



**REPAIR MANUAL  
DRIVEN FRONT AXLE  
MT14/MT17 SERIES**

**MARMON-HERRINGTON ALL-WHEEL DRIVE**

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# SECTION 202

## CONTENTS

SECTION	SECTION NO.	PAGE
FORWORD .....	203	5
DRAWING OF THE DRIVEN FRONT AXLES TYPE MH MT14/MT17 .....	204	6
TECHNICAL DATA .....	205	9
WHEEL BRAKE .....		12
ANTIFRICTION BEARINGS .....		13
SEALS .....		14
TORQUE RATINGS .....	206	15
WHEEL DRIVE; WHEEL HUB, AXLE HOUSING .....		15
WHEEL BRAKE .....		16
DIFFERENTIAL CARRIER HEAD .....		16
ADJUSTMENT DATA .....	207	18
WHEEL HUB .....		18
STEERING KNUCKLE .....		18
WHEEL BRAKE .....		18
DIFFERENTIAL CARRIER HEAD .....		19
GENERAL SERVICE INSTRUCTIONS .....	209	29
WHEEL DRIVE; WHEEL HUB .....		29
KNUCKLE HOUSING .....		29
WHEEL BRAKE .....		29
DIFFERENTIAL CARRIER HEAD .....		30
GENERAL INSTRUCTIONS .....		31
WHEEL DRIVE, WHEEL HUB		
WHEEL DRIVE, WHEEL HUB SECTIONAL VIEW .....	210	32
PARTS OF THE WHEEL DRIVE, WHEEL HUB .....	211	33
REMOVING AND REINSTALLING THE WHEEL DISK .....	212	35
REMOVING AND REINSTALLING THE BRAKE DRUM .....	213	35



**WHEEL DRIVE, WHEEL HUB (continued)**

REMOVING AND REINSTALLING THE END-COVER .....	214	35
REMOVING AND REINSTALLING THE PINION		
CARRIER, ADJUSTING THE AXLE-SHAFT CLEARANCE .....	220	36
DISASSEMBLING AND REASSEMBLING THE PLANETARY GEAR .....	221	37
REMOVING AND REINSTALLING THE SUN GEAR .....	222	38
REMOVING AND REINSTALLING THE WHEEL HUB .....	223	38
ADJUSTMENT OF AXIAL PLAY .....	224	39
DISASSEMBLING AND REASSEMBLING THE RING GEAR SUPPORT .....	225	42
INSTALLATION INSTRUCTIONS FOR PARTS OF ANTI-LOCKING SYSTEM .....	229	44

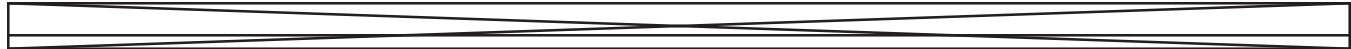
**FRONT AXLE HOUSING**

REMOVING AND REINSTALLING THE TIE-ROD, ADJUSTING THE TOE-IN AND THE WHEEL TURN ANGLES .....	241	46
REPAIRING TIE ROD .....	242	49
DISASSEMBLING AND REASSEMBLING THE KNUCKLE HOUSING AND THE SPINDLE .....	243	50
DISASSEMBLING AND REASSEMBLING THE DOUBLE-JOINT AND THE KNUCKLE SUPPORT .....	244	51
REMOVING AND REINSTALLING ADJUSTING, THE STEER ARMS, THE BRAKE CHAMBER HOLDER AND THE TIE-ROD ARMS .....	245	52
ASSEMBLING THE DOUBLE-JOINT (REPLACING THE AXLE-SHAFT) .....	246	54
REMOVING AND REINSTALLING THE INNER BEARING AND FASTENERS OF THE SPINDLE TRUNNION .....	247	58

**FRONT WHEEL BRAKE**

DRAWING OF THE FRONT WHEEL BRAKE .....	260	62
PARTS OF THE FRONT WHEEL BRAKE .....	261	62
REMOVING AND REINSTALLING THE BRAKE SHOES .....	262	63
REPAIRING THE BRAKE SHOES AND THE BRAKE DRUM .....	263	63
REMOVING AND REINSTALLING THE BRAKE BRACKET, ASSEMBLING THE SPRING SUPPORTING PIN .....	264	67
REMOVING AND INSTALLATION OF THE BRAKE LEVER AND THE CAMSHAFT .....	265	69
REPAIRING THE CAMSHAFT BEARING SUPPORT .....	266	70
MANUAL SLACK ADJUSTER AND ITS ASSEMBLING .....	267	72
AUTOMATIC SLACK ADJUSTER .....	268	73





## **DIFFERENTIAL CARRIER ASSEMBLY**

<b>DIFFERENTIAL CARRIER ASSEMBLY DIFFERENTIAL SECTIONAL VIEW .....</b>	<b>310</b>	<b>75</b>
<b>PARTS OF THE DIFFERENTIAL CARRIER ASSEMBLY .....</b>	<b>311</b>	<b>77</b>
<b>REMOVING AND REINSTALLING THE DIFFERENTIAL CARRIER ASSEMBLY .....</b>	<b>312</b>	<b>78</b>
<b>REMOVING AND REINSTALLING THE COMPANION FLANGE AND THE COVER .....</b>	<b>313</b>	<b>80</b>
<b>REMOVING AND REINSTALLING THE DIFFERENTIAL, ADJUSTING THE BACKLASH AND THE CONTACT PATTERN .....</b>	<b>314</b>	<b>83</b>
<b>DISASSEMBLING AND REASSEMBLING THE DIFFERENTIAL .....</b>	<b>315</b>	<b>89</b>
<b>DISASSEMBLING AND REASSEMBLING THE BEARING CAGE, ADJUSTING THE CENTER DISTANCE .....</b>	<b>316</b>	<b>92</b>
<b>DISASSEMBLING AND REASSEMBLING THE BEARING CAGE .....</b>	<b>317</b>	<b>94</b>
<b>REPAIRING, REINSTALLING AND ADJUSTING DIFFERENTIAL LOCK .....</b>	<b>318</b>	<b>99</b>
<b>OIL FILL-UP, RUN, CHECK .....</b>	<b>395</b>	<b>102</b>



## FOREWORD

This publication “GENERAL REPAIR INSTRUCTIONS” was prepared for workshops and contains all the necessary assembly instructions as well as data to be checked and adjusted during repair, with the knowledge of which repair and adjustment of the MARMON-HERRINGTON MT14/MT17 type driven front axles.

For technical data on the specific type versions of the M-H MT14/MT17 type driven front axles refer to the publication “TECHNICAL DATA”, while for the spare parts of that “PARTS CATALOG” grouped according to the Type.

The “GENERAL REPAIR INSTRUCTIONS” contain sections divided into the technical data and the service instructions of the axle. The sections of the service instructions contain the disassembly and re-assembly operations of the individual assembly unit, stating the special tools to be used.

The serial numbers of the figures are started from the beginning in each section. The item

numbers of the figures for an assembly unit are referred to in each section dealing with the assembly procedures.

The manufacturer shall not be liable for warranty claims on damages resulting from negligence of the general service practice required for normal service operations but not contained in this Manual.

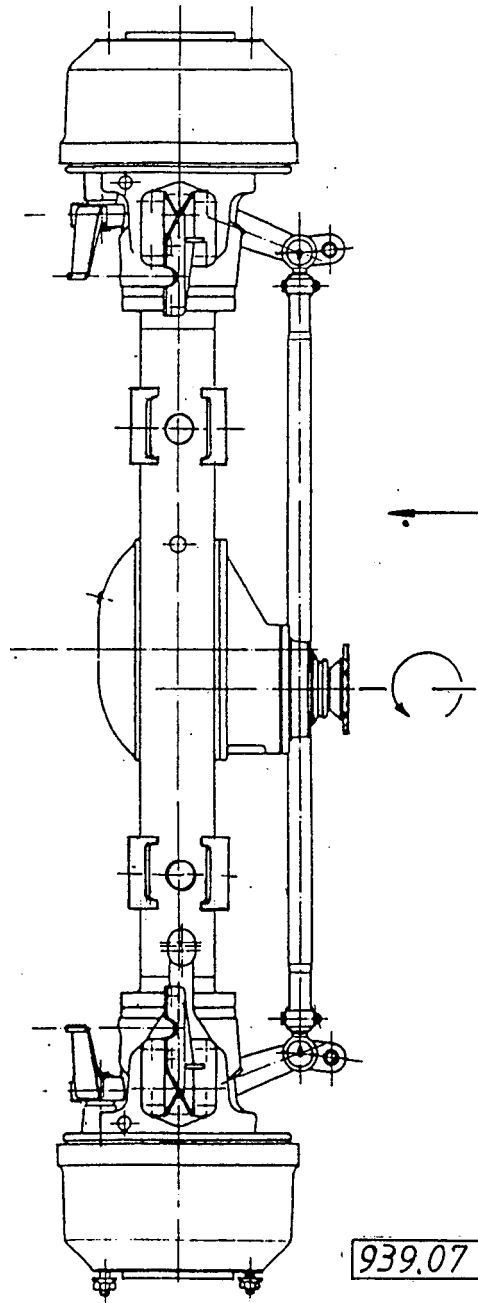
For replacing assembly units or individual parts use ONLY genuine M-H MT14/MT17 made products.

## RIGHTS FOR ALTERATIONS RESERVED!

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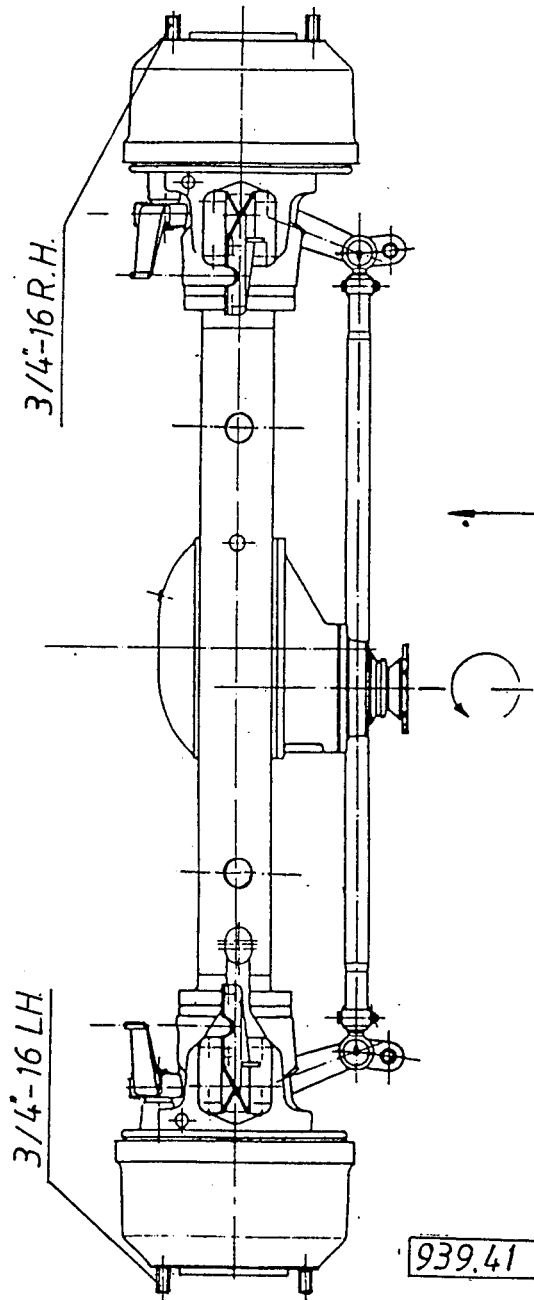


## DRAWINGS OF AXLES



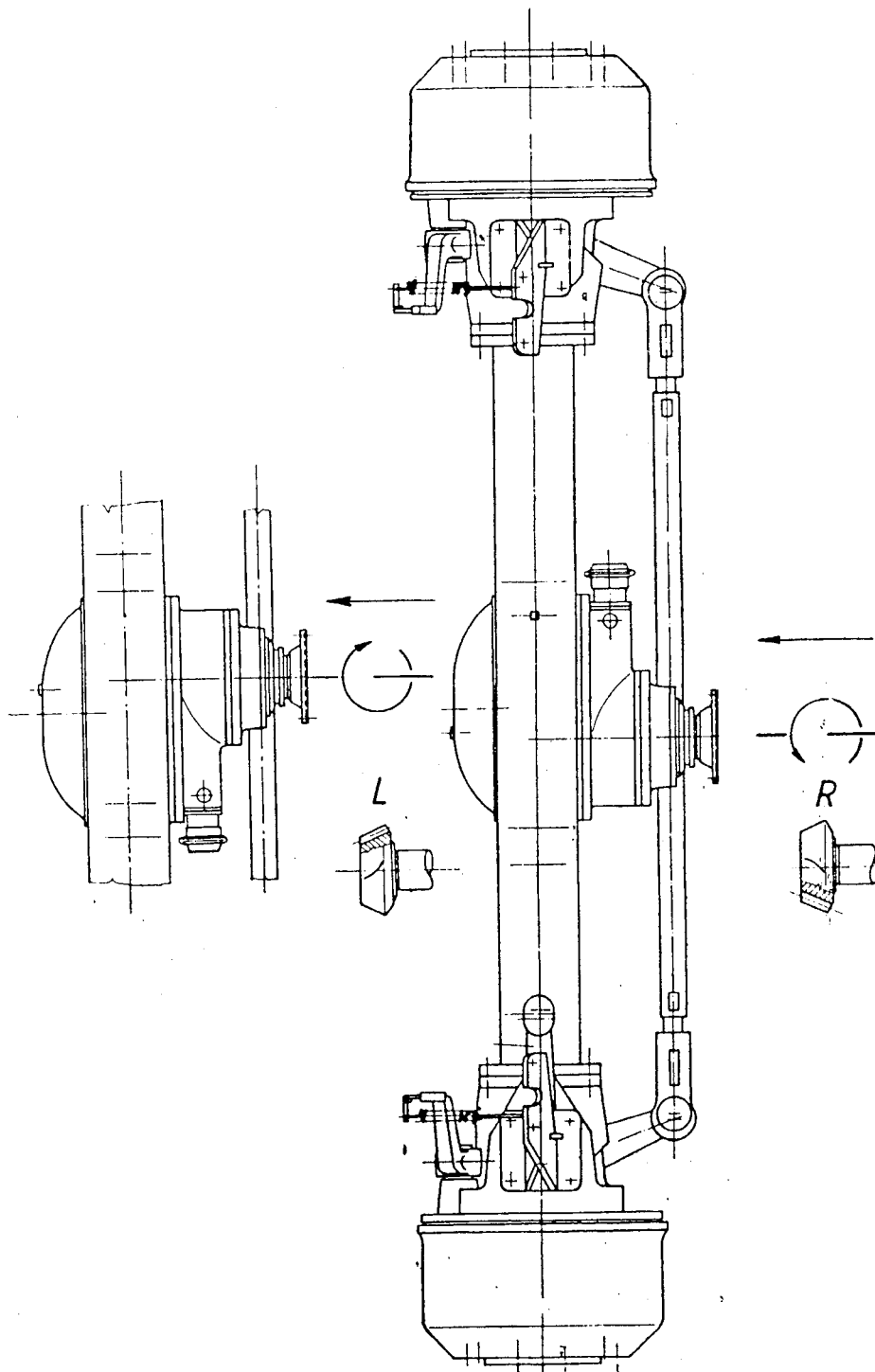
DRIVE PINION HAND OF SPIRAL	HUB PILOTED WHEEL
R (bal-right-links)	





DRIVE PINION HAND OF SPIRAL	BALL SEAT WHEEL
R (bal-right-links)	





DRIVE PINION HAND OF SPIRAL	DIFFERENTIAL LOCK



## SECTION 205

### TECHNICAL DATA

DESCRIPTION	UNITS	TYPE
		MT14/MT17
<b>SYSTEM:</b>  The reduction of the driven and steered front axle is of two-stage design. The reduction is accomplished by a pinion and ring gear set in the carrier and by spur planetary gearing in the wheel hub.		
<b>DIMENSIONS:</b>		
WHEEL TRACK	mm	2035*
a./ Rubber tire		16.5 x 22.5*
b./ Rolling radius	mm	540
c./ Sinking depth	mm	168.1*
Max. Width	mm	2480*
For detailed technical data marked by asterisk (*) at the type versions required by one orderer refer to publication “ <b>TECHNICAL DATA</b> ” related to the type versions.		



# TECHNICAL DATA

205

DESCRIPTION	UNITS	TYPE
		MT14/MT17
<b>RATIOS:</b>		
Ring gear/pinion		27/22 - 29/13 *
Planetary gear		64/26 + 1 = 3.461
Total ratio		4.248 - 7.720 *
Differential lock *		
<b>GENERAL DATA:</b>		
Camber		1°
Knuckle pin inclination		7°
Inner wheel turn angle		max. 40°
Rated axle load	kg	7200*
Max. Input torque	Nm	3750 - 7370*
Max. Input speed	1/sec r.p.s.	50
Mass of axle without oil fill	kg	710 - 721 *
<b>WHEEL HUB EXECUTION</b>		
"A" Bolt centering, for installing wheel disk	mm	Flange diameter: 280 h 11 Wheel nut hex. distance: 30
"C" Hub centering, for installing wheel disk	mm	Flange diameter: 280, 8 -32 Wheel nut hex. distance: 32
"D" Hub centering, for installing wheel disk	mm	Flange diameter: 221 -0.290 Wheel nut hex. distance: 3/4" -16
Constructional elements of ABS can be mounted into axle		*
Impulse ring installed		*



# TECHNICAL DATA

205

DESCRIPTION	UNITS	TYPE
		MT14/MT17
<b>WHEEL BRAKE</b>		
System: The wheel brake is out of simplex system internally acting drum brake.		
Brake drum diameter	mm	420
Max. trued-up brake drum diameter	mm	423
Brake lining width	mm	420x180
Brake shoe clearance (at adjustment)	mm	0.3 - 0.6
Min. Brake lining thickness measured at brake shoe center (marked by upper edge of recess on side of brake lining)	mm	7
<b>SLACK ADJUSTER</b>		Automatic slack adjuster
Slack adjuster installation radius, "C"	mm	165
Distance of slack adjuster bushing bore center from seating plane of the chamber bracket	mm	233
<b>ANTI-FRICTION BEARINGS IN WHEEL HUB</b>		
Outer: Taper Roller Bearing		30218 A MGM
Inner: Taper Roller Bearing		32218 A MGM
<b>IN WHEEL HUB PLANETARY GEAR:</b>		
Cylindric Roller Bearing		K 30x42x30 MGM
<b>ON DRIVE PINION:</b>		
Outer: Taper Roller Bearing		32312 B X7JU MGM
Inner: Taper Roller Bearing		32314 B X7JU MGM
<b>ON DIFFERENTIAL:</b>		
On Half Case:	Taper Roller Bearing	30215 A MGM
On Flanged Case		
Half:	Taper Roller Bearing	32215 A MGM



# TECHNICAL DATA

205

DESCRIPTION	UNITS	TYPE
		MT14/MT17
<b>IN THE STEERING KNUCKLE CARRIER:</b> Cylindric Roller Bearing Taper Roller Bearing <b>IN THE SPINDLE:</b> Cylindric Roller Bearing <b>IN THE DOUBLE JOINT:</b> Needle Roller Bearing Bushing Assy. <b>SEALS:</b> In Wheel Hub: In Differential Carrier: In Camshaft Bushing Bracket In Spindle In Steering Knuckle Carrier "O" Ring Oil Seal		RNU 2209 EC 31310 SKF  NKS 50 INA  GWB 6.369.37.006.00.020  1HH1 145x175x17 NB STEFA SYSTEM 500 AS 75x95x10 FP SIMMERWERKE 42x52x5 NB-AFIT ASL 50x65x8-NB SIMMERWERKE  012.0-3340-018 A49. 5x80x8-NB SIMMERWERKE



## TORQUE RATINGS

DESIGNATION	SECTION/FIGURE ITEM No.	TYPE
		MT14/MT17
NOTE: Nm to ftlb = Nm ÷ 1.3558 (Ex. 600 Nm ÷ 1.3558 = 443 ftlb)		
WHEEL HUB, AXLE HOUSING	210/1	Nm
Wheel nuts		
With lock washer		
Hex. distance 30 mm “A”	81	360 - 400
Sole nut		
Hex. distance 32 mm “C”	41	540 - 670
Wheel nuts		“D” - As specified by the orderer
Wheel hub cower mounting bolts	43	30 - 40 * Mounted with thread locker
Planetary carrier counting bolts	56	40 - 50 *
Spindle nut (inner) Per section 223	36	196
Spindle nut (outer)	34	450 - 490
Brake drum mounting bolts	53	40 - 50
Tie-rod arm clamp self lock nuts	242/1/5	75 - 90
Tie-rod ball stud castle nuts	242/1/2	230 - 320
Steering arms and tie-rod arms mounting bolts	10	412 - 451
Spindle mounting bolts	7	160 - 180 Mounted with thread locker
Steering knuckle carrier mounting bolts	16	334 - 353 Mounted with thread locker
Stop bolts jamnut	241/3/2	60 - 80
WHEEL BRAKE	260/1	Nm
Nuts of brake support mounting hex. bolts	25	160 - 180 Mounted with thread locker
Dust shield mounting bolts	-	10 - 12
Hex. bolts mounting stop of the automatic slack adjuster	-	20 - 25
DIFFERENTIAL CARRIER HEAD	310/1	Nm
Differential carrier housing to axle housing mounting bolts	-	88 - 98 Mounted with thread locker



## TORQUE RATINGS

DESIGNATION	SECTION/FIGURE ITEM No.	TYPE
		MT14/MT17
Drive pinion castle nut	1	540 - 590
Differential carrier cover mounting bolts	6	20 - 30
Bearing cage mounting bolts	14	88 - 98
Adjuster lock plate mounting bolts	22	15 - 20
Differential case halves clamp bolts	25	49 - 59
Ring gear mounting bolts	39	98 - 118 Mounted with thread locker
Nuts of clamps for diff lock actuating air chamber	-	2 - 5
Bolts mounting the actuating air chamber	-	29 - 39



## ADJUSTMENT DATA

DESIGNATION	UNITS	TYPE
		MT14/MT17
<b>NOTE:</b> mm to inch = mm ÷ 25.4 (Ex. 0.15 mm ÷ 25.4 = .006 inch)		
<b>WHEEL HUB, AXLE HOUSING</b>	210/1	Nm
<b>WHEEL HUB:</b>		
Axial play of wheel hub bearings (adjusted by the spindle nuts)	mm	0.01 - 0.04
<b>STEERING KNUCKLE:</b>		
Thickness of shims necessary for adjusting the preload of the 31310 SKF bearing	mm	0.2; 0.3; 0.5; 2.0; 2.05
Rotating torque of knuckle housing (in checking. no seal is installed)	Nm	17.6 - 25.5
Toe-in (measured at brake drum flange)	mm	1.5 $\pm$ 1.5
Max. Inner wheel turn angle		40°
<b>WHEEL BRAKE:</b>		
Shoe clearance (during adjustment)	mm	0.3 - 0.6
Axial play of camshaft	mm	0.1 - 0.5
<b>DIFFERENTIAL CARRIER HEAD</b>		
Drive pinion to drive gear backlash	mm	0.15 - 0.25
Drive pinion rolling torque after preloading the bearings (the oil seal is not installed. adjustment by the distance rings)	Nm	1.0 - 1.7
Size of distance rings	mm	- 34 spacers of 13.89 to 14.715 mm in 0.025 mm thickness steps
Theoretical distance between the drive pinion face and the drive gear centerline <b>(“AXIS DISTANCE”)</b>	mm	88.00
Shim thickness	mm	0.20; 0.25; 0.30; 0.50; 1.0
Clearance between clutch gear and toothed hub (as engaged)		0.5 - 2.0



## GENERAL SERVICE INSTRUCTIONS

**This section summarizes the service operations and adjustment data considered by us to be most important and which should thoroughly be observed and followed during assembling the axle.**

### WHEEL DRIVE, WHEEL HUB

After tightening the spindle-end nuts obtain **0.01 - 0.04 mm** axial play at the wheel bearings.

For adjustment refer to the Section **223**.

Install **ONLY** identical code, same tolerance class bearings supplied in one package to one wheel hub planetary gear.

### KNUCKLE HOUSING

Install the taper roller bearings into the knuckle housing without clearance, then assure preload by reducing the shims (by **0.25 - 0.35**). Measure the preload with torque spanner. The knuckle housing may turn on torque **17.6 - 25.5 Nm**.

For adjustment refer to Section **245**.

### WHEEL BRAKE

If the brake linings are worn to the permitted limit (**as indicated by the upper edge of the recess on side of the brake lining**) replace the linings according to the instructions.

Check the brake shoe surface in contact with the shoe anchor pin and the camshaft rollers.

Adjust the specified shoe clearance (**0.3 - 0.6 mm**) by means of the brake lever.

**After adjustment the brake lining may not interfere with the brake drum.**

From the sealing rings of the brake camshafts only that at the brake cam head may not pass over the surplus lubricant during greasing. The sealing ring at the brake cam head protects the brake drum against the grease. **Make sure to install the sealing rings in proper position.**

True up the brake drum **ONLY** to the permitted maximum diameter.

### DIFFERENTIAL CARRIER HEAD

Install the taper roller bearings of the drive pinion with preload. Assure such a preload the bearings shall roll on torque of **1 - 1.7 Nm** for new bearings and on torque of **0.5 - 0.85 Nm** for bearings that have run (half of the

rolling torque of the new bearings).

For adjustment refer to the Section **317**.

The differential gears should be rotatable without jamming.

Install the taper roller bearings of the differential without clearance.

For adjustment of the proper contact pattern and the specified **0.15 - 0.25 mm** backlash refer to the Section **314**.

When assembling the diff. lock assure a clearance of **0.5 - 2.0 mm** between the clutch sleeve and the engaged hub. For adjustment refer to Section **318**.

## GENERAL INSTRUCTIONS

**For purpose of safety during service operations performed on the axle removing the individual assembly units make sure to assure safe backing, fixing or suspension.**

Install only clean and sound parts free of burrs and dents. Before installation wipe the mating surfaces of the parts clean and apply thin coat of oil.

For assembly operations use **ONLY** plastic or lead-in-sert hammer.

Before installing the oil seals make sure to check if the sealing lip is sound and apply specified grease between the sealing lip and the dust protection edge. Install the O-rings also with grease.

When installing the taper roller bearings take care of the pairing according to the original packing or to the manufacturer's specification.

**The following thread adhesive, locking and surface sealing material are used at the axle, e.g.:**

<b>Thread adhesive</b>	<b>LOCTITE 277</b>
<b>Thread locker</b>	<b>LOCTITE 242</b>
<b>Surface Sealant</b>	<b>LOCTITE 515</b>

Before installation apply the **LOCTITE 242** and **277** concentrically to approx. **4-5 threads** on the threaded surface of the bolt.

Clean and degrease the surfaces before applying the air-curing oil-resistant sealant type **LOCTITE 515**. Apply a continuous strip of min. **3 mm** diameter to the specified surface. The time between applying the sealant and assembling the parts together may not exceed **10 mins**.

**Instead of the above adhesive locking and sealing material other equivalent grade ones may also be used.**





**WHEEL DRIVE, WHEEL HUB**  
**WHEEL DRIVE, WHEEL HUB SECTIONAL VIEW**



## SECTION 211

### PARTS OF THE WHEEL DRIVE, WHEEL HUB

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| 1 — Ring gear                     | 47 — Spacer ring                |
| 2 — Ring gear Support             | 48 — Taper screw plug           |
| 3 — Circlip                       | 49 — Snap ring                  |
| 5 — Spacer sleeve (toothed)       | 50 — End — cover with seal ring |
| 6 — Spacer sleeve                 | 51 — Oil drain plug             |
| 7 — Hex. bolt                     | 52 — Threaded stub              |
| 8 — Sealing ring                  | 53 — Hex. bolt                  |
| 9 — Needle roller bearing         | 54 — Brake drum                 |
| 10 — Hex. bolt                    | 55 — Steel ball                 |
| 11 — Gasket                       | 56 — Hex. bolt                  |
| 12 — Tie-rod arm                  | 57 — Dowel pin                  |
| 13 — Double-joint shaft           | 58 — Extension                  |
| 16 — Hex. bolt with lock plate    | 59 — 45 grease fitting          |
| 17 — O-ring                       | 60 — Grease fitting             |
| 23 — Axle housing                 | 61 — Lock wire                  |
| 24 — Knuckle support (trunnion)   | 62 — Dowel pin                  |
| 25 — Taper roller bearing         | 63 — Air chamber bracket        |
| 26 — Shims                        | 64 — Hollow screw               |
| 27 — Washer                       | 65 — Seal rings                 |
| 28 — Steering arm (cover)         | 66 — Vent tube                  |
| 30 — Sealing ring                 | — Breather                      |
| 31 — Knuckle housing              | 68 — Distance ring              |
| 32 — Taper roller bearing         | 69 — Friction disk              |
| 33 — Lock plate                   | 70 — Friction disk              |
| 34 — Taper roller bearing         | 71 — Spoon pin                  |
| 35 — Spindle                      | 72 — Shim                       |
| 36 — Spindle-end nuts             | 73 — Sealing ring               |
| 37 — Wheel bolt                   | 74 — Seal retainer              |
| 38 — Wheel hub                    | 75 — Sealing ring               |
| 39 — Planetary carrier            | 76 — Sealing ring               |
| 40 — Planetary pinion             | 77 — Snap ring                  |
| 41 — Wheel nut                    | 78 — Snap ring                  |
| 42 — Spacer plate                 | 79 — Cylindric roller bearing   |
| 43 — Hex. bolt with spring washer | 80 — Impulse ring               |
| 44 — Cylindric roller bearing     | 81 — Wheel nut                  |
| 45 — Planetary pin                | 82 — Lock washer                |
| 46 — Sun gear                     |                                 |



## SECTION 212

### REMOVING AND REINSTALLING THE WHEEL DISK

#### REMOVING THE WHEEL DISK

With wheels in loaded condition loosen the wheel nuts by means of a wheel nut spanner. Then after jacking up the axle, remove the nuts and the wheel.

