceed as follows:

- a) Lock bevel gear shaft with a suitable clamping screw (Fig. H 3/46).
- b) Attach try square to rear axle housing.

- c) Insert holder with dial gauge into bore of differential housing and clamp in place. Check the tooth backlash of 0.16–0.20 mm (0.0065–0.008") at a diameter of 205 mm (8.07"); it must be identical with the lash engraved on the back of the ring gear. The diameter of 205 mm (8.07") is marked on the try square. Make the check at four points on the ring gear circumference.

The smallest lash shall govern. To increase or reduce the backlash, turn adjusting nuts clockwise or anticlockwise, as required.

For checking correct adjustment of the gear set it is absolutely necessary to make a bearing impression of the tooth flanks.

Note: If the facilities required for adjusting the gear set are not available, adjustment must

be made after the bearing impression. This, however, can only be done by qualified and experienced mechanics.

47. To make an impression, remove the bearing flange again and lift the differential out.
48. Paint about five teeth of the ring gear on either side with blue paint that has been thinned with oil, install differential again and tighten bearing flange.
49. Attach a crank to the universal joint flange. As you turn, arrest the ring gear simultaneously. Take differential out again. Check impression and correct the adjustment, if necessary.
For proper and improper tooth contact and the required corrections see Figs. H 3/49, 49a and 49b.

The following illustrations show proper and improper tooth contact. The corrections required are given below.

Impression on Ring Gear under Load (Gear arrested)

Proper tooth contact

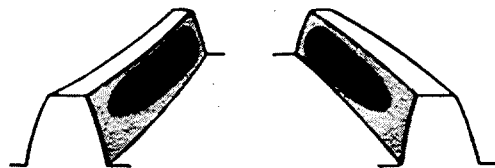


Fig. H 3/49

Too high tooth contact

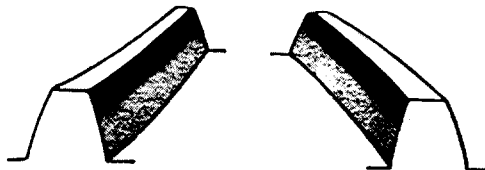


Fig. H 3/49a

Reduce installation distance of bevel drive gear. At the same time increase installation distance of ring gear to maintain correct tooth backlash.

Too low tooth contact

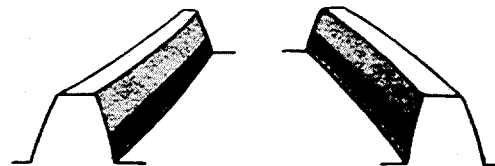


Fig. H 3/49b

Increase installation distance of bevel drive gear. At the same time reduce installation distance of ring gear to maintain correct tooth backlash.

If other impressions result, such as crosswise tooth contact, heel or toe contact, the bores in the rear axle housing or faulty gear teeth are to be blamed. These faults cannot be remedied by altering the adjustment.

50. For final assembly coat the bearing flange with a sealing compound and tighten all nuts.
51. Screw threaded ring on bevel drive gear out again, coat with a sealing compound and tighten with wrench 191 589 05 07. Be sure that safety fits accurately in a cutout of the threaded ring. To check this, place support of rear axle suspension shortly against the ring.

Coat the two adjusting screws on side with a sealing compound as well and tighten to 4.5 mkg (32.5 ft.lb.). Tighten check nut and secure it; the lug of the lock plate must abut against the cast-on surface (see Fig. H 3/39).

52. Tighten the two threaded rings for the bevel bearing with a torque wrench and wrench 187 589 02 07 to 8–10 mkg (58–72 ft.lb.) and secure them (Fig. H 3/52).

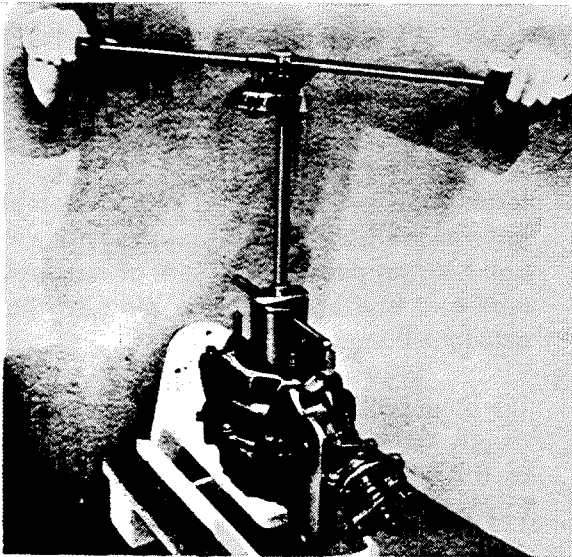


Fig. H 3/52

Check tooth backlash (0.016–0.020 mm = 0.0065–0.008") again.

53. Attach support of rear axle suspension to the housing and secure the threaded ring.

Rear Axle Tubes:

54. Press new grease retainer into brake anchor plate with punch 187 589 09 39. Strictly adhere to the pressing-in depth to avoid any damage to the grease retainer (see Fig. H 3/54).

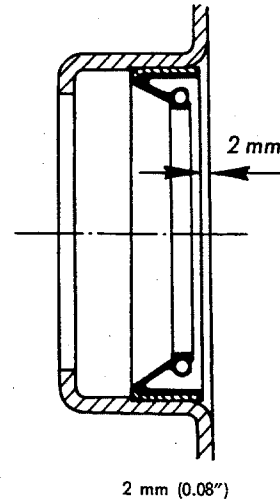


Fig. H 3/54

Clamp rear axle shaft in place and push on brake anchor plate. Use sleeve 191 589 03 61 in order not to damage the grease retainer (Fig. H 3/54a).

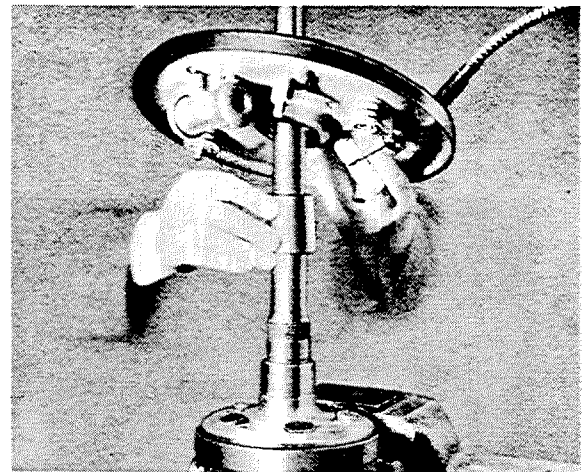


Fig. H 3/54a

Push oil seal on sealing surface of rear axle shaft and fill hollow space with heat resistant bearing grease (Fig. H 3/54b).

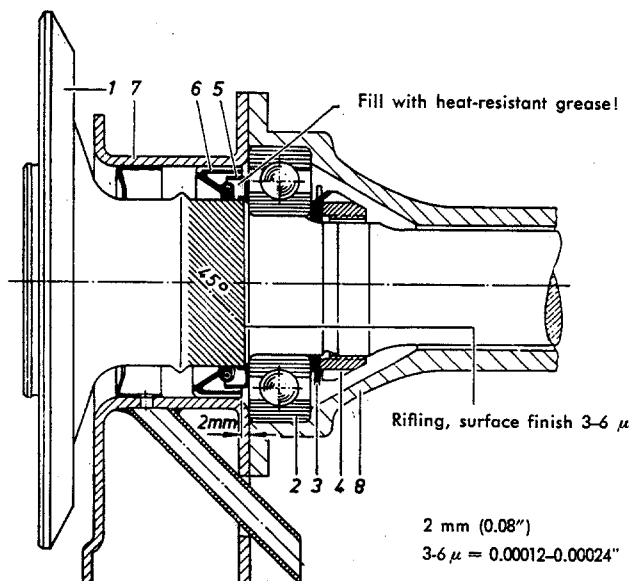


Fig. H 3/54b

- | | |
|--------------------------|----------------------|
| 1 Rear axle shaft | 5 Oil seal |
| 2 Grooved collar bearing | 6 Grease retainer |
| 3 Lock plate | 7 Brake anchor plate |
| 4 Slotted nut | 8 Rear axle tube |

Note: The oil seal must contact the ball bearing race and fit tightly on the sealing surface, so that it will revolve with the shaft. If the shaft has been reworked, use a correspondingly smaller seal. The oil seal must by no means touch the grease retainer (Fig. H 3/54b).

55. Press ball bearing on rear axle shaft, install lock plate (with collar facing the inner ball bearing race) and tighten ring nut forcefully with wrench 136 589 09 07 (Fig. H 3/55).

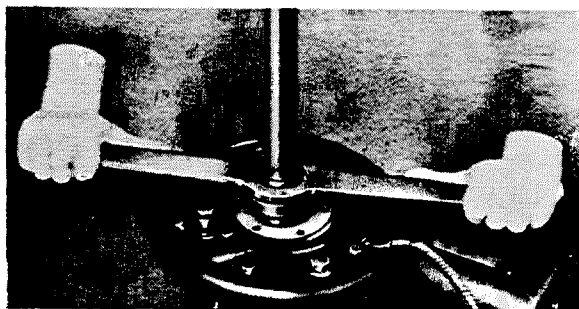


Fig. H 3/55

Peen lock plate into the grooves of the ring nut (Fig. H 3/55a).

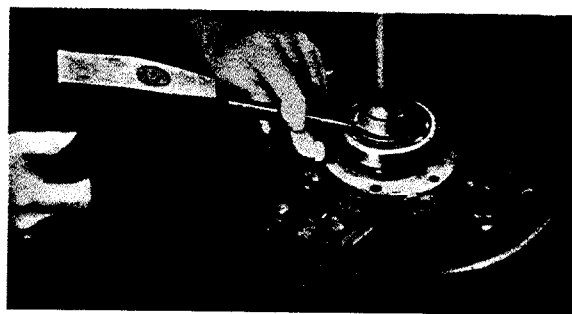


Fig. H 3/55a

56. Pull rubber boot over flange of rear axle tube.

Use new boots every time the rear axle is overhauled.

In order not to damage the boot during installation, note the following:

- Turn trunnion screw out of rear axle tube
- Grease inside of boot
- Do not use any pointed objects.

Note: Use only rubber boots bearing the marking MMX, as these resist hypoid oil better than boots of the conventional type.

57. Insert rear axle shaft into rear axle tube (grease the ball bearing), push shaft with ball bearing into bearing seat of rear axle tube and bolt brake anchor plate to rear axle tube flange.

The outer ball bearing race must be arrested axially in the rear axle tube with an overlap of 0.2–0.3 mm (0.008–0.012") through the brake anchor plate.

Note: The spiders and rear axle shafts are marked "l" (left-hand) and "r" (right-hand), resp. Be careful to install the spiders and shafts correctly.

58. Place pressure spring on rear axle shaft (the side having the smaller inner diameter first). Insert the spider into the differential.

Push selected collar bushings on rear axle tube journals and insert the tube into the housing. The bushings with thick bottom for the hand brake cable fastening are installed in front.

Note: Before this is done, coat collar bushings and housing cover with a sealing compound.

After installation has been effected, check again whether the rear axle tubes are just beginning to fall after they have been released.

Fasten rubber boot on bearing cap and rear

axle tube with hose bands (use screw-type hose band locks).

59. Screw wheel brake cylinders and brake lines in place. Use new copper sealing rings for the hollow screws. Install brake shoes.
60. Bolt hand brake cable with cable roller housing to brake anchor plates and cable roller brackets to rear axle housing.
61. Install brake drum and fasten with a wheel nut.
62. Fill 2.6 liters (5.5 US pints; 4.6 Imp. pints) of hypoid oil into the rear axle.