

III. Assembly

Differential:

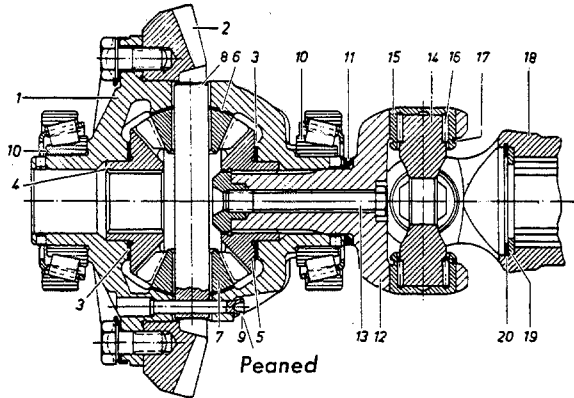


Fig. H 3a/38

- | | |
|------------------------------------|---------------------------|
| 1 Differential housing | 10 Bevel roller bearing |
| 2 Ring gear | 11 Adjusting washer |
| 3 Contact washer | 12 Inner fork |
| 4 Rear axle shaft gear, left-hand | 13 Tightening screw |
| 5 Rear axle shaft gear, right-hand | 14 Spider star |
| 6 Ball washer | 15 Needle bearing bushing |
| 7 Differential bevel gear | 16 Needles |
| 8 Differential bolt | 17 Snap ring |
| 9 Retaining pin | 18 Outer fork |
| | 19 Washer |
| | 20 Lock ring |

38. Install rear axle shaft gears with contact washers into the differential housing (Fig. H 3a/38a).

The rear axle shaft gear with pressed-in nut for fastening the sliding joint must be on the right side (as seen into direction of travel). See Fig. H 3a/38.

To install the differential bevel gears with ball washers, use punch 136 589 13 61.

Now check whether rear axle shaft and differential bevel gears turn heavily and without play. If this is not the case, the contact washers behind the rear axle shaft

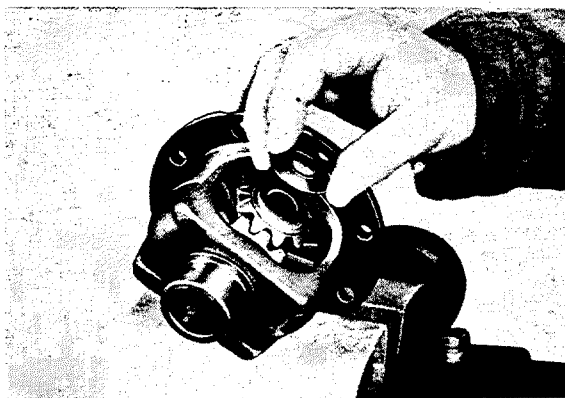


Fig. H 3a/38a

gears must be replaced with washers of greater thickness.

The contact washers are available from 1.3 to 1.7 mm (0.051–0.067"), the thickness varying from 0.1 to 0.1 mm (0.004 to 0.004").

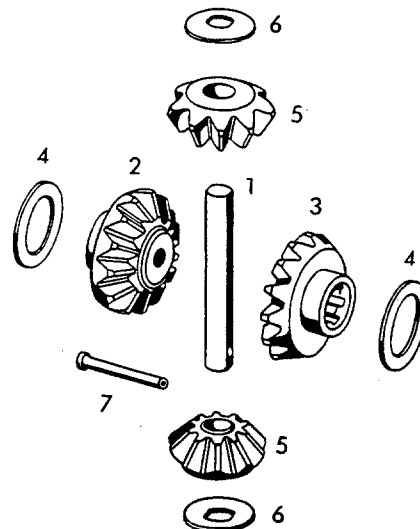


Fig. H 3a/38b

- | | |
|------------------------------------|---------------------------|
| 1 Differential bolt | 4 Contact washer |
| 2 Rear axle shaft gear, right-hand | 5 Differential bevel gear |
| 3 Rear axle shaft gear, left-hand | 6 Ball washer |
| | 7 Retaining pin |

Insert differential bolt, then install retaining pin (use a new one) and pean drilled end with a punch (see Fig. H 3a/38).

39. Press inner races of bevel roller bearings on differential housing by means of punch 180 589 01 39.

40. Place an adjusting washer on inner fork of sliding joint (beveled side facing the sliding joint, see Fig. H 3a/38) and bolt fork to right-hand rear axle shaft gear by means of a tightening screw. The play between adjusting washer and differential housing should be 0.05 to 0.10 mm (0.002 to 0.004"). If this is not the case, the adjusting washer must be exchanged. The adjusting washers are available with thicknesses ranging from 1 to 2 mm (0.04 to 0.08"), the thickness varying from 0.1 to 0.1 mm (0.004 to 0.004").

After checking the play and installing the proper adjusting washer, unscrew the fork

again. The fork is only mounted before installation of the right-hand rear axle tube is effected.

Sliding Joint:

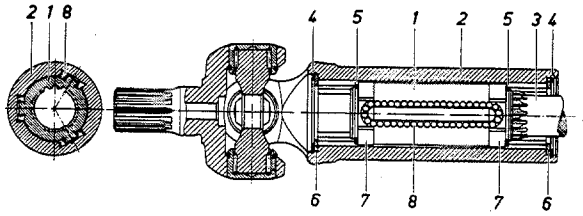


Fig. H 3a/41

- | | |
|-------------------|--------------------|
| 1 Sliding sleeve | 5 Lock ring |
| 2 Outer fork | 6 Washer |
| 3 Rear axle shaft | 7 Deflection plate |
| 4 Lock ring | 8 Cylinder rollers |

41. Place deflection plates on sliding sleeve and secure them by means of a lock ring. Install the lock rings so that the two eyelets are in front of a keyway (see arrow in Fig. H 3a/41a); if this is not the case, the sliding sleeve cannot be inserted into the fork.

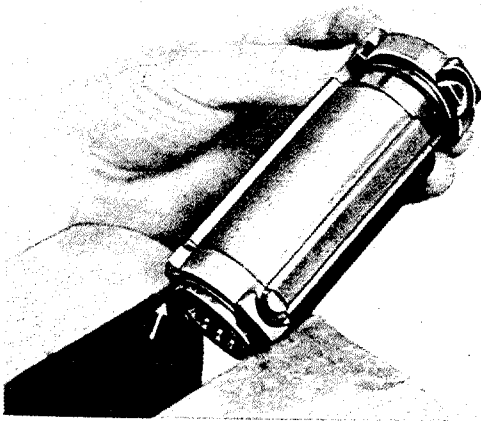


Fig. H 3a/41a

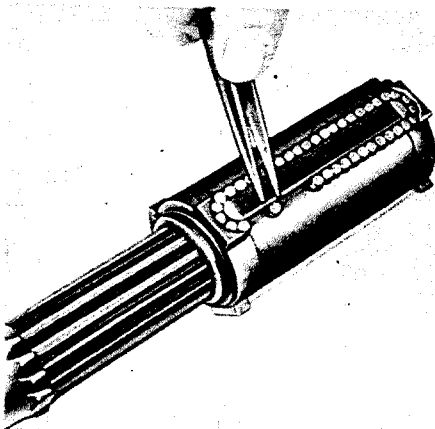


Fig. H 3a/42

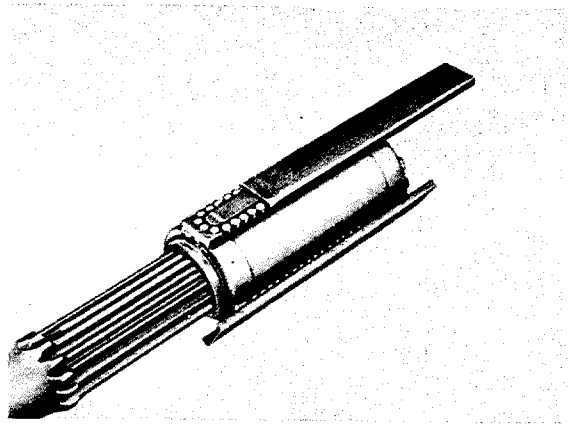


Fig. H 3a/42a

42. Provide cylinder rollers with vaseline and place on sliding sleeve, then cover with inserting plates 180 589 03 63 (Figs. H 3a/42 and 42a). The beveled surfaces of all plates must point in the same direction. Insert sliding sleeve, with beveled surfaces of insertion plates first, into the fork (Fig. H 3a/42b), then install a washer and lock plate on either side to prevent that the sleeve will fall out.

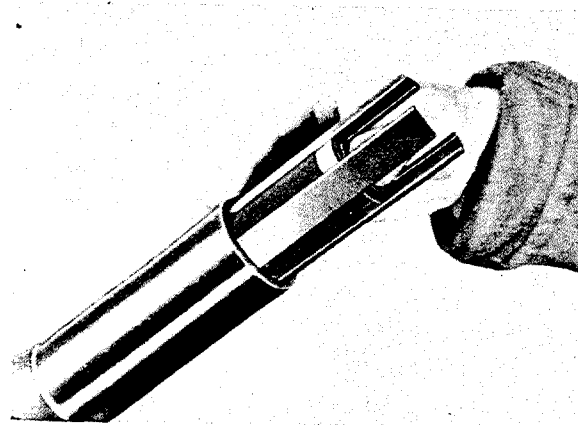


Fig. H 3a/42b

Check play between sliding sleeve and fork. It should be 0.01 to 0.05 mm (0.0004 to 0.002"). See also cf. 26.

43. Place needles into the needle bearing bushings with vaseline and mount spider. Proceed with utmost care when pressing the bushings into the bore of the fork. Above all a good support must be provided (Fig. H 3a/43).

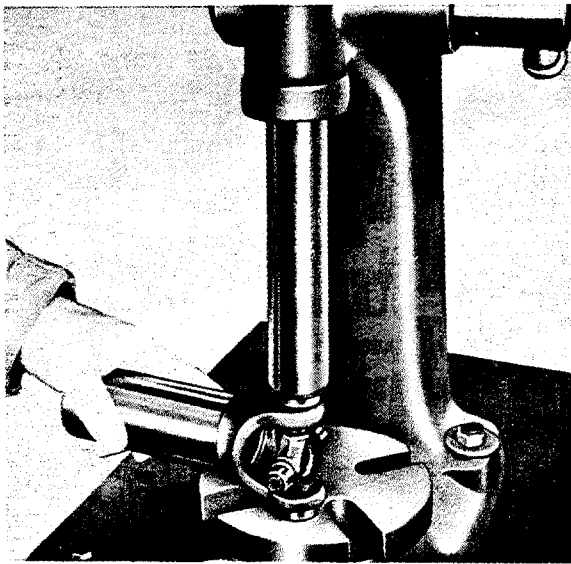


Fig. H 3a/43

Now install the snap rings (Fig. H 3a/43a). Select the snap rings so that the spider star has **no end play**.

The snap rings are available with the following thicknesses: 2.15, 2.25, 2.30, 2.35, 2.40, 2.45 and 2.55 mm (0.085, 0.089, 0.091, 0.093, 0.095, 0.097, 0.101 in.).

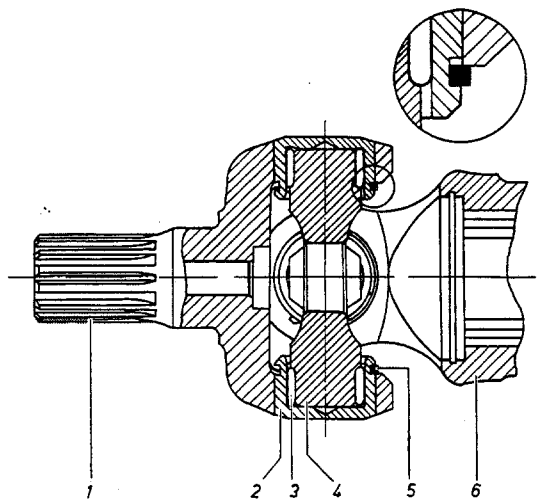


Fig. H 3a/43a

- | | | |
|--------------------------|---------------|--------------|
| 1 Inner fork | 3 Needle | 5 Snap ring |
| 2 Needle bearing bushing | 4 Spider star | 6 Outer fork |

Bevel Drive Gear:

44. Press inner race of cylinder bearing on drive shaft, install spacer sleeve and thrust ring and press the inclined bearing on (Fig. H 3a/44). **Press against the inner race only!**
45. After shoulder ring and cover with pressed-in grease retainer have been put on, provide keyways of bevel drive gear shaft with heat-resistant grease and press universal joint flange on. Place lock plate on nut and screw nut in place.

46. Place drive gear assembly with universal joint flange on holding wrench 180 589 09 07 clamped into a vise, and tighten slotted nut to 14–16 mkg (100–115 ft.lb.). (See Fig. H 3a/46).

Check lateral out of true of universal joint flange. The permissible lateral out of true at the outer diameter of the flange is 0.03 mm (0.0012"). See also Operation No. G 3/73.

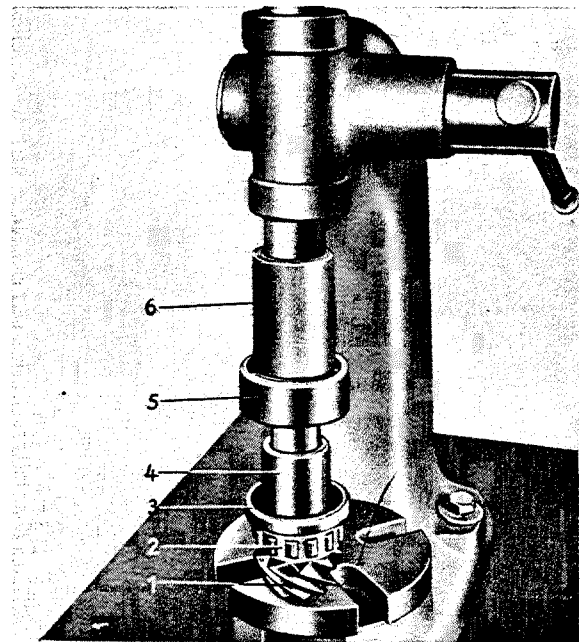


Fig. H 3a/44

- | | |
|--------------------|----------------------|
| 1 Bevel drive gear | 4 Spacer sleeve |
| 2 Cylinder bearing | 5 Inclined bearing |
| 3 Thrust ring | 6 Pressing-on sleeve |

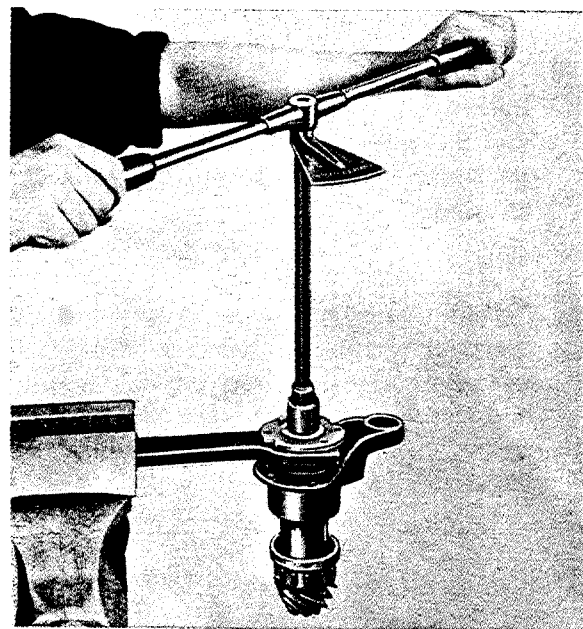


Fig. H 3a/46

Pean lock plate into groove of universal joint flange and slotted nut.

Rear Axle Housing:

47. Install rear snap ring with hook into the housing watching out for proper seat in the groove!

The hook must engage the groove cast into the housing (Fig. H 3a/47).

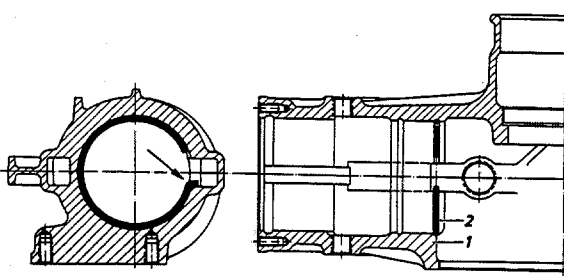


Fig. H 3a/47

1 Rear axle housing 2 Snap ring

Press outer race of cylinder bearing in with punch 120 589 00 39 and install front snap ring. Make sure that the ring is properly seated in the groove.

48. Turn the two side adjusting screws about halfway in, so that the thrust ring will contact the screws when the mounted bevel gear shaft is inserted into the rear axle housing.

49. Place an adjusting washer of any thickness on cover of mounted bevel drive gear; insert bevel drive gear into rear axle housing and screw in place. Turn the two adjusting screws in until they fit snugly against the thrust ring (Fig. H 3a/49).

50. Press outer ring of bevel roller bearing into the housing by means of punch 180 589 00 39 and turn threaded ring in by three threads.

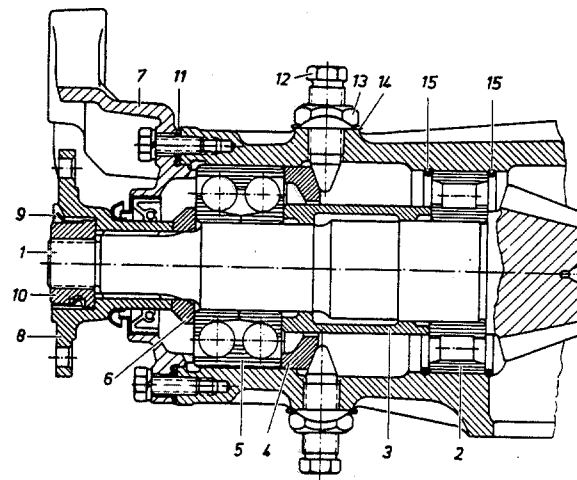


Fig. H 3a/49

- | | |
|---|------------------------------------|
| 1 Bevel drive gear | 8 Universal joint flange |
| 2 Cylinder bearing | 9 Lock washer |
| 3 Spacer sleeve | 10 Slotted nut |
| 4 Thrust ring | 11 Adjusting washer |
| 5 Inclined bearing | 12 Adjusting screw for thrust ring |
| 6 Shoulder ring | 13 Hexagonal nut |
| 7 Cover with pressed-in grease retainer | 14 Lock plate |
| | 15 Snap ring |

Adjustment of Bevel Gear Drive:

51. 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. The back of the ring gear bears the ratio as well as the installation dimensions (Fig. H 3a/51).

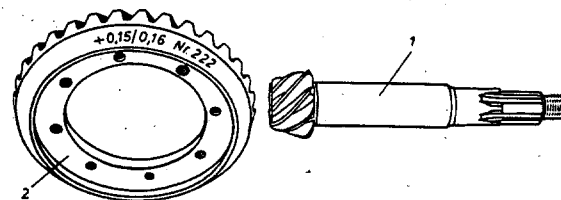


Fig. H 3a/51

1 Bevel drive gear 2 Ring gear

When the two installation dimensions specified on the ring gear are adhered to, optimum running properties of the gear set will be obtained.

To make the adjustment, proceed as follows:

52. Set tool 180 589 01 23 to zero position by means of the adjusting disc having a diameter of 108.00 mm (4.25"). See Fig. H 3a/52.

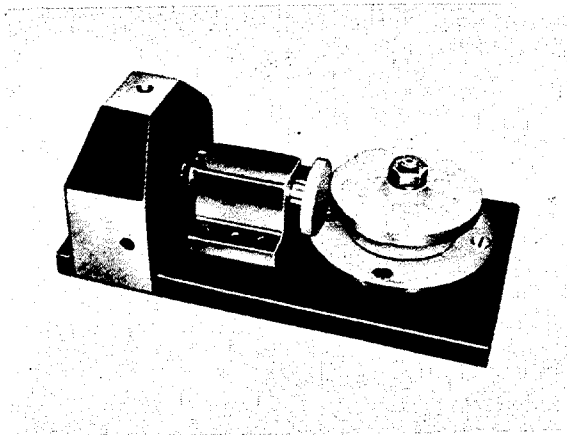


Fig. H 3a/52

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.

53. Exchange the measuring disc on tool 180 589 00 23 for a bracket with gauge holder 180 589 00 23 and a dial gauge 000 589 14 21. Clamp the dial gauge so in place that it is preset to 1 mm (0.04"). 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 3a/53).

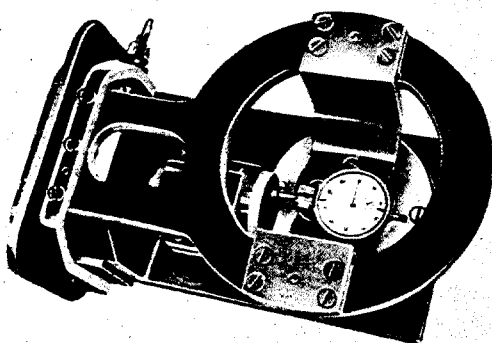


Fig. H 3a/53

54. Install bracket with gauge holder and dial gauge into the housing (Fig. H 3/54).

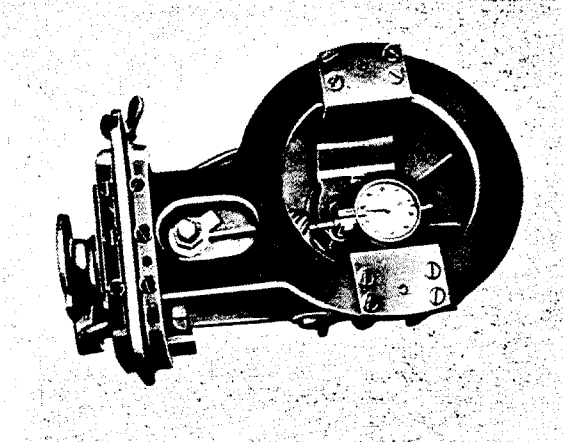


Fig. H 3a/54

Adjust the distance from bevel gear shaft to ring gear as fixed on the test tool and stated on the ring gear.

Proceed as follows:

Example 1

Specified distance + 0.23 mm (0.00901").

As the dial gauge is preset to 1 mm (0.0394"), it must read 1.23 mm (0.04842") after the adjustment has been effected. (The hand of the dial gauge moves in clockwise direction).

Example 2

Specified distance — 0.23 mm (0.00901").

As the dial gauge is preset to 1 mm (0.0394"), it must read 0.77 mm (0.0303") after the adjustment has been effected. (The hand of the dial gauge moves in anti-clockwise direction).

The adjusting tolerance is ± 0.01 mm (0.0004").

For adjusting the distance, 1.0 to 2.0 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.

55. Screw threaded ring on left-hand rear axle tube all the way in and press outer race of bevel roller bearing in with punch 180 589 04 39.

56. Install differential housing and bolt left-hand rear axle tube to rear axle housing.
57. Tighten threaded ring in left-hand rear axle tube with wrench 180 589 02 07 until the play of the bevel gear has been eliminated. Then back threaded ring off by three or four grooves. The grooves of the threaded ring are visible through the lock screw hole.

Note: The tightening of the threaded ring in the left-hand rear axle tube with wrench 180 589 02 07 is only possible before the grease retainer is installed in the rear axle tube.

58. Tighten right-hand threaded ring with wrench 180 589 00 07.
59. Measure the tooth backlash with tool 190 589 01 21 (Fig. H 3a/59).

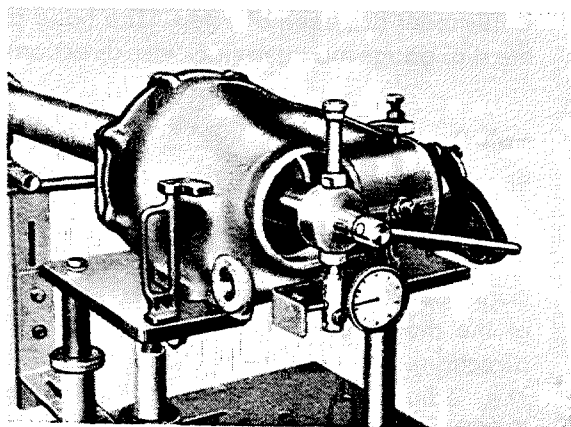


Fig. H 3a/59

To adjust the backlash, turn the threaded rings with wrenches 180 589 02 07 and 180 589 00 07.

Proceed as follows:

- a) Lock bevel gear with a clamping screw.

- 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 176 mm (6.93"); it must be identical with the backlash engraved on the back of the ring gear.

The diameter of 176 mm (6.93") is marked on the try square. Make the check at four points of the ring gear circumference. The smallest value shall govern. To increase or reduce the tooth backlash, turn the threaded rings clockwise or anti-clockwise as required.

60. **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, the adjustment must be made solely after the bearing impression. This, however, can only be done by qualified and experienced mechanics.

To make an impression, remove the left-hand rear axle tube again and take the differential housing out.

Paint about five teeth of the ring gear on either side with blue paint that has been thinned with oil, install differential housing again and bolt left-hand rear axle tube in position.

Attach a crank to the universal joint flange. As you turn the ring gear, brake it simultaneously. Take differential housing out again, check impression and correct the adjustment, if necessary.

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

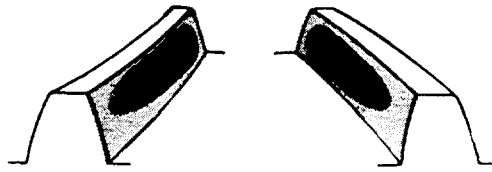


Fig. H 3a/60

Too high tooth contact

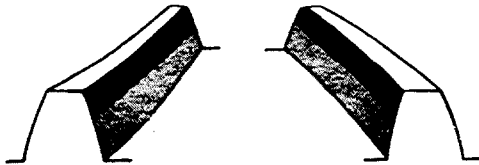


Fig. H 3a/60a

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

Too low tooth contact

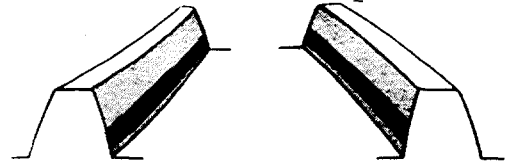


Fig. H 3a/60b

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

If other impressions result, such as crosswise 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.

61. For final assembly coat flange on left-hand rear axle tube with a sealing compound, and bolt rear axle tube in place.
62. Take bevel gear shaft out again, provide adjusting washer with a sealing compound, and insert bevel gear shaft finally into the housing supported on the assembly stand. Tighten the cover.
63. Coat adjusting screws with a sealing compound; tighten the screws first to 2.0 mkg (14 ft.lb.), then to 3.5 mkg (25 ft.lb.). Arrest adjusting screws with check nuts and secure them (use new lock plates).
64. Tighten right-hand threaded ring with wrench 180 589 00 07 and a torque wrench to 6–7 mkg (43.5–50.5 ft.lb.). Check tooth backlash again (0.16–0.20 mm = 0.0063–0.008") and secure right-hand threaded ring. Secure the left-hand threaded ring by screwing in the trunnion screw at top of

rear axle tube. Tighten the screw and knock the lock plate up.

65. Bolt sliding joint to right-hand rear axle shaft in differential housing by means of the tightening screw (Fig. H 3a/65). Be careful not to interchange the adjusting washer which has been selected previously (see Operation No. H 3a, cf. 40).

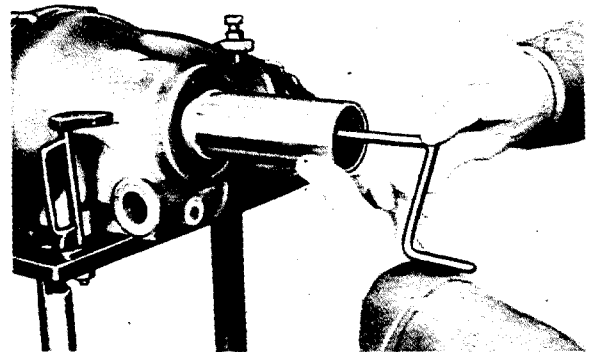


Fig. H 3a/65

66. Attach rubber boot to rear axle housing. The large bulge of the eccentric boot must be at top (see Fig. H 3a/69).
67. Place right-hand rear axle tube on rear axle housing and fasten it temporarily by means of punch 180 589 08 39. The adjusting washers between fork of rear axle tube and rear axle housing must fit tightly. The overall

play should by no means exceed 0.1 mm (0.004"). If possible, adjusting washers of equal thickness should be installed on either side.

The adjusting washers are available with the following thicknesses: 1.90 mm, 2.00 mm, 2.10 mm, 2.20 mm (0.075, 0.079, 0.083, 0.087 in.) and, in case the eyelets on the rear axle tube had to be remilled, 2.50 mm (0.098").

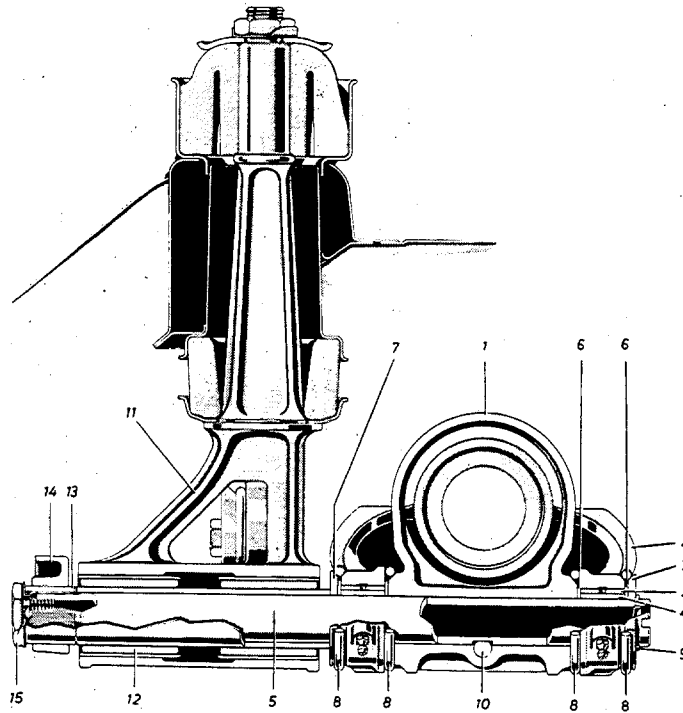


Fig. H 3a/67

- | | | |
|-----------------------------|---------------------------------|------------------------------------|
| 1 Rear axle housing | 7 Shim | 12 Silent block |
| 2 Right-hand rear axle tube | 8 Rubber ring | 13 Spacer sleeve |
| 3 Bushing in rear axle tube | 9 Lock ring | 14 Cover |
| 4 Connecting pin sleeve | 10 Wedge-type screw | 15 Hexagonal screw with lock plate |
| 5 Connecting pin | 11 Rear axle suspension support | |
| 6 Adjusting washer | | |

Note: Before the adjusting washers are installed, the inner rubber rings must be placed in position.

68. Install rear connecting pin sleeve into the rear axle tube.
69. Grease pin lightly, install adjusting washer and rear shim and mount lock ring. Then insert connecting pin until the splines become visible on the opposite side. Install front connecting pin sleeve, adjusting washer, rubber ring and shim (Fig. H 3a/69).

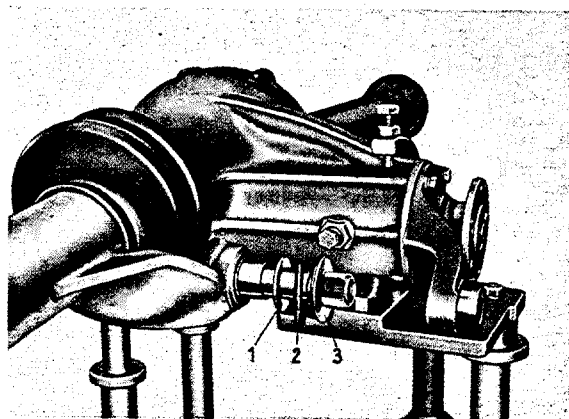


Fig. H 3a/69

- | | | |
|--------------------|---------------|--------|
| 1 Adjusting washer | 2 Rubber ring | 3 Shim |
|--------------------|---------------|--------|

The chamfered sides of the shims must face the rear axle tube.

70. Place rear axle suspension support in position with silent block mounted, but not yet tightened, and drive connecting pin through. The groove in the connecting pin must be strictly horizontal, as otherwise the wedge-type screw cannot be installed properly (Fig. H 3a/70).

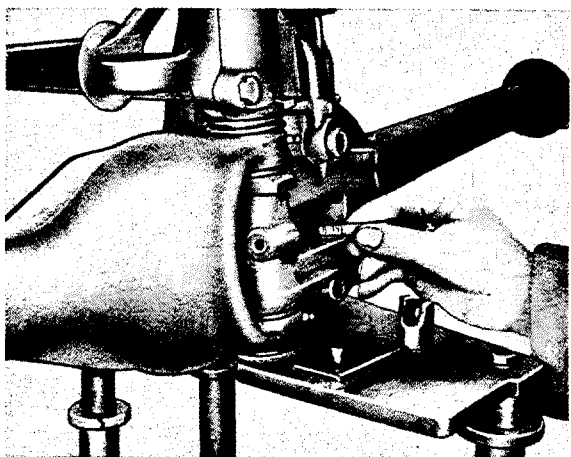


Fig. H 3a/70

Note: The silent blocks of the present design are no longer provided with a splined front end. Instead the rear end of the spacer sleeve is splined.

When an old silent block is to be exchanged for a block of the new design, the block and the spacer sleeve must be replaced together. When installing the silent block into the support be sure that the projecting end of 6 mm (0.24") points towards the rear (Fig. H 3a/70a).

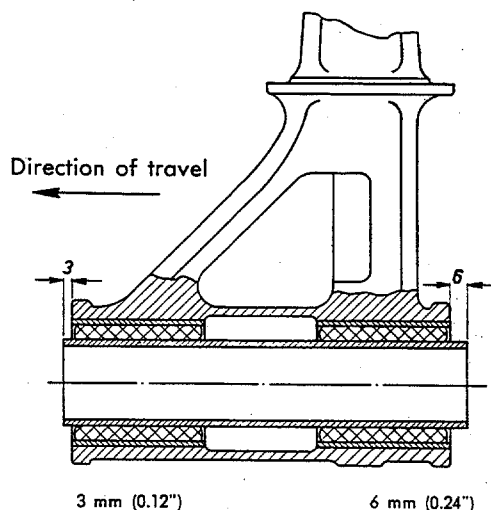


Fig. H 3a/70a

71. Press splined spacer sleeve on front end of connecting pin, install lock washer and tighten hexagonal screw with a torque wrench to 12–14 mkg (87–100 ft.lb.). Secure the screw by bending the lock washer.
72. **Only now tighten the wedge-type screw.**
73. Fasten rubber boot with hose bands.
74. Check distance between front end of universal joint flange and center of rear axle suspension support. It should be 131 ± 1 mm (5.16 ± 0.04 "). In actual practice the distance to the collar (103.5 ± 0.5 mm = 4.07 ± 0.02 ") is checked with gauge 180 589 04 23 (Fig. H 3/73).

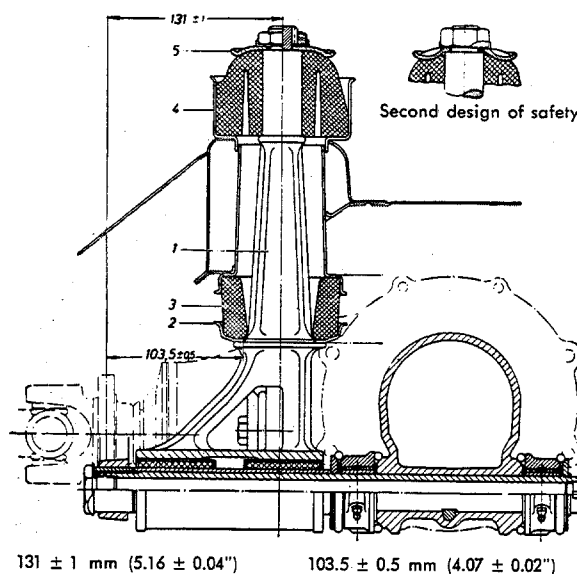


Fig. H 3/73

Deviations from these specifications can be corrected by displacing the support on the silent block or by exchanging the outer adjusting washers. After the correction has been made, tighten the support with the two hexagonal screws.

Rear Axle Tubes:

75. Press a new grease retainer into the rear axle tube by means of punch 180 589 03 39. The retainer must be pressed in up to the collar to prevent any damage to the sealing ring (Fig. H 3a/75).
76. Press new grease retainer into sealing holder by means of punch 120 589 05 39.

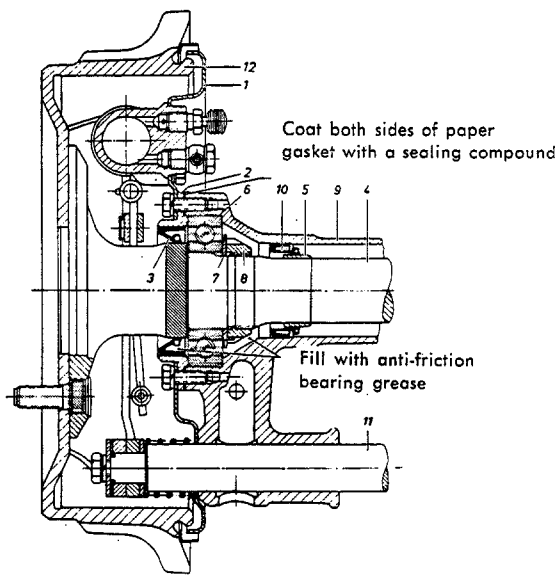


Fig. H 3a/75

- | | |
|---------------------------|--------------------|
| 1 Brake anchor plate | 7 Lock washer |
| 2 Sealing holder | 8 Slotted nut |
| 3 Grease retainer | 9 Rear axle tube |
| 4 Rear axle shaft | 10 Grease retainer |
| 5 Ring | 11 Supporting tube |
| 6. Grooved collar bearing | 12 Brake drum |

77. Clamp rear axle shaft and push brake anchor plate and sealing holder with grease retainer on rear axle shaft. Use insertion sleeve 120 589 00 61 to ensure that the grease retainer will not be damaged.
78. Press ball bearing on rear axle shaft, put on lock plate (collar facing inner race of ball bearing) and tighten slotted nut forcefully by means of wrench 136 589 09 07 (Fig. H 3a/78).

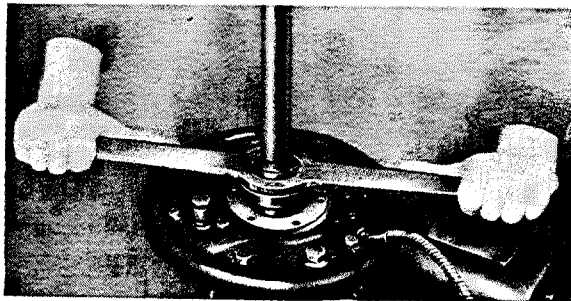


Fig. H 3a/78

Peen lock plate into grooves of slotted nut (Fig. H 3a/78a).

79. Provide **both sides** of the paper gasket with a sealing compound and place gasket on sealing holder towards the rear axle tube side.

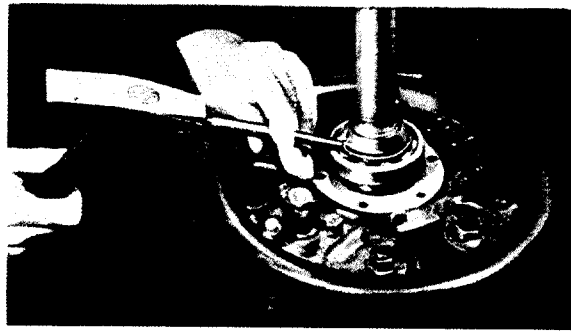


Fig. H 3a/78a

80. Press rear axle shaft into rear axle tube (before this is done, provide ball bearing with oil and fill hollow space between the two grease retainers with anti-friction bearing grease, (see Fig. H 3a/75) and bolt brake anchor plate in place.

Note: When the right-hand rear axle shaft is inserted, the sliding joint must be held in horizontal position.

81. Bolt cable roller housing of hand brake cable to brake anchor plate.
82. Screw both wheel brake cylinders and brake lines in place. (In connection with the hollow screws use only copper sealing rings).
83. Mount brake shoes, attach hand brake cable, install brake drums and fasten them with a wheel nut.
84. Install tightening washer (wheel side) and press torque arms with pressed-in rubber bearings (provide with talcum) on supporting tube. Put on second tightening washer and lock plate and tighten hexagonal screw forcefully.

Note: Press the torque arm on in such a way that its front end is at the same level with the center of the universal joint flange (Fig. H 3a/84).

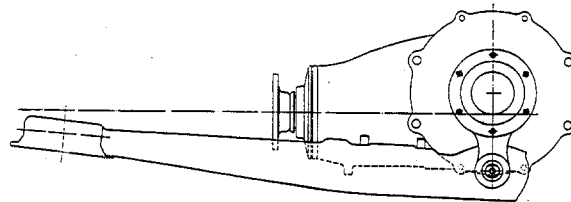


Fig. H 3a/84

85. Fill 2.25 liters (4.75 US pints, 4.0 Imp. pints) of SAE 90 hypoid oil into the rear axle.