

STEERING

Two types of steering are fitted at the present time, the "ZF One-finger" as well as "ZF" Gemmer steering. Steerings are interchangeable one with another, the design of steering mechanism remains the same. Both drag rod halves are operated by two drop arms, the left drop arm is fitted to the steering, the right one to the drop arm bracket; operation by means of a tie rod (cross tube) of unalterable length.

Steering adjustment in connection with a control of the entire steering geometry and kinematics is again thoroughly described in group R - Wheel Measurement. Driving security depends on the correct adjustment of the steering. Steering in connection with wheel position can influence road holding and tyre wear considerably. We recommend to pay special attention to the adjustment of steering, see group L, and wheel measurement, group R.

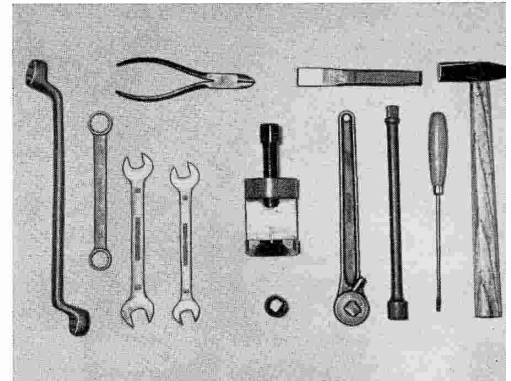
Make	ZF One-finger	ZF Gemmer
Type	Type L 542	Type GA 15
Gearing on the average	1 : 14.27	1 : 15.43
Steering lock	inner 42°	inner 42°
	outer 32°	outer 32°

GROUP L. STEERING

L1. Removal and reassembly of steering

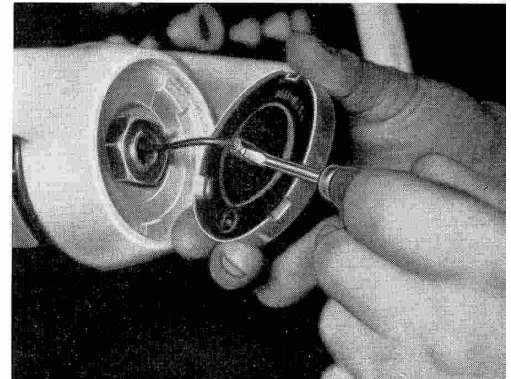
Tools: Ring spanner 27, 17 mm, spanner 17, 14 mm, socket 17 mm with extension and ratchet, side cutting nippers, hammer, chisel, screwdriver 3 mm, extractor WK 141.

Figure 1



1. Lift out horn button. (See also V 1, figure 2)
(Insulated screwdriver)
2. Disconnect horn cable and pull out underneath.
(Insulated screwdriver)

Figure 2



3. Separate rubber joint disk from steering and steering column, bend up lock plate and remove bolts.
(Hammer, chisel, 2 spanners 14 mm)

Figure 3



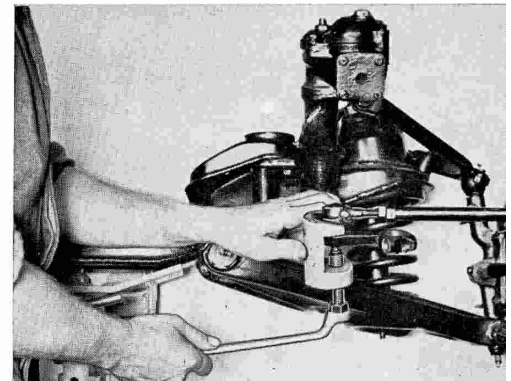
Caution: Steering flange (joint disk) remains on steering, care must be taken that rubber ring seal 55.27 - 61 is in the bore of the joint disk when re-assembling.

4. Remove split pin and undo ball pin nut of left drag rod on drop arm.
(Side cutting nippers, ring spanner 17 mm)

Caution: Loosen drag rod under spring tension only, i. e. under load, as otherwise ball pin caps are too much under tension.

5. Pull off drag rod from drop arm.
(Extractor WK 141, ring spanner 27 mm)

Figure 4



6. Remove split pins and undo steering nuts.
(Side cutting nippers, ring spanner 17 mm, spanner 17 mm)

7. Lift out steering with drop arm.

Reassembly of steering in reversed sequence.

L 2. Basic adjustment of steering

(Control work)

To coincide the straight line position on steering box as well as the horizontal position of the two-spoke steering wheel the following controls are necessary:

1. Control front wheels by rectangle and diagonal measurement with drop arm and turn drop arm for straight line position.
 - a) The distance - punch mark left drop arm and punch mark right drop arm as well as ball pin center drag rod resp. punch mark ball pin bolt right and left on left resp. right drop arm must be of equal length. Correct length: $691 \text{ mm} \pm 2 \text{ mm}$ or $27 \frac{13}{64}'' \pm \frac{5}{64}''$.

Figure 5

- b) With diagonal measurement left drop arm centre of motion right tie rod eye resp. punch mark position and right drop arm centre of motion resp. left tie rod eye an equal measure must be present, admissible divergence up to 2 mm or .0787".

Figure 6

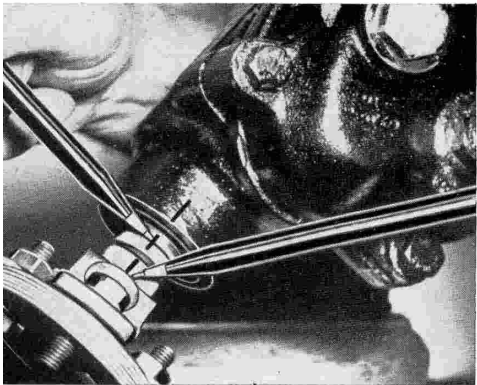
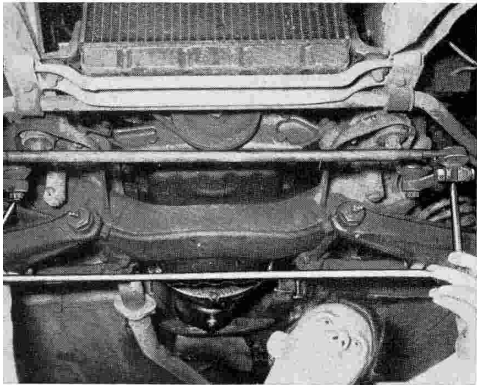
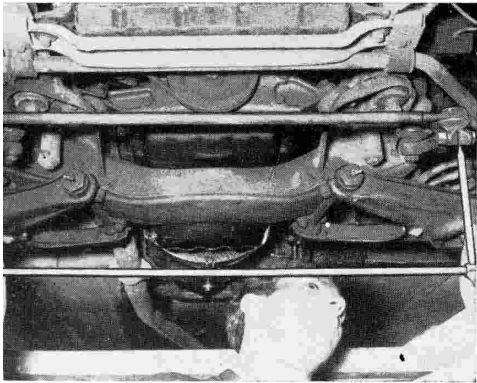
2. In this position the steering must be without play and the spokes of the steering wheel must be exactly in horizontal position if clearances in steering box are correctly adjusted (See L 3 a Figure 16 and L 3 b Figure 23)
3. In case of non-coincidence it must be controlled if assembly steering - steering column via rubber joint disk has the correct position.

Figure 7

This position is marked by a location mark on both clutch flange and steering column splining.

4. If no coincidence of the 3 points mentioned under 1, the clutch flange must be undone and transposed by one tooth to bring about horizontal position of the steering wheel.

Figure 8



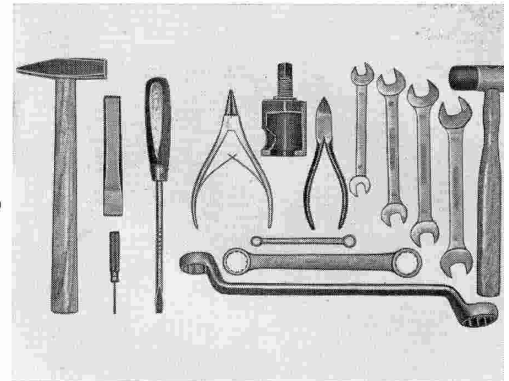
L 3 a. "ZF" Ross steering

Dismantling and reassembling

Steering removed, according to L 1

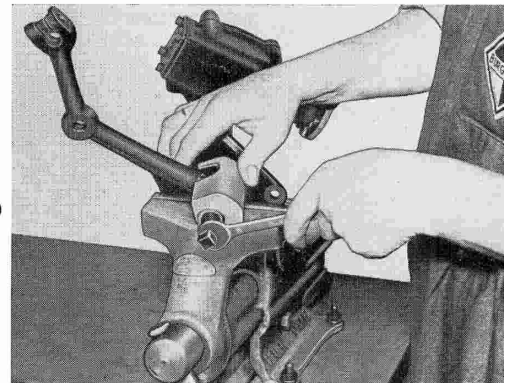
Tools: Ring spanner 10, 22, 30 mm, spanner 10, 14, 17, 19 mm, hammer, chisel, plastic head hammer, side cutting nippers, circlip "Seeger" pattern pliers, screwdriver, extractor WK 142.

Figure 9



1. Undo drain plug, drain oil.
(Ring spanner 22 mm)
2. Clamp steering box in vice.
3. Remove split pin and undo finger lever shaft nut.
(Side cutting nippers, ring spanner 30 mm)
4. Pull off drop arm.
(Extractor WK 142/1, left, spanner 14 mm)

Figure 10



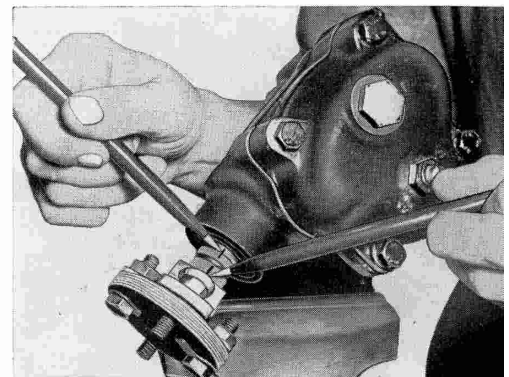
5. Caution: When reassembling steering drop arm watch tooth position. Tooth space (gash) of drop arm must coincide with broad tooth of steering. (See also V 3 Figure 13)

Undo clutch flange from upper steering column.
(Spanner 10 mm, ring spanner 10 mm)

6. Pull off clutch from lower steering column.

Caution: When reassembling, care must be taken that slot on clutch and locating mark on lower steering column coincide.

Figure 11



7. Undo housing cover.
(Spanner 14 mm)

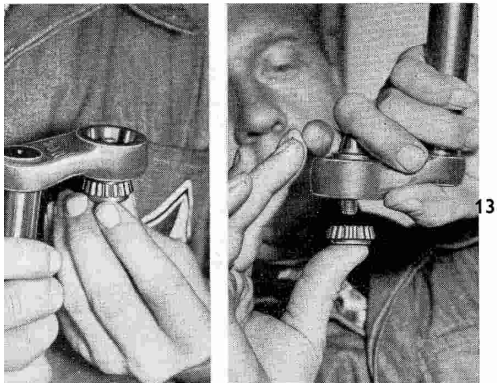
Caution: Bolts have different length. Sealing washers belong under long bolts.

8. Lift out complete finger lever shaft.
9. Dismantling and reassembling of finger lever shaft.
 - a) Bend up lock plate under steering finger nut.
(Hammer, chisel)
 - b) Undo nut.
(Spanner 17 mm)
 - c) Drive out steering finger downwards.
(Plastic head hammer)

Caution: When reassembling stick at first 16 Timken rollers on stiff grease of steering finger. Place the thicker end of each roller on the thicker end of the cone inner race.

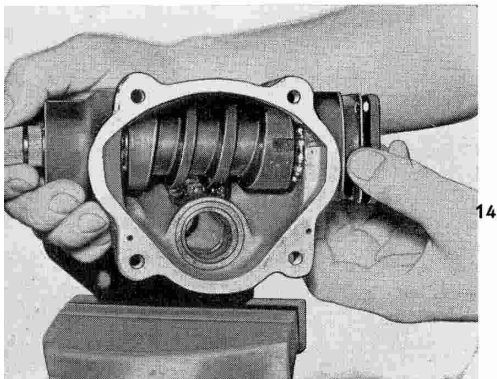
Figure 12





Put finger lever shaft from above on Timken bearing, turn together at 180° and put free roller race with rollers stuck on in the same manner from below on finger.

Figure 13

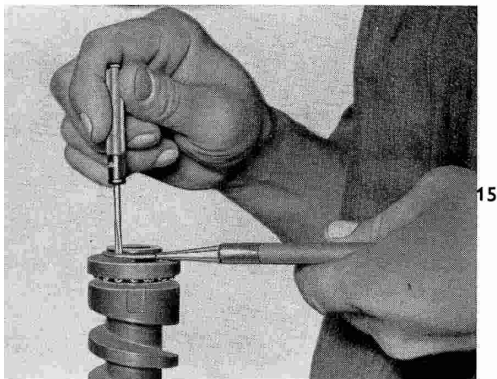


Press finger and roller race together, insert lock plate ring and screw on nut. Tighten nut as far as the finger can still be turned with nut. Secure nut with lock plate.
(Spanner 17 mm, hammer, chisel)

10. Unscrew oil level tube with adjusting flange.
(Ring spanner 10 mm)

Caution: When reassembling set ball bearing for steering shaft with suitable shims on correct tension. Steering shaft must be an easy fit so that it can be turned by hand, it should have no play but must not jam.

Figure 14

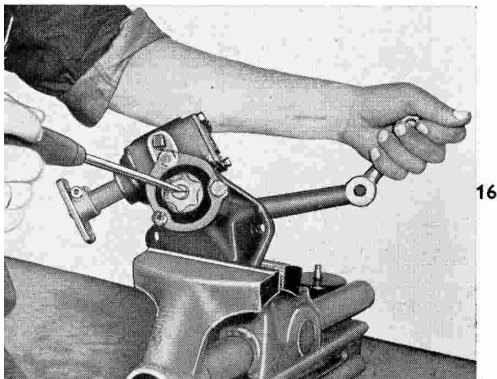


11. Remove seal ring on oil level tube.
(Screwdriver)

Caution: When reassembling, place sealing ring with suitable shims so high that the sealing ring is pressed close.

12. Lift out drop arm with worm.
13. Remove ball races by opening circlips.
(Circlip type pliers, small screwdriver)

Figure 15



Reassembly in reverse sequence. When reassembling adjust with adjusting screw so that steering is exactly in centre position. (Notch on housing and steering shaft must coincide).
The steering shaft should not have any play and must not jam. When turning toward the right or left play must make itself felt. When correctly adjusted, very little play must begin 5 to 6 teeth on steering shaft when turning toward the right or left, seen from mark.
Undo securing nut and adjust adjusting screw with screwdriver. Tighten securing nut again after adjustment.
(Large screwdriver, spanner 19 mm)

Figure 16

Fill up steering before fitting to vehicle with 150 ccs gear oil SAE 90.

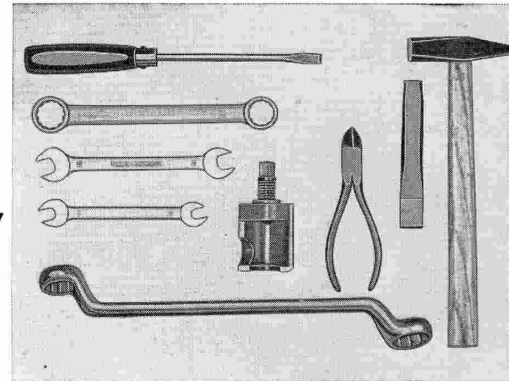
L 3 b. "Gemmer" Steering
dismantling and reassembling

Steering removed according to L 1

Tools: Ring spanner 22, 30 mm, spanner 10, 14 mm,
side cutting nippers, hammer, chisel, plastic
head hammer, extractor WK 142/1 left.

Figure 17

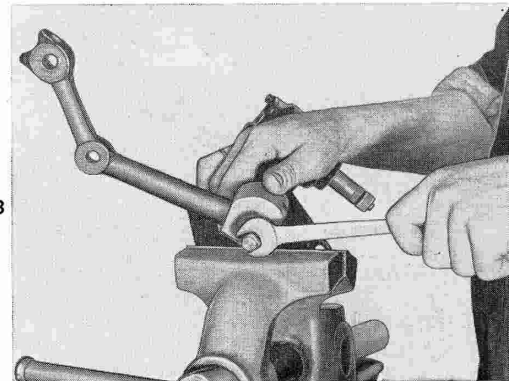
17



1. Undo oil plug, drain oil.
(Spanner 10 mm)
2. Clamp steering in vice.
3. Remove split pins and undo steering shaft nut.
(Side cutting nippers, ring spanner 30 mm)
4. Pull off drop arm.
(Extractor WK 142/1 left, spanner 14 mm)

Figure 18

18

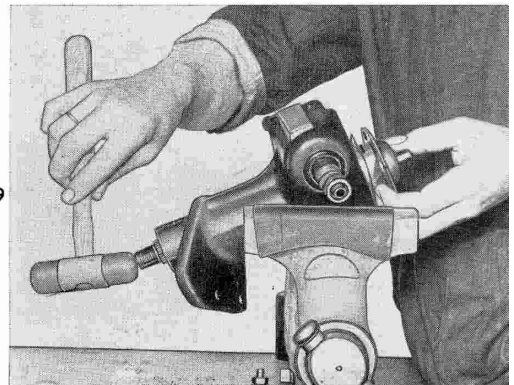


Caution: When reassembling, pay attention to position of drop arm - steering. Tooth space (gash) in drop arm must coincide with broad tooth on steering shaft.
(See also V 3 Figure 13)

5. Remove adjusting nut, lock plate and seal ring.
(Ring spanner 22 mm)
6. Unscrew housing cover.
(Spanner 14 mm)
7. To loosen cover tap steering shaft end slightly with plastic head mallet and remove together with steering shaft at the same time.
(Plastic head mallet)

Figure 19

19

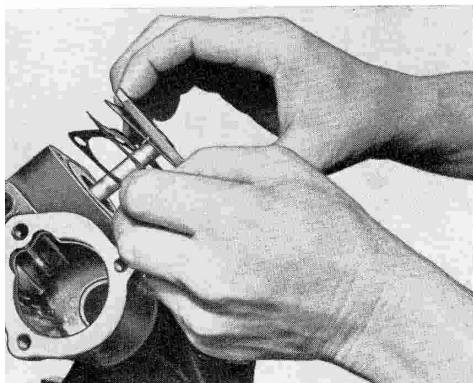


Caution: When reassembling push on an adjusting screw with guide washer (Select for fit) on steering shaft and screw on cover.

Figure 20

20



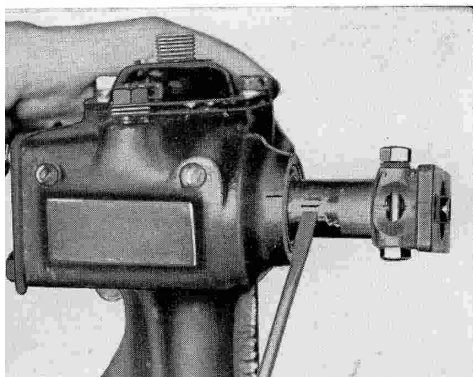


21

8. The steering shaft bolt is pressed in its guide and riveted. Therefore the steering roll can only be renewed or replaced together with the steering shaft.
9. Bend up locking plates for bolts on adjusting flange. (Hammer, chisel)
10. Undo bolts on adjusting plate. (Ring spanner 10 mm)
11. Remove adjusting flange.

Caution: When reassembling bearing for steering shaft with worm, set same on tension by fitting shims in suitable number. Shaft must be an easy fit so that it can be turned by hand.

Figure 21



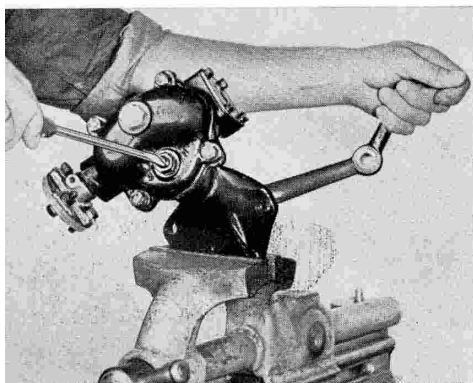
22

12. Drive out steering shaft upwards. (Plastic head mallet)

Caution: When reassembling insert feltring between oil level tube and shaft.

Reassembly in reversed sequence. When reassembling pay attention that the slot on shaft coincides with the mark on housing with steering in centre position.

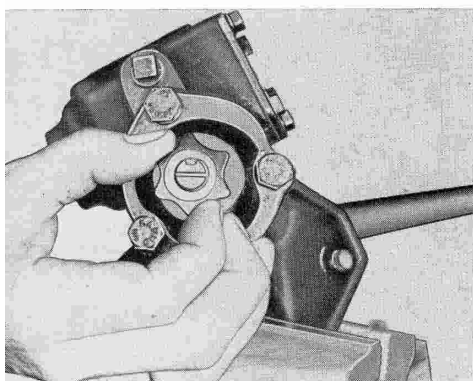
Figure 22



23

Adjustment by adjusting screw in centre position, without clearance.

Figure 23



24

After this adjustment the adjusting screw is exactly adjusted by the external tothing of lock plate and is secured again by cap nut. Insert locking plate in such a way that the stamped in inscription "Aussen" (Outside) can be seen.

Figure 24