#### REINSTALLING THE WHEEL DISK

After positioning the wheel disk, tighten the wheel nuts as specified.

## SECTION 213

### REMOVING AND REINSTALLING THE BRAKE DRUM

#### REMOVING THE BRAKE DRUM

After removing the wheel disk back out the 4 hex. bolts attaching the brake drum to the wheel hub, then by 2 M12 bolts of at least **40 mm** thread length driven into the threaded bores for this purpose in the brake drum flange pull the brake drum off and remove.

#### REINSTALLING THE BRAKE DRUM

Aligning the bores position the brake drum to the wheel hub. Install the hex. bolts attaching the brake drum and tighten to **39 - 49 Nm** torque.

## SECTION 214

### REMOVING AND REINSTALLING THE END-COVER

#### REMOVING THE END-COVER

- Drain the oil.
- Remove the hex. bolts (43) attaching the end-cover (50) to the planetary carrier and separate the end-cover. With a bolt driven into M8 hole in the cover flange.

#### REINSTALLING THE END-COVER

As described in the “**GENERAL SERVICE INSTRUCTIONS**” apply oil-resistant sealant to the seating surface of the end-cover. On the planetary carrier, outside the planetary pin holes but inside the cover locking threaded holes.

Aligning the bores and the oil drain bore position the end-cover to the planetary carrier then secure by lock washers and hex. bolts tightened to **18.6 - 24.5 Nm** torque.

Apply thread adhesive to the threaded stub (52) and screw into the planetary carrier.



## SECTION 220

### REMOVING AND REINSTALLING THE PINION CARRIER, ADJUSTING THE AXLE-SHAFT CLEARANCE

#### REMOVING THE PINION CARRIER

After removing the end-cover (50) by means of snap ring pliers remove the snap ring (71), then the shims (27) and the friction disk (70) from the pinion carrier.

Following this remove the hex. bolts (33) from the flange of the pinion carrier (8), then by means of **M8** bolts of at least **35 mm** thread length driven into the two threaded bores for this purpose in the pinion carrier flange pull the pinion carrier out of the wheel hub.

#### REINSTALLING THE PINION CARRIER

As described in the “**GENERAL SERVICE INSTRUCTIONS**” apply oil-proof sealant to seating flange of the pinion carrier (avoiding the bores from inside).

Position the pinion carrier into the wheel hub aligning the bores and the gear teeth. Secure by means of hex. bolts tightened to **39 - 49 Nm** torque.

#### ADJUSTING THE AXLE-SHAFT CLEARANCE

Insert the friction disk (70) into the installed pinion carrier and secure by the snap ring (71). Push the friction disk to bottom out against the bull gear (46) and by means of feeler gage measure the clearance between the friction disk and the snap ring.

From the shims (72) select such a pack the thickness of which is **0.4 - 1.6 mm** less than the measured value.

By means of snap ring pliers remove the snap ring (71) again, then insert the selected shim pack and finally install the snap ring.

## SECTION 221

# DISASSEMBLING AND REASSEMBLING THE PLANETARY GEAR

By means of the service mandrel shown drive the planet pins out toward direction the steel ball (see Fig. 1.).

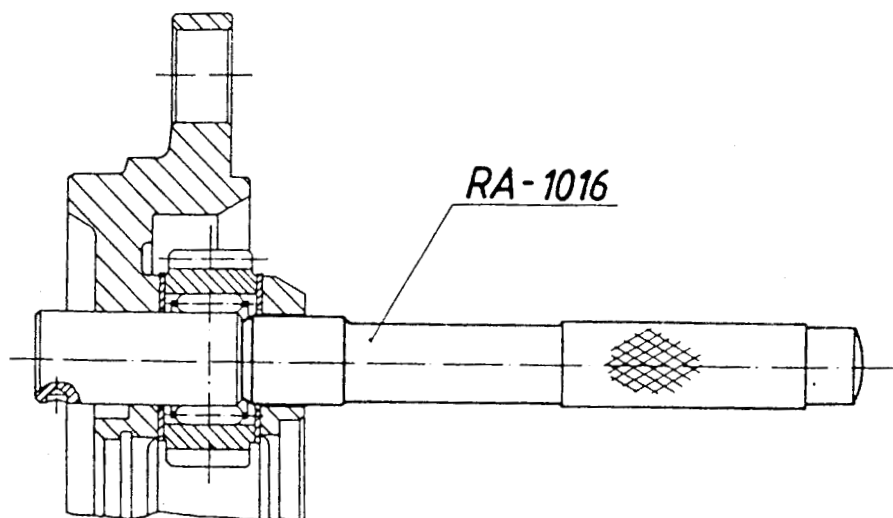


Fig. 1.: PRESSING OUT THE PLANET PINS

Stack the sound or replaced parts one by one over the pilot mandrel put thru the planetary carrier bore as shown in Fig. 2.

By means of the service mandrel shown tap in the planet pins (see Fig. 2.).

When pressing in the planet pins (45) make sure to check if the groove machined in the planetary carrier (39) for the steel ball and the seat in the planet pin align so, to be able to insert the steel ball before completely pressing in the planet pin.

When replacing the cylindric roller bearings (44) make sure to use ONLY identical color code, same tolerance class bearings supplied in one package for a planetary gear.

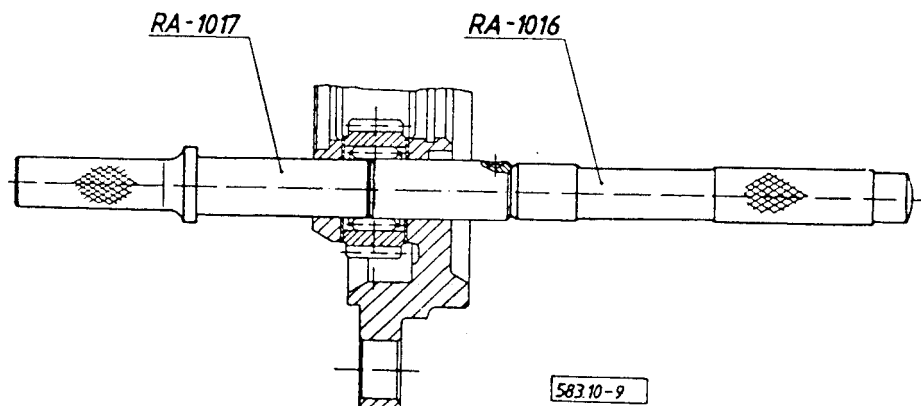


Fig 2.: PRESSING IN THE PLANET PINS

## SECTION 222

# REMOVING AND REINSTALLING THE SUN GEAR

## REMOVING THE SUN GEAR

After removing the pinion carrier remove the snap ring (49) and the distance ring (68).

Following this pull the sun gear (46) from the axle-shaft together with the spacer ring (47) and remove the friction disk (69).

## REINSTALLING THE SUN GEAR

Reinstall the sun gear in reverse order of removal. Make sure to check if the friction disk (69) is on the spacer ring (47), as well as the chamfered side of the distance ring (68) faces inward.



## REMOVING AND REINSTALLING THE WHEEL HUB

### REMOVING THE WHEEL HUB

Before removing the spindle-end nuts safely suspend the wheel hub (38).

After removing the planetary carrier and the sun gear release the spindle-end nut (36).

With the clamping elements shown, clamp the wheel hub elements together and remove the spindle end nut with the nut spanner shown (Fig. 1.).

Remove the suspended wheel hub from the knuckle. The wheel hub parts (inner part of the inner taper roller bearing (32) and toothed spacer sleeve (5) clamped together with the locking elements are removed from the knuckle by the seal ring (8) struck with surface sealant.

Application of the locking elements assures central positioning of the seal ring pressed in the wheel hub, when removing and reinstalling the assembled wheel hub.

### REINSTALLING THE WHEEL HUB

Reinstall the wheel hub pre-assembled and clamped together by means of the clamping elements, on the spindle according to Section 224.

Adjust the axial play of the wheel hub bearing support to **0.01 - 0.04 mm**.

By means of the wrench Drw. No. 4983-00455 tighten the inner shaft-end nut (36) — while continually rotating and axially moving the wheel hub — so, the wheel hub shall turn hard. By this means proper connection of the bearings is assured.

Back out the shaft-end nut and tighten again to **196 Nm** torque, then turn back by approx. **35° to 45°**.

Position the lock plate, install the outer shaft-end nut and tighten to **450 - 490 Nm** torque.

By means of dial indicator check if the specified **0.01 - 0.04 mm** axial play is obtained.

In case of improper bearing clearance repeat the adjustment by properly turning back the shaft-end nut and check procedures.

If the **0.01 - 0.04 mm** axial play is adjusted secure the shaft-end nuts by the lock plate (33).

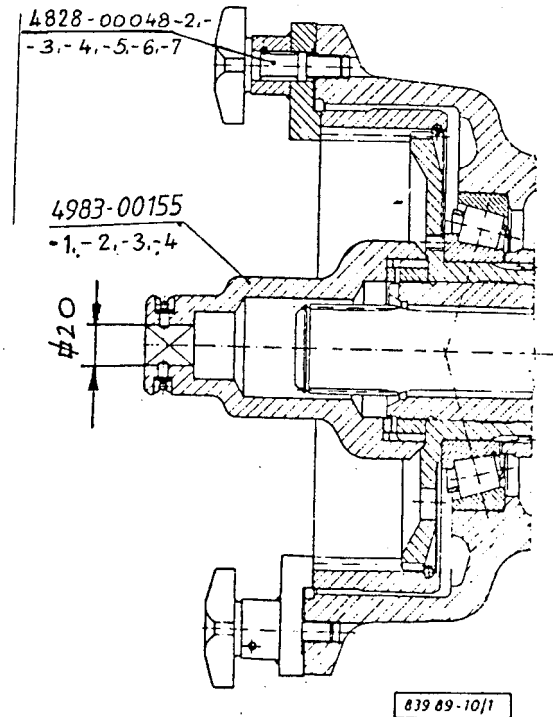


Fig. 1.: REMOVING THE SPINDLE END NUT

## SECTION 224

### DISASSEMBLING AND REASSEMBLING THE WHEEL HUB

#### ADJUSTING THE AXIAL PLAY (REPLACING THE BEARING INNER RACES AND THE SEALING RING)

By means of simple pry remove the sealing ring (8) from the removed wheel hub.

Press out the cups of the taper roller bearings. For both bearing cups use the tool shown in Fig. 1.

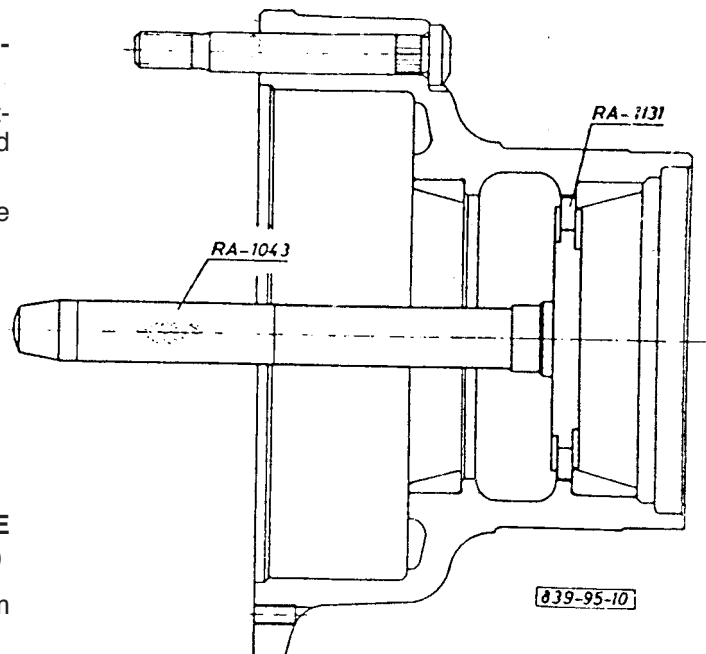
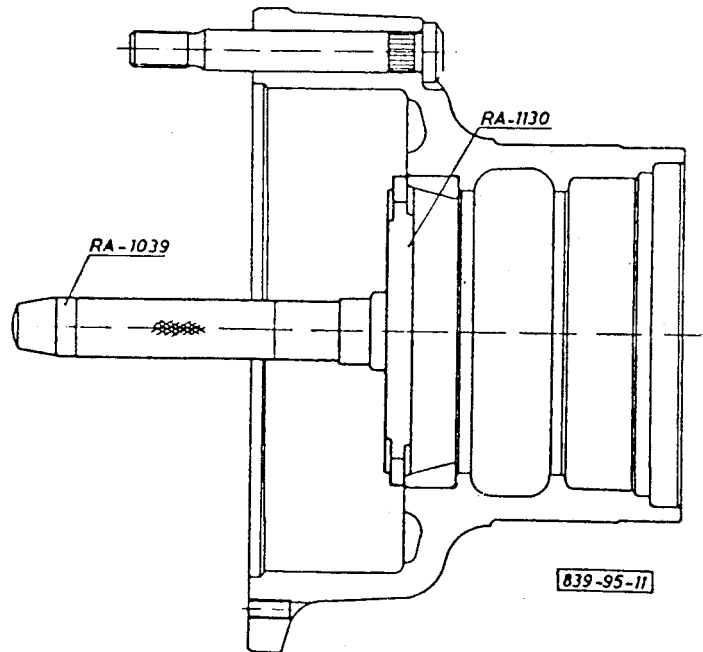


Fig. 1.: DRIVING OUT THE CUP OF THE OUTER TAPER ROLLER BEARINGS



## REASSEMBLING THE WHEEL HUB

By means of the tools shown in **Fig. 2**, press the cup of the outer taper roller bearing (34) into the wheel hub. Turn the wheel hub over and by means of the same tools press in the cup of the inner taper roller bearing (32), as well.

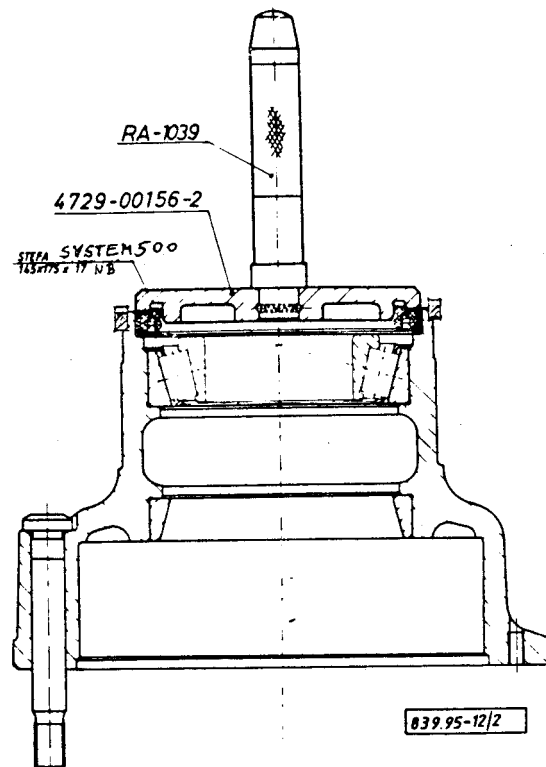


*Fig. 2.: PRESSING IN THE CUPS OF THE TAPER ROLLER BEARINGS*

Position the inner part of the inner taper roller bearing (32) into the cup race. Apply thin coat of oil-resistant surface sealant to the sealing ring seat, then by means of the tools shown in **Fig. 3**, press the sealing ring (8) into the wheel hub.

### WARNING!

On axles mountable with ABS, toothed surface of impulse ring shall be protected from shocking during installation of seal ring!



*Fig. 3.: PRESSING IN THE SEALING RING*



## THE WHEEL HUB PRE-ASSEMBLING

Pre-assembling is made on the master shaft shown in **Fig. 4**.

Place on the master shaft the wheel hub assembled with taper roller bearing cups, inner part of the inner taper roller bearing and the seal ring. Place in the engaged spacer sleeve (5).

Position on it the ring gear support (2) assembled with the inner part of tapered roller bearing and ring gear, take care of bearing parts.

Clamp the installed parts together with the clamping elements shown in **Fig. 1**. of Section 223.

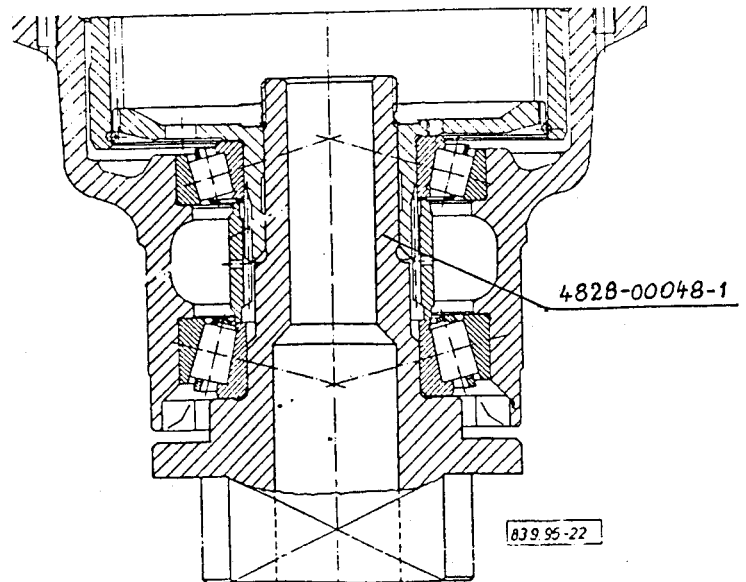


Fig. 4.: THE WHEEL HUB PRE-ASSEMBLING OF

## SECTION 225

### DISASSEMBLING AND REASSEMBLING THE RING GEAR SUPPORT

#### DISASSEMBLING THE RING GEAR SUPPORT

After removing the circlip (3) pull the ring gear (1) off the ring gear support.

By 2 M8 bolts of at least **40 mm** thread length driven into the thru bore in the ring gear support flange press off the taper roller bearing inner race (see **Fig. 1**).

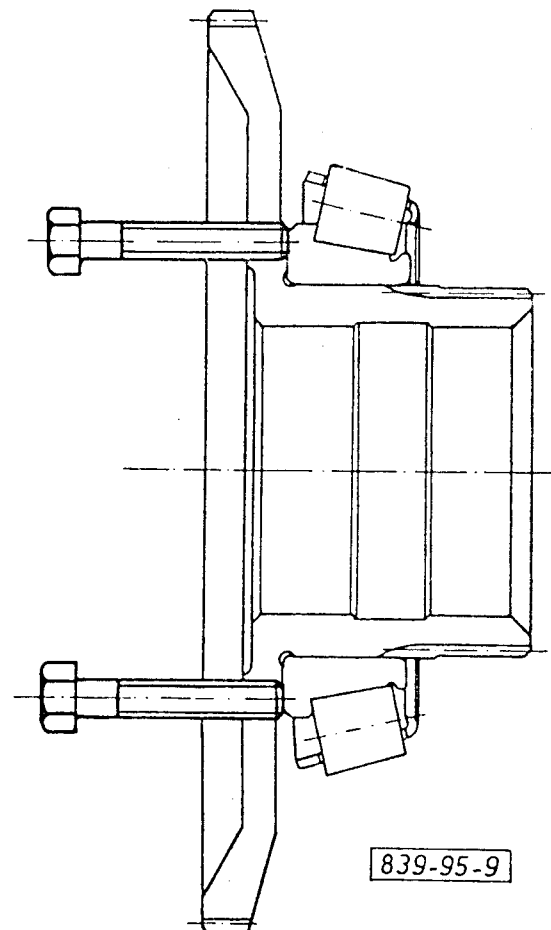


Fig. 1.: PRESSING OFF THE TAPER ROLLER BEARING INNER RACE





## REASSEMBLING THE RING GEAR SUPPORT

As shown in the figure press the taper roller bearing inner race to the ring gear support to bottom out (see Fig. 2.).

Aligning the tothing of the ring gear support and the ring gear push them together and install the circlip (3) into its groove.

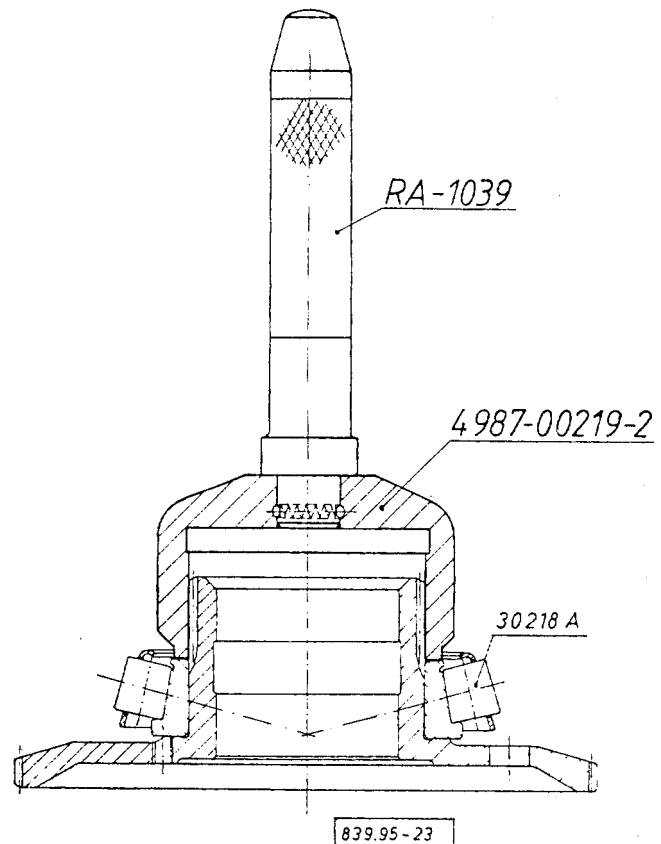


Fig. 2.: PRESSING ON THE TAPER ROLLER BEARING INNER RACE

## SECTION 229

### INSTALLATION INSTRUCTIONS FOR THE PARTS OF ANTILOCKING SYSTEM

This section contains the constructional elements of the antilocking and anti-skid systems (ABS and ASR), that can be installed by the customer into each axle type as well as the installation instructions.

The models given “**TECHNICAL DATA**” contain the items (A,C) necessary at the installation of the anti-lock and anti-skid systems (1).

#### 1. INSTALLABLE ELEMENTS OF THE ANTI-LOCK AND ANTI-SKID SYSTEMS

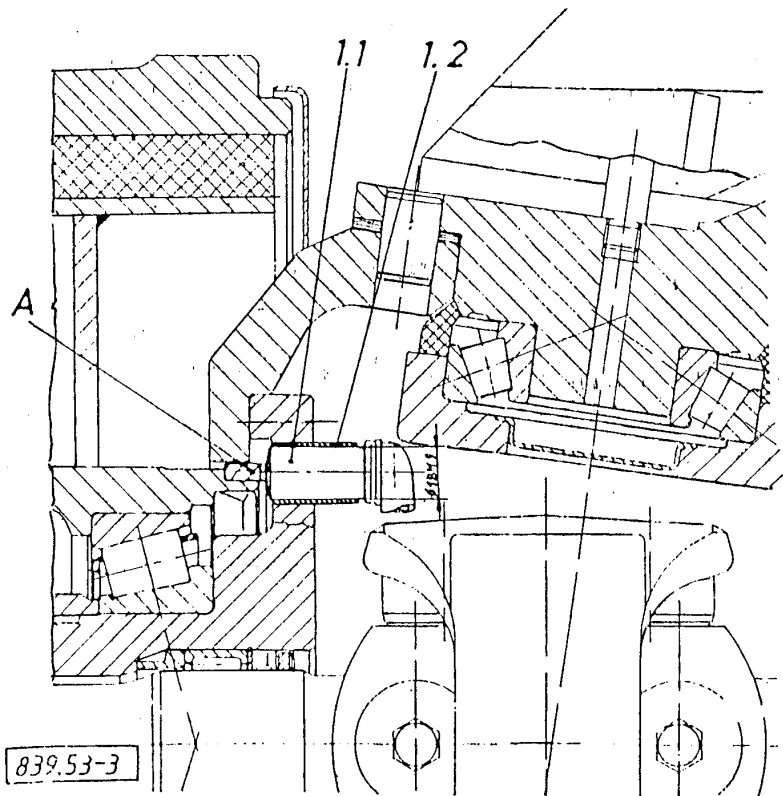
##### 1.1 Revolution sensor:

A 335545231 Robert Bosch GmbH  
or WABCO 441 032:001 0  
or ZB 9010-I/83315 KNORR-BREMSE

##### 1.2 Spring bushing:

C 335 002-431 A Robert Bosch GmbH  
or WABCO 899 760 510 4  
or 4B 69698 KNORR-BREMSE

**NOTE:** The revolution sensor and the spring bushing must be of the same make.



A. TOOTHED PULSE GENERATING RING





## 2. INSTALLATION INSTRUCTION

Before installing the spring bushing coat the 18H9 bore of the revolution sensor holder with copper paste or silicone grease (e.g. Molykote FP 186, Unirew N3) in order to prevent corrosion.

Insert the spring bushing from the middle of axle into the 18H9 bore until stop (1.2).

Put the revolution sensor (1.1) into the spring bushing and push it until it reaches the generator ring and the wheel hub. This setting has to be performed every time the hub will be disassembled.

During operation maximum clearance between the revolution sensor and the generator ring may be **0.8 mm**.

When leading the wire of the revolution sensor out of the axle brake mechanism be sure not to bend it with a ra-

dius less than **R50 mm**. Fasten the wire at distances of **50 mm** exposed to heat load inside the brake mechanism.

Check the runout of the toothed pulse generating ring on the wheel hub. Maximum permissible runout of toothing in direction of revolution sensor shaft is **0.2 mm**.

**NOTE:** Tachometer to be built in only with spring bushing of the same manufacturing. Besides Bosch and Knorr tachometer, a tachometer of other production, interchangeable with the above is allowed to be built in. If the impulse ring is changed, before pressing the new impulse ring is to be heated uniformly to 150 C° and pushed up to stop on the wheel hub.

**TOOTHING CAN NOT GET DAMAGED!**

## SECTION 241

### FRONT AXLE HOUSING

#### REMOVING AND REINSTALLING THE TIE-ROD, ADJUSTING THE TOE-IN AND THE WHEEL TURN ANGLES

##### REMOVING THE TIE-ROD

Remove the cotters and back out the castle nuts, then remove the linkages from the taper bore of the tie-rod arms by pressing out the ball stud with the tool shown (Fig. 1.).

##### REINSTALLING THE TIE-ROD

Reinstall the tie-rod in reverse order of removal.

After reinstalling the tie-rod adjust the steering geometry of the axle.

##### 1. ADJUSTING TOE-IN

Toe-in (Fig. 2.) means the difference between the dimensions "A" and "B" measured at the height of the wheel center in front and rear of the brake drum flange. The value "B" measured in front is smaller.

$$\text{TOE-IN} = A - B = 1.5 \pm 1.5 \text{ mm.}$$

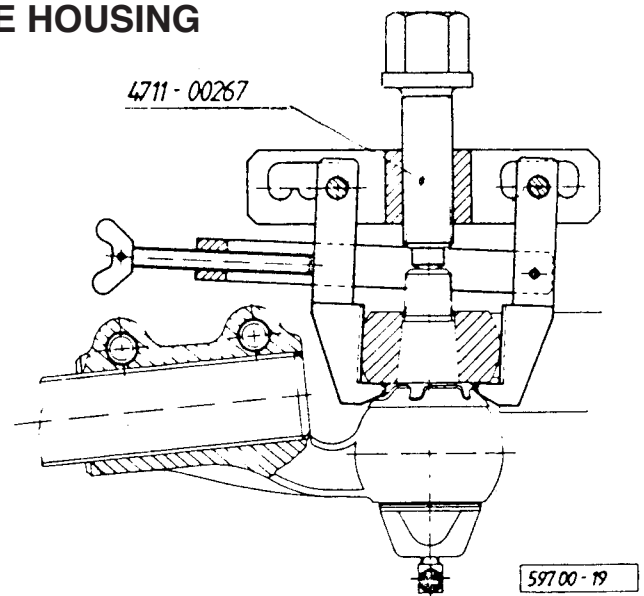


Fig. 1: PRESSING OUT THE BALL STUDS

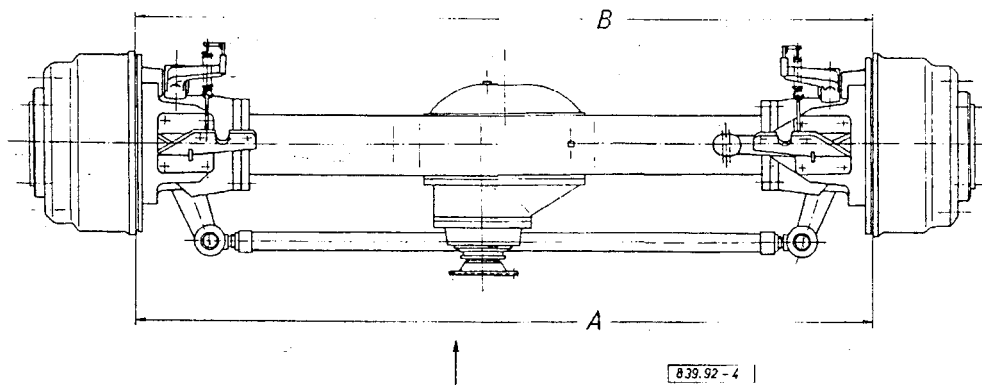


Fig. 2.: TOE-IN



## ATTENTION!

Measure toe-in with axle installed to the vehicle and in condition not hoisted up!

Perform adjustment of toe-in after loosening the tie-rod clamp self lock nuts by turning the tie-rod to proper direction.

After proper adjustment tighten the castle nuts of the ball studs to **230 - 320 Nm** and the tie-rod clamps castle nuts to the torque specified in Section 242, then cotter secure the self lock nuts and check the toe-in again.

## 2. ADJUSTING MAX. INNER WHEEL TURN ANGLE

- 1 — Stopbolt
- 2 — Jamnut
- a — Wheel turn angle

Upon reaching the max. inner wheel turn angle (a) specified in the “**TECHNICAL DATA**”, adjust the stop bolt so, to bottom out against the axle body (**Fig. 3.**).

## WARNING!

By means of the pressure relief valve adjust the power steering gear so, the servo effect shall terminate **2.0 - 3.0 mm** before the stop bolts bottom out against the axle body.

Secure the stop bolt by tightening the hex. jamnut to **60 - 80 Nm** torque.

Perform adjustment of the max. inner wheel turn angle on both sides.

When adjusting the inner wheel turn angles the double joint may not interfere with the knuckle carrier and the steering knuckle.

The outer wheel turn angle is a resultant value.

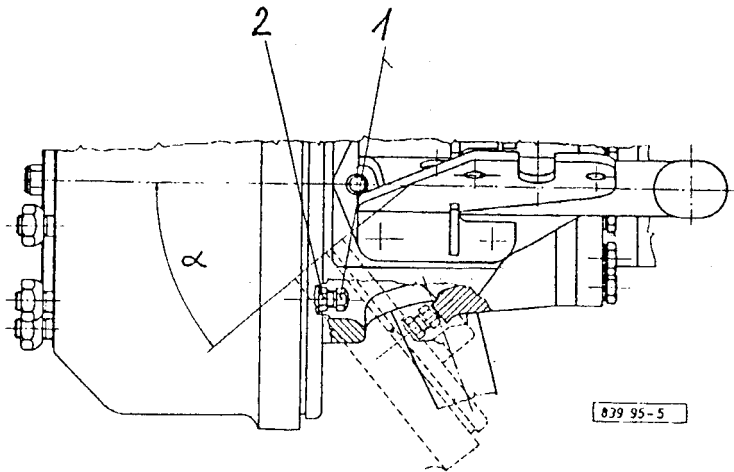


Fig. 3.: ADJUSTING THE MAX. INNER WHEEL TURN ANGLE

## SECTION 242

## REPAIRING THE TIE-ROD

### DISASSEMBLING THE TIE-ROD

Loosen the self-lock nut (4). Screw the ball joint head out of the tie-rod end.

The ball joint head may be replaced as a unit only.

When reassembling the tie-rod make sure to check if the distance (X) between the tie-rod end and the ball stud centerline is nearly identical on both sides.

After installing the tie-rod to the tie-rod arms and adjusting the specified toe-in tighten the self-lock nuts of the shackles to **75 - 90 Nm** torque.

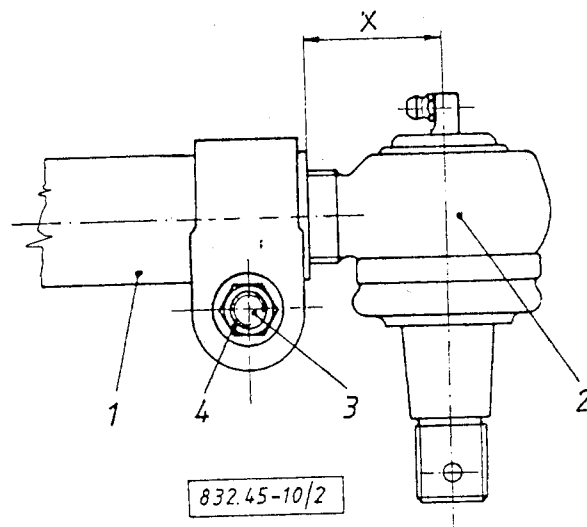


Fig. 1.: THE TIE-ROD



## SECTION 243

### REMOVING AND REINSTALLING THE STEERING KNUCKLE

#### HOUSING THE SPINDLE

After the wheel hub is dismantled (Section 223) remove the steer arms (28) and the tie-rod arms (12) as described in the Section 245.

Then pull the spindle (35) together with the steering knuckle housing (31) of the knuckle carrier (24) and the outer axle-shaft.

After removing the vent tube (66), by screwing the hex. bolts (7) out, the knuckle can be separated from the knuckle housing.

#### REINSTALLING THE STEERING KNUCKLE HOUSING AND THE KNUCKLE

The spindle with the knuckle housing are fixed to each other with hex. bolts assembled with **LOCTITE 242**. Take care of that on the spindle the breather be positioned on top. Tightening torque of the hex. bolts is **160 - 180 Nm**.

The vent tube (66) put thru the hole of the knuckle housing is to be fixed with the hollow bolt (64) to the spindle.

For installing the inner seals of the spindle over the splines of the outer axle-shaft pull the service sleeve of Drw. No. 4746-00100 over the end of the outer axle shaft.

Carefully push the spindle mounted with knuckle housing, subassembled with inner seals over the service sleeve on the outer axle-shaft, taking care not to damage the sealing rings, then pull the service sleeve of the axle-shaft end.

Assemble the steering and tie rod arms on to the knuckle support (24) as given in Section 245.

## SECTION 244

### REMOVING AND REINSTALLING THE DOUBLE-JOINT THE KNUCKLE SUPPORT

#### REMOVING THE DOUBLE-JOINT

After removing the steering knuckle carefully pull the double joint out of the differential gear splines and the pinion carrier seals.

#### REMOVING THE KNUCKLE SUPPORT

Remove the hex. bolts (16) attaching the knuckle support (24) to the axle housing (23).

Separate the properly suspended knuckle support (24) from the axle housing flange with 2 bolts of **M12** driven in the axle housing flange.

#### REINSTALLING THE KNUCKLE SUPPORT

Position the sound "O"-ring to shoulder of the knuckle support.

The knuckle support subassembled with double-joint into the axle housing as piloted by the dowel pin (57). Install the hex. bolts (16) with lock plates.

Tighten the bolts to **334 - 353 Nm** torque and fold the marked corners of the locking plates on the bolt head plane.

#### REINSTALLING THE DOUBLE-JOINT AND THE STEERING KNUCKLE

Carefully push the inner longer axle-shaft of the double joint thru the sealing ring of the knuckle carrier and the bore of its cylindric roller bearing (79), then aligning the splines with those of the differential gear push the axle-shaft further to bottom out against the differential, making sure not to damage the sealing ring (75 and 76).



## REMOVING AND REINSTALLING AND ADJUSTING THE STEERING ARMS, THE CHAMBER BRACKET AND THE TIE-ROD ARMS.

### REMOVING THE STEERING AND TIE-ROD ARMS

Remove the securing wire from the bolts attaching the chamber bracket and steering arm, then back out the hex. bolts (10).

Remove the chamber bracket (63).

By 2 M10 bolts driven into the threaded bores of the steering arm remove the steering arm from the steering knuckle housing. Remove the tie-rod arms (12) in the same way.

### REPLACING THE TAPER ROLLER BEARING INNER RACE

The taper roller bearing inner race remained on the removed tie-rod arm and steering arm can be pulled off by means of bearing puller (Fig. 1.).

Position the washer (27) to the cover (28) and tie-rod arms (28 and 12). By means of the press sleeve shown in Fig. 2. press on the taper roller bearing inner race to bottom out.

### ADJUSTING THE BEARING PRELOAD, REINSTALLING THE STEERING ARMS AND THE TIE-ROD ARMS

In assembling the steering arm (or cover) (28) and the tie rod arms (12), first the taper roller bearings (25) No. 31310 must be mounted free of clearance by installing shims (26) of proper thickness, without seal (11), then the knuckle bearings must be preloaded by reducing thickness of the shims by 0.25 - 0.35 mm.

Preloading is proper, if in this pre-assembled condition the rotating torque of the knuckle housing is 17.6 - 25.5 Nm. Torque is measured with a torque spanner placed on hex. bolt locking the cover.

If adjustment is proper, make the final assembling.

Take care of that the parts used in the adjustment be installed.

Install the seals (11) too.

Locating with the dowel pin (62), mount the cover or the steering arm and the tie-rod arms. Position the chamber bracket (63) on the cover and steering arm. Screw in the drilled-head bolts (10) and tighten them to a torque of 412 - 451 Nm, then secure with locking wire (61).

Screw in the grease fittings (59) and (60) with the extension (58) and fill the pins or the taper roller bearings with the grease specified.

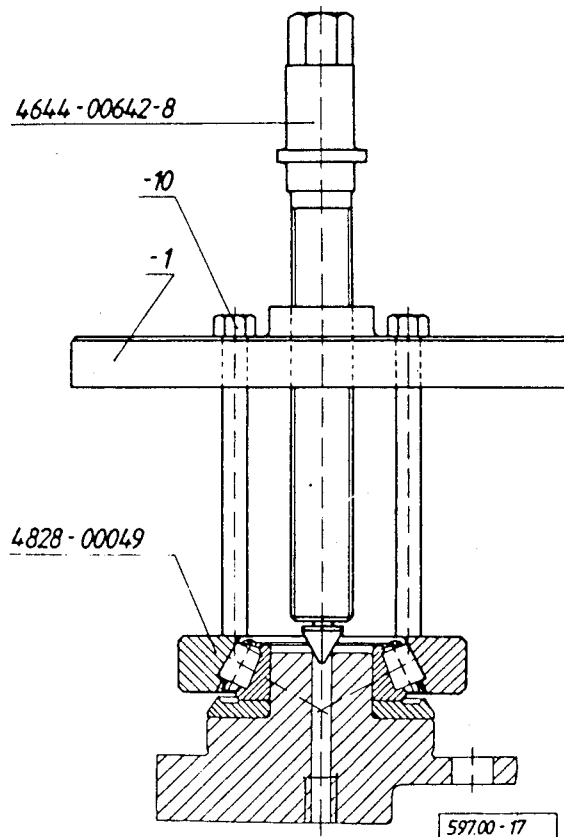


Fig. 1.: PULLING OUT THE INNER PORT OF THE  
TAPER ROLLER BEARING

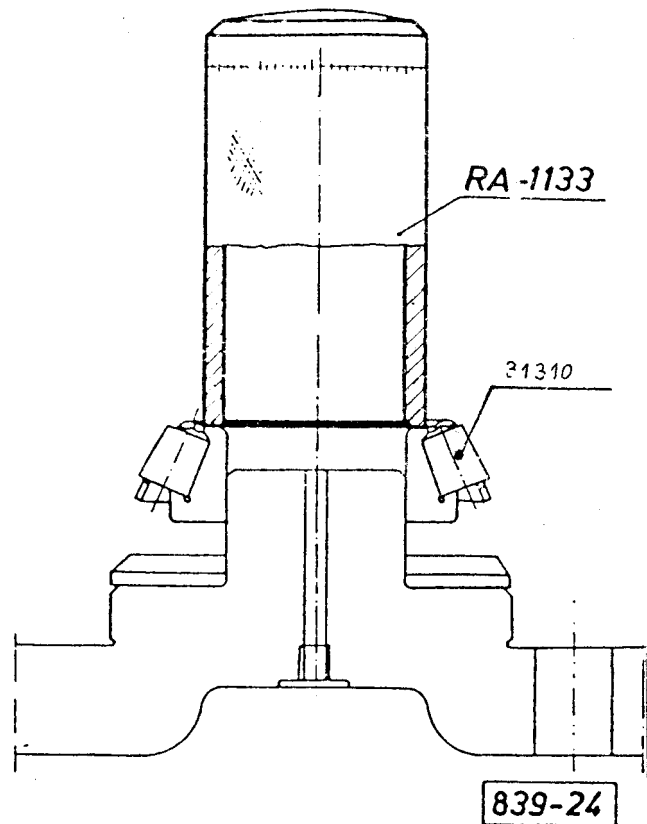


Fig. 2.: PRESSING ON THE TAPER ROLLER BEARING  
INNER RACE



## ASSEMBLING THE DOUBLE-JOINT (AXLE-SHAFT REPLACEMENT)

### REMOVING THE AXLE-SHAFTS FROM THE DOUBLE-JOINT

Remove the screw plug from the bearing cap and remove the snap ring before the bearing cap.

- 1 — Bearing cap
- 2 — Carrying ring
- 3 — Screw plug
- 4 — Snap ring
- 5 — Spider
- 6 — Pivot pin
- 7 — Threaded dowel

By means of the puller shown remove the bearing caps from the carrying ring on both the sides, by screwing the bolt of the puller to place of the screw plug (see Fig. 1.).

**Mark the removed parts to assure reinstallation to their original place.**

After removing the bearing caps remove the axle-shaft together with outer spider from the carrying ring.

Pull the bearing cap out of the outer spider by proper adapter of the puller, then unscrew the dowel pins, from the spider.

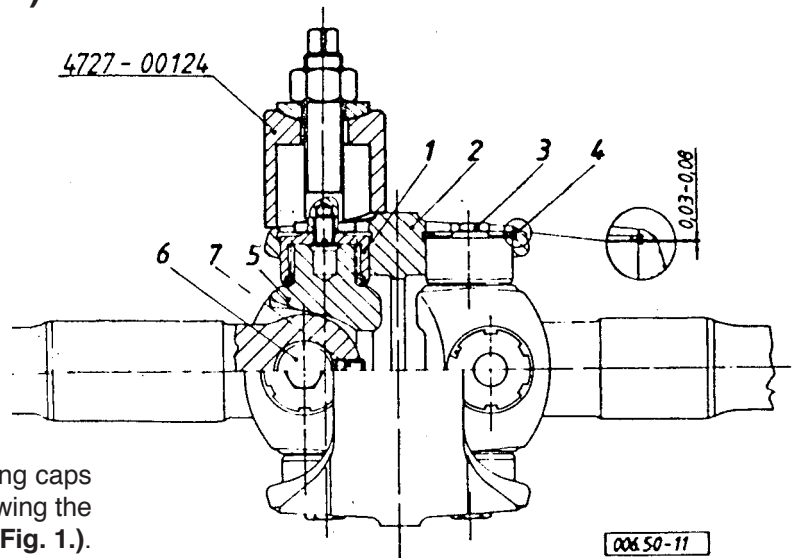
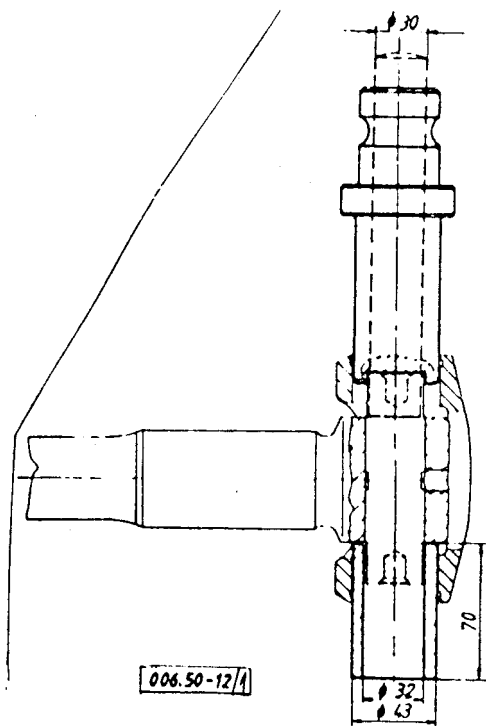


Fig. 1.: PULLING OUT THE BEARING BUSH



Properly backing up the axle-shaft, start the knuckle pin out of the axle-shaft by means of the thrust pin of the tool shown in Fig. 3., then drive out by a mandrel of diameter less than 30 mm (Fig. 2.).

Fig. 2.: DRIVING OUT THE KNUCKLE PINS



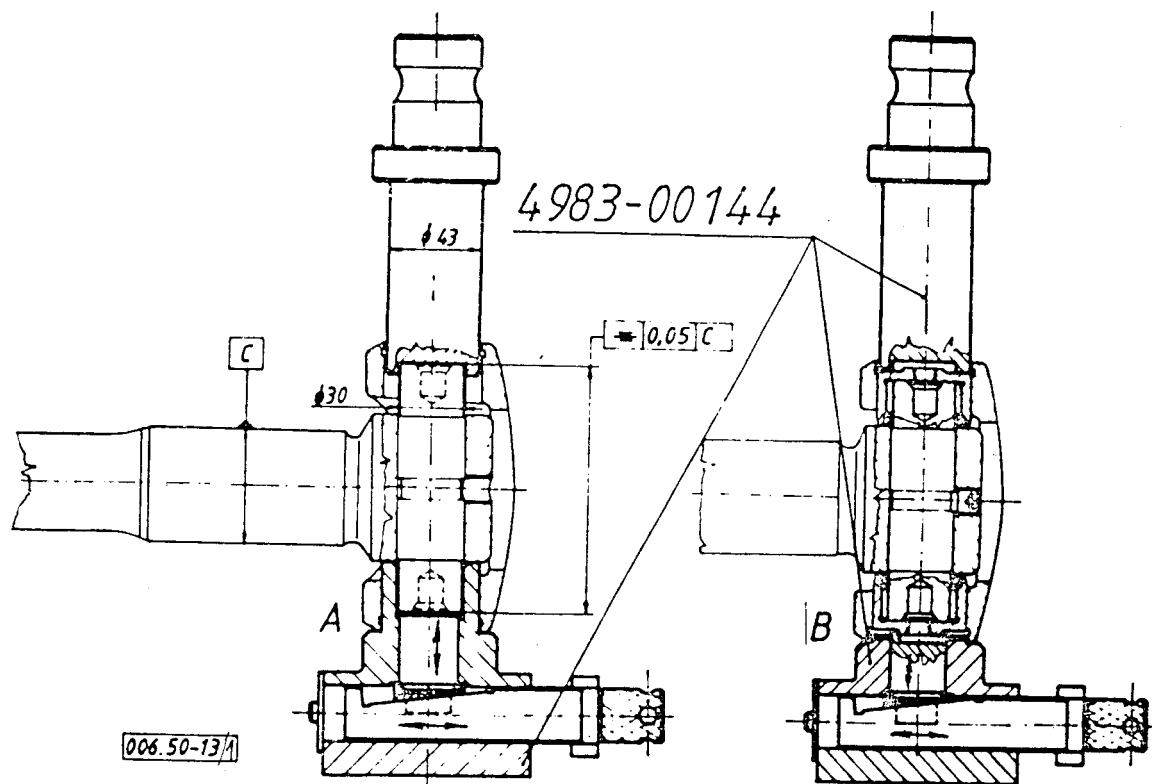


Fig. 3.: INSTALLING THE KNUCKLE PINS AND THE BEARING CAPS

## REASSEMBLING THE DOUBLE JOINT

Reassemble the new axle-shaft in reverse order of removal.

Install the proper axle-shaft into the spider and press in the knuckle pin to center position as shown by "A" in Fig. 3.

### WARNING!

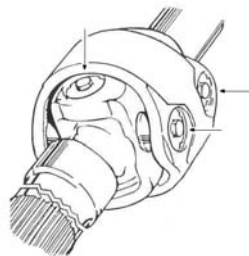
The symmetry tolerance of the face of the knuckle pin pressed into the axle-shaft relative to the ground bearing journal of the axle-shaft is  $\pm 0.05$  mm. Perform check between centers by dial indicator.

Adjustment of the mean position can be performed by rotating the adjusting spindle of the device and by adjusting the movable wedge or its support pin (Fig. 3.).

After adjusting the knuckle pins to mean position, secure the threaded dowel (7). Apply **LOCTITE** thread locker to the dowel.

## DOUBLE-JOINT SERVICE

The Cardan-Joint caps are fitted with plugged threaded ports that are used for disassembly/assembly. While these ports will accept a standard zerk fitting, we recommend that only a needle attachment be used to flow lube into these joints. Adding lube under pressure may result in the failure of the cup seal.



Fill up the roller spaces of the bearing bushes equipped with oil seal, as well as the bores of the knuckle pins and the end of the spider with specified grease.

Adjust the axial play of the knuckle pin and the spider to **0.03 - 0.08 mm**, by installing identical thickness snap rings or using ones different with one size step.

According to detail "A" of Fig. 3. use proper backing and press the bearing cap assembly to one side, then install a "standard" **2.075 mm** thickness blue colored snap ring into the groove. By backing up as shown in detail "B" of Fig. 3., press the bearing cap assembly to the other side and install here also the "standard" **2.075 mm** thickness blue colored snap ring into the groove.

If the joint assembly can be turned easily, the axial play is excessive, so first install the next higher thickness step snap ring instead of the "standard" thickness one. If the joint in spite of this still can be rotated easily, replace the snap ring on the other side also to the next higher thickness step one.

When the joint assembly turns excessively hard, the axial play is too low, so replace the "standard" thickness snap rings to a lower thickness step one, as described above.

Insert the spider subassembly with axle-shaft into the carrying ring and backing up properly press in the bearing caps assembled with oil seal and packed with grease using the thrust pin of the press set **No. 4983-00144**. Install the snap rings as above.

Install the screw plugs into the bearing caps filled with grease.



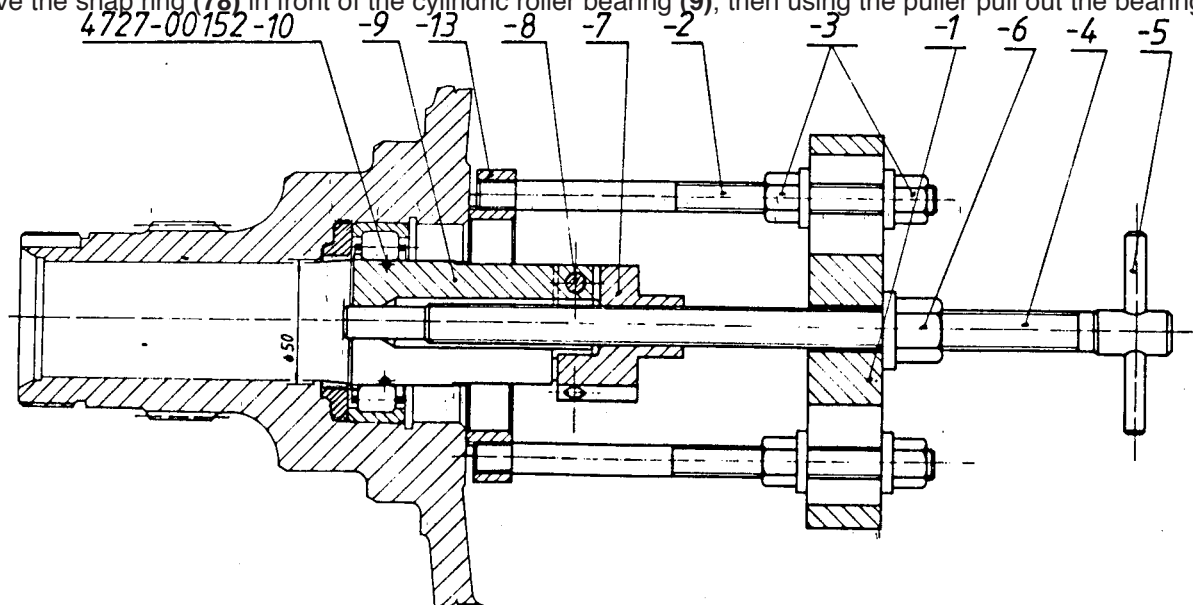


## REMOVING AND INSTALLATION OF THE INNER BEARING AND FASTENERS OF THE SPINDLE TRUNNION

### REMOVAL FROM THE SPINDLE

By means of the puller shown in **Fig. 1**, pull out the seal retainer (73), the sealing ring (30).

Remove the snap ring (78) in front of the cylindric roller bearing (9), then using the puller pull out the bearing (**Fig.**

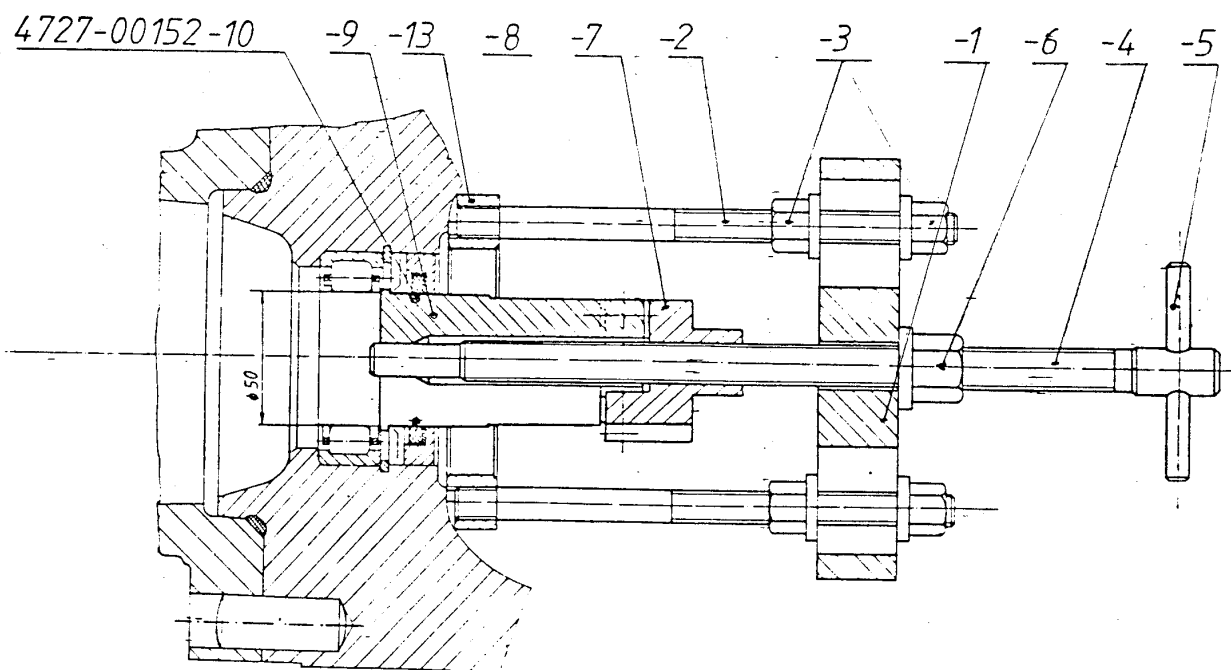


*Fig. 1.: PULLING OUT THE CYLINDRIC ROLLER BEARING FROM THE SPINDLE*

1.).

### REMOVING THE KNUCKLE SUPPORT BEARING

By means of the device shown in **Fig. 2**, pull out the seal retainer (74), the seal ring (76) from the knuckle support.



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*Fig. 2.: REMOVAL OF KNUCKLE SUPPORT BEARING*



Remove the lock ring (77) and pull out the cylindrical roller bearing (79) with the tool shown in Fig. 2.

### INSTALLATION

Place the spacer sleeve (6) in the spindle (35). By means of the tools shown drive in the cylindric roller bearing (Fig. 3.).

When assembling the knuckle support.

Before the cylindric roller bearing drive in the snap ring and sealing ring (76), then by the same tool

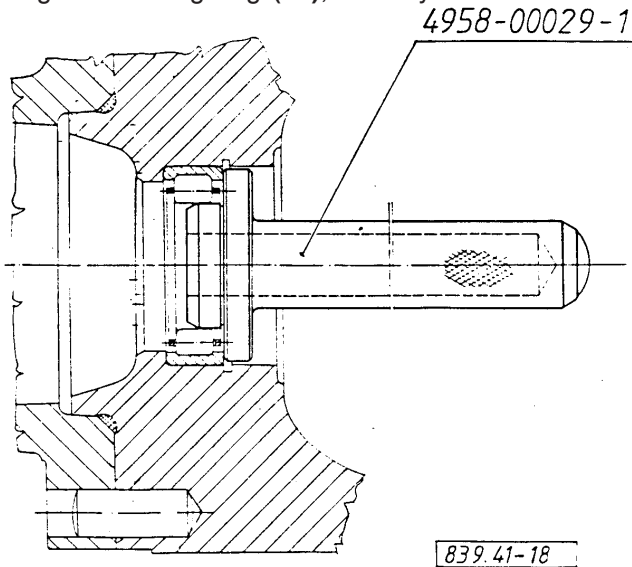


Fig. 4.: DRIVING IN THE CYLINDRIC ROLLER BEARINGS INTO THE KNUCKLE SUPPORT

drive in the seal retainer (74) together with the seal (75) so, the seal shall be on the inner side.

### REMOVING AND REINSTALLING CUPS OF TAPER ROLLER BEARING

By means of the device shown in Fig. 5. pull the cup of

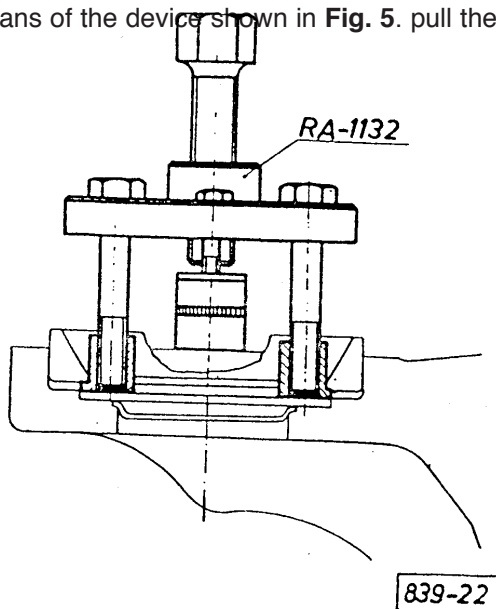


Fig. 5.: PULLING OUT THE TAPER ROLLER BEARING CUPS

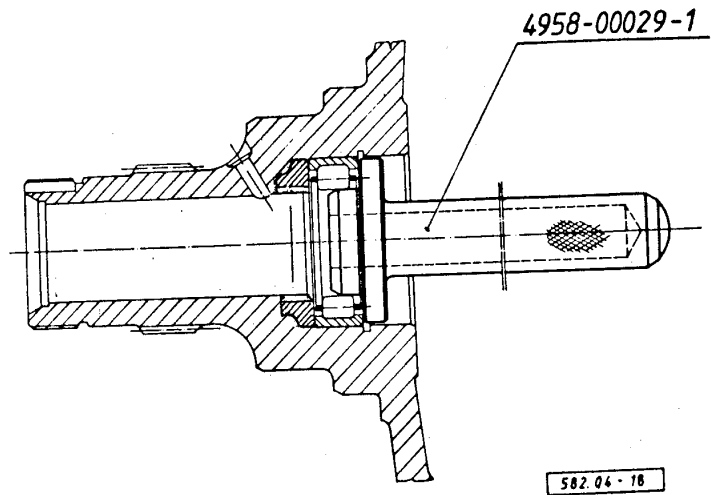


Fig. 3.: DRIVING IN THE CYLINDRIC ROLLER BEARINGS

the taper roller bearings 31310 out of the knuckle support.

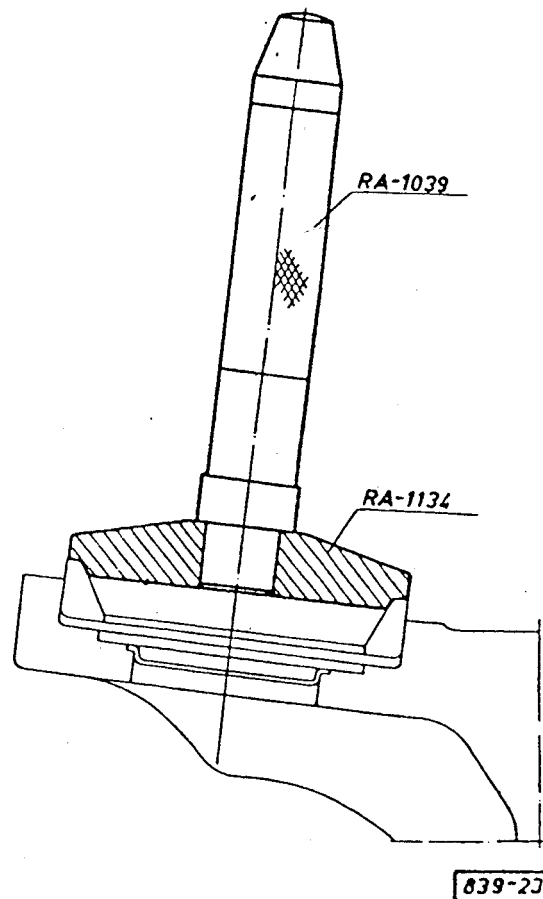


Fig. 6.: PRESSING IN THE TAPER ROLLER BEARING CUP





Press in of the taper roller bearings **31310** as shown in **Fig. 6**.

## FRONT WHEEL BRAKE

SECTION 260

### DRAWING OF THE FRONT WHEEL BRAKE

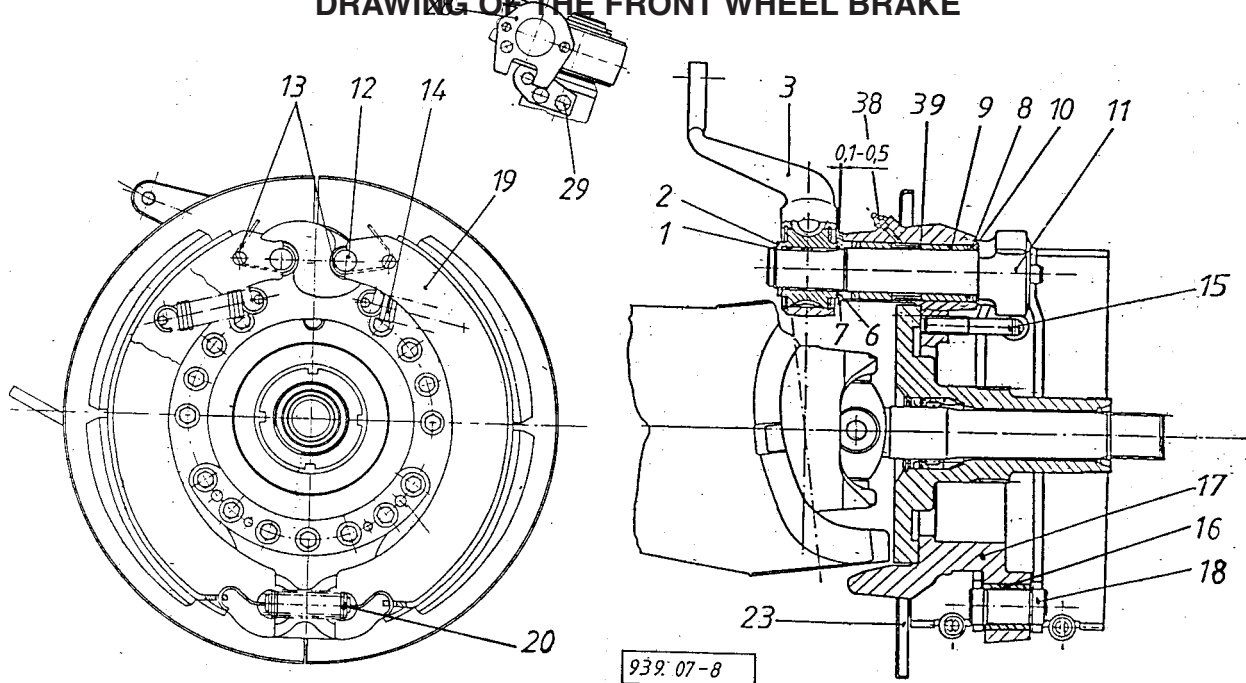


Fig. 1.: DRAWING OF THE WHEEL BRAKE

SECTION 261

### PARTS OF THE FRONT WHEEL BRAKE

- |                    |   |
|--------------------|---|
| 1 - Snap ring      | 13 - Roller locking spring                    |
| 2 - Washer         | 14 - Brake shoe return spring, long           |
| 3 - Brake lever    | 15 - Spring support pin                       |
| 6 - Shims          | 16 - Bushing                                  |
| 7 - Spacer         | 17 - Brake Bracket (steering knuckle housing) |
| 8 - Sealing ring   | 18 - Brake shoe anchor pin                    |
| 9 - Bearing bush   | 19 - Brake shoes                              |
| 10 - Spacer washer | 20 - Brake shoe return spring, short          |
| 11 - Camshaft      | 23 - Dustshield                               |
| 12 - Roller        | 28 - Stop                                     |
|                    | 29 - Hex. bolt, Flat lock washer              |



38 - Ball grease fitting

39 - Spacer

## SECTION 262

### REMOVING AND REINSTALLING THE BRAKE SHOES

#### REMOVING THE BRAKE SHOES

Remove the brake drum (54 in Fig. 1. of Section 210).

Pry the brake shoes (19) away. Remove the rollers (12) together with the lock springs (13).

Unhook the shoe return springs by means of a spring hooking device, then remove the brake shoes.

#### REINSTALLING THE BRAKE SHOES

Position the brake shoes to be placed in shoe anchor pin (18) and the brake camshaft head. Hook the return springs (14 and 20) to the brake shoes. Use the spring hooking device.

Pry the brake shoes away, then insert the rollers so, they shall seat both in the brake shoe rib and in the brake spanner involute profile.

## SECTION 263

### REPAIRING THE BRAKE SHOES AND THE BRAKE DRUM

**DO NOT** operate the axle with brake drum trued-up exceeding the permitted max. diameter and brake lining worn below the permitted limit. Exceeding the permitted limits the brake camshaft may turn over making the brake application impossible.

The permitted minimum brake lining thickness is indicated by the upper edge of the recess in the brake lining side. (This value is  $v_{min} = 7 \text{ mm}$  as measured at center of the brake shoe)

In case of damage or wear to the permitted limit replace the brake linings.

Replacement of the brake lining or true-up of the brake shoe may be performed only in brake shoe pairs.

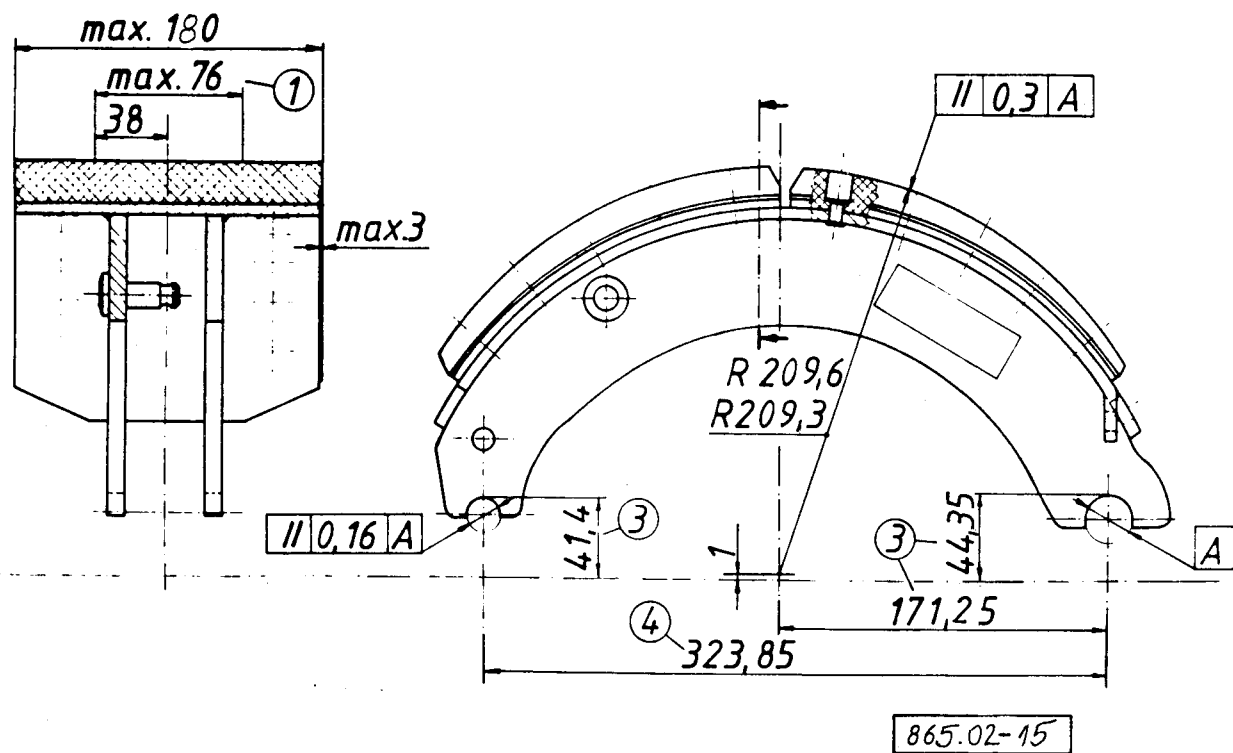


Fig. 1.: DATA FOR TRUEING UP THE BRAKE SHOES WITH NEW LININGS.

The brake shoes equipped with new linings should be in compliance with the dimension specifications and technical requirements shown in Fig. 1.





Fig. 4.

### 1 - Center of the brake shoe

### 2 - Brake camshaft end of the brake shoe

The brake lining should seat so, the feeler gage of thickness **0.15 mm** could not be inserted between the lining and the brake shoe along the full length except the **Zed**-area (see Fig. 1.).

At the both webs check the brake lining surface for parallel.

That to the dimension "A" so, the dimension "A" by a  $\phi 22.5$  mm pin be positioned as shown (see Fig. 1.).

During checking the **32** rivets should endure the **5340 N** test load, applied to bottom of the  $\phi 3.784$  mm bore, without loosening.

On each lining **2** rivet flanges may crack in **Vee**-shape, provided the test load was endured.

### CHECKING THE BRAKE DRUM

Check the inside surface of the brake drum.

If depth of the hair-cracks experienced on the brake drum surface does not exceed **1 mm** the brake drum can be repaired by true-up.

The maximum of the brake drum diameter after true-up  **$\phi 423$  mm**

Out of this diameter the brake drum should be replaced.

When trueing up the brake drum the brake shoes should be trued up taking the brake drum diameter into account.

E.g.: If diameter of the trued up brake drum is **422 mm**, true up the brake shoe to **R210.6 - R210.3 mm** as shown in Fig. 1.

### SECTION 264

## REMOVING AND REINSTALLING THE BRAKE SUPPORT BRACKET, ASSEMBLING THE SPRING SUPPORTING PIN

In case of damage to the brake bracket, the steering knuckle housing machined also as the brake bracket should be replaced as described in the Section 243.

### ASSEMBLING THE SPRING SUPPORTING PINS

Install the spring supporting pins (15) with thread adhesive.

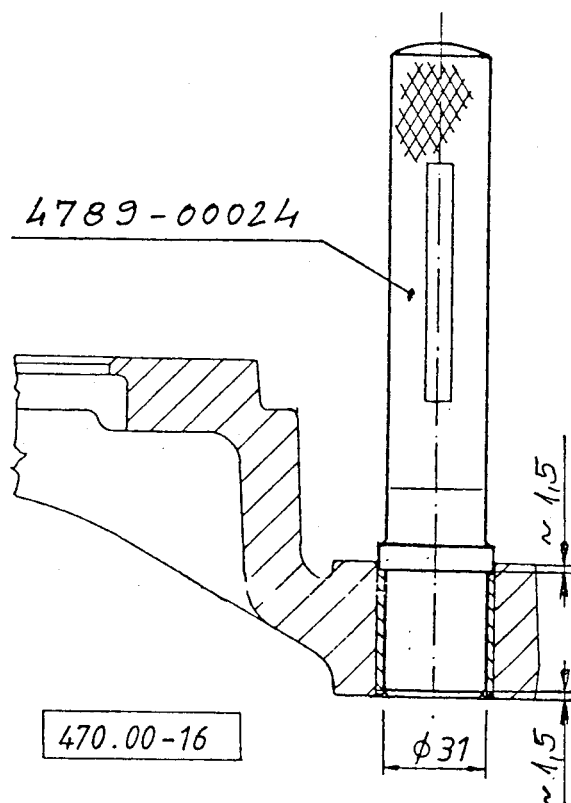


Fig. 1.: PRESSING THE BUSHINGS IN AND OUT



If the anchor pin bushing (16) are to be replaced, use the tool shown. **Fig. 1.**

## SECTION 265

### REMOVING AND REINSTALLING THE BRAKE LEVER AND THE CAM- SHAFT

#### REMOVING THE CAMSHAFT

Removal of the camshaft can be performed after removing the brake shoes.

Remove the snap ring (1) and the washer (2)

Pull the brake lever (3), the shims (6) and the spacer (7) off the brake camshaft (11) end.

Pull the brake camshaft out (4) and remove the spacer washer (10) below the brake cam head.

#### REINSTALLING THE BRAKE CAMSHAFT AND THE BRAKE LEVER

Apply grease to the camshaft support bushings (9).

Position the spacer washer (10) to the brake camshaft

and push the relevant brake camshaft (RH - LH) into the bearing bushing.

Pull the spacer (7) and the shim pack (6) necessary for adjusting **0.1 - 0.5 mm** axial clearance over the brake camshaft.

Install the brake lever to the brake camshaft so, the bore center of the brake lever bushing shall be in distance "A" specified in the "**TECHNICAL DATA**" from the upper plane of the chamber bracket.

Beside the brake lever install the washer (2) and secure by snap ring (1).

Check axial play of the brake camshaft to be **0.1 - 0.5 mm**. If required adjust by shims (6).

Fill up the camshaft bearings with specified grease.

#### WARNING!

After installing the RH, LH camshaft make sure to check for installed properly. When actuating the brake lever, the brake shoes should open.

#### INSTALLING THE STOPS (AT AUTOMATIC SLACK ADJUSTER)

Attach the relevant (RH-LH) brake lever stops (28) to the chamber bracket by 2 off **M8x14** hex. bolts (29) with lock washers for each. Tighten the hex. bolts **20 - 25 Nm** torque.

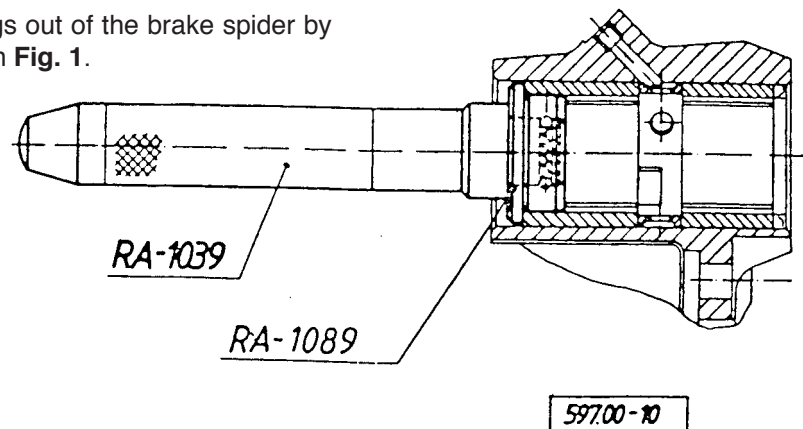
## SECTION 266

### REPAIRING THE CAMSHAFT BEAR- ING SUPPORT

#### REMOVING THE BEARING BUSHINGS AND THE SEALING RINGS

From one side remove the sealing ring by a simple pry.

Press the bearing bushings out of the brake spider by means of the tools shown in **Fig. 1.**



*Fig. 1.: PRESSING OUT THE BEARING BUSHINGS*



Pressing out the bearing bushing (9) will push out the spacer ring (39), the other bushing and the sealing ring ahead.

### REINSTALLING THE BEARING BUSHINGS

Press in the shorter bearing bushing with the tool shown, to the specified value then install the spacer and press in the bearing bushing to the other side. When pressing in, take care of that the bushing corners rounded to **R 1.5** be on the side shown (**Fig. 2.**).

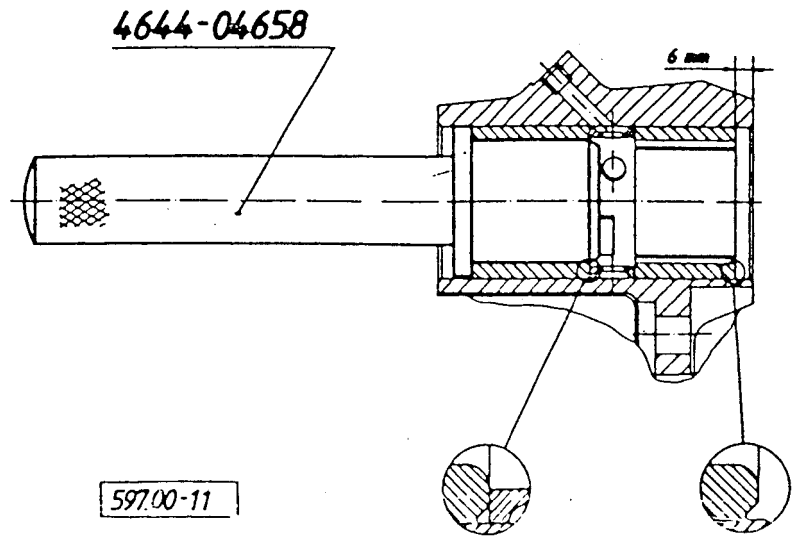


Fig. 2.: DRIVING IN THE BEARING BUSHINGS

### REINSTALLING THE SEALING RINGS

When reinstalling the sealing rings make sure to check if the sealing lips of the rings both near the brake cam head and on the brake lever side face toward the axle housing center and the brake lever.

By this means leak-tightness at the brake cam head is assured.

During lubrication with grease the sealing ring near the brake lever should pass the surplus lubricant toward the brake lever.

By means of the tools shown press the seal-

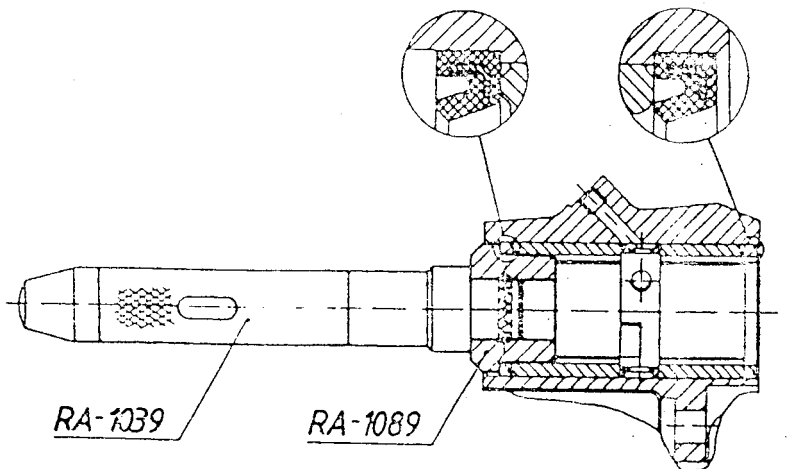


Fig. 3.: PRESSING IN THE SEALING RING

ing rings before the bushings (see Fig. 3.).

## SECTION 267

### MANUAL SLACK ADJUSTER

#### DISASSEMBLING THE MANUAL SLACK ADJUSTER

Remove the snap ring (6) and the shims (5). Back out the grub screw (12), then remove the spring (11) and the steel ball (10). Fixing the worm gear (at the brake spanner stem) unscrew the worm (3) from the brake lever. The worm will push out the backing disk (4) ahead.

On both sides remove the snap rings (9) before the worm gear and remove the worm gear (8) as well.

Drive the bushing (1) out of the brake lever also, if required, and drive in the new bush to flush with side sur-

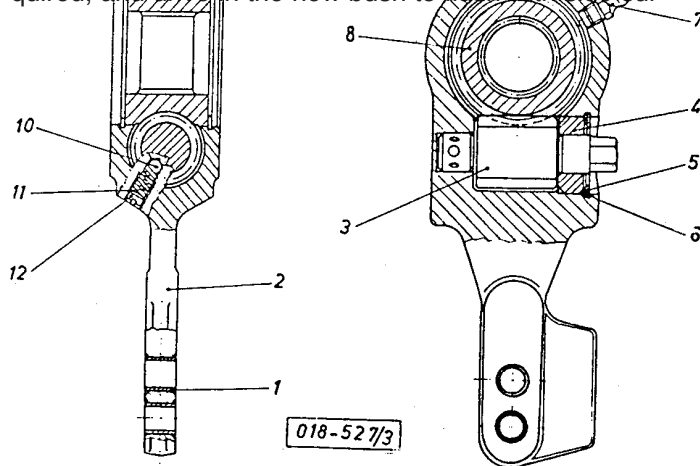


Fig. 1.: MANUAL SLACK ADJUSTER

face of the brake lever.

- |                 |                       |
|-----------------|-----------------------|
| 1 - Bushing     | 3 - worm              |
| 2 - Brake lever | 4 - Backing disk      |
|                 | 5 - Shim              |
|                 | 6 - Snap ring         |
|                 | 7 - Ball lube fitting |
|                 | 8 - Worm gear         |

- 9 - Snap ring
- 10 - Steel ball
- 11 - Spring
- 12 - Grub screw

#### REASSEMBLING THE MANUAL SLACK ADJUSTER

In case of damage to the teeth replace the worm-worm gear pair. Position the worm (3) and the worm gear (8) into the brake lever. Secure the worm gear by snap rings (9) on both sides.

The worm and the worm gear should be rotatable without jamming and jerk.

Insert the steel ball (10) and the spring (11) into the seat and secure by grub screw (12).

Before the worm, drive in the backing disk (4) to bottom

out, position the required shim pack so, to be able to insert the snap ring without clearance. Finally install the snap ring.

Fill up the worm gear with specified grease.

## SECTION 268

### AUTOMATIC SLACK ADJUSTER

The slack adjuster requires no maintenance, since it is automatically readjusted according to the brake lining wear.

In case of replacing the brake linings of after repairing the axle perform adjustment of the shoe clearance and the automatic slack adjuster as follows:

#### ITEMS:

- 1 - Adjusting plate
- 2 - Setscrew (hex. distance 13)
- 3 - Setscrew (hex. distance 10)
- 4 - Plastic protection cup

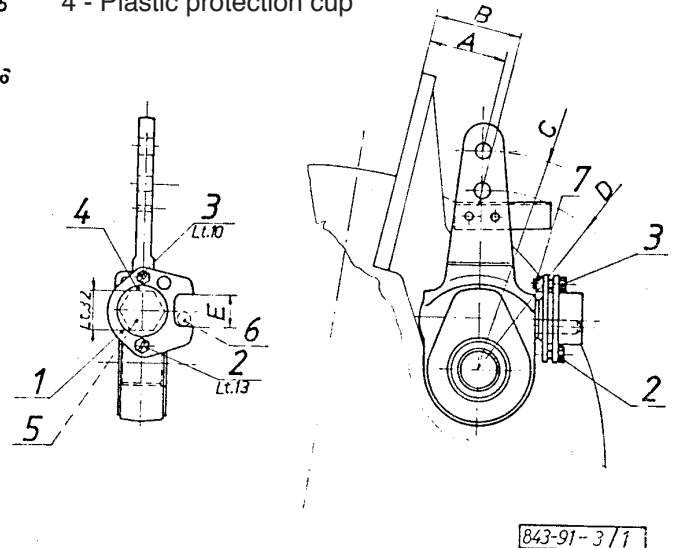


Fig. 1.: AUTOMATIC SLACK ADJUSTER

- 5 - Hex. adjusting ring (hex. distance 32)
- 6 - Stop pin
- 7 - Plastic thread protector

#### ADJUSTMENT DATA:

A = Distance between the chamber holder plane and the brake lever bore

B = - " -

C = Brake lever installation radius



D = - “ -

For dimensions A - C and B - D refer to “**TECHNICAL DATA**”.

**A/ ADJUSTING POSITION OF THE BRAKE LEVER AND THE SHOE CLEARANCE:**

- Remove setscrews (2, 3).
- Take care of the plastic thread protector (7).
- Remove the adjusting plate (1) and the plastic protection cap (4).
- By turning the hex. adjusting ring (5) to proper direction adjust the specified distance between the seating surface and the brake lever bore. (Start adjustment from a distance higher than specified.

If required, also adjust the push rod clevis.)

- After the above operation adjust the shoe clearance to **0.3 - 0.6 mm**.

**B/ ADJUSTING AND FIXING THE ADJUSTING PLATE:**

- Secure the stop fork “E” of the adjusting plate (1) in bottom position relative to stop pin (6) as shown in **Fig. 1**.
- Complete adjustment by reinstalling the protection cap (4) and the adjusting plate (1) as well as installing and securing the setscrews (2, 3) and screwing on the plastic thread protector (7).

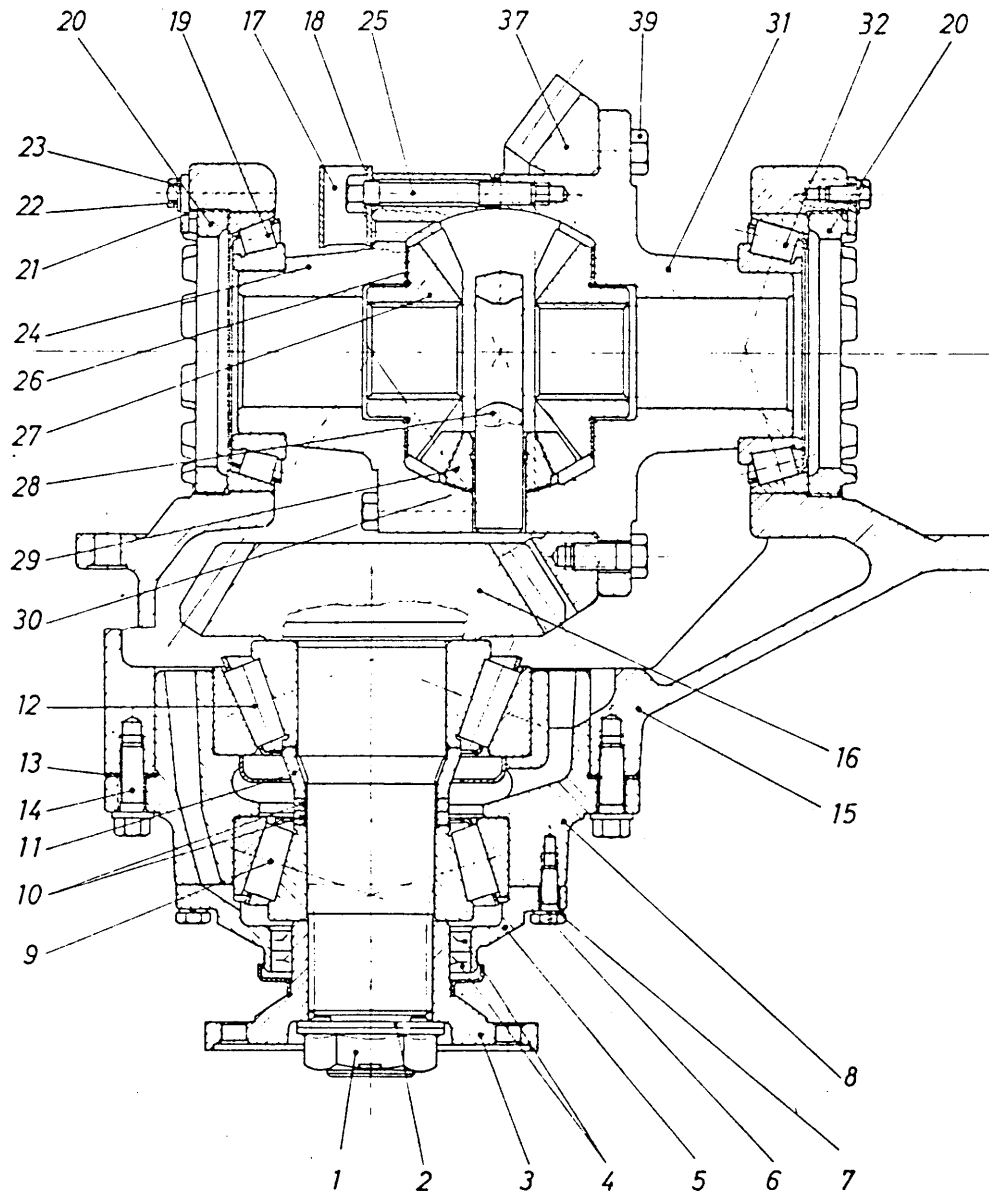




SECTION 310

**DIFFERENTIAL CARRIER ASSEMBLY**

**DIFFERENTIAL CARRIER ASSEMBLY SECTIONAL VIEW**



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*Fig. 1.: DIFFERENTIAL CARRIER ASSEMBLY SECTIONAL VIEW*



# LIMITED SLIP DIFFERENTIAL CARRIER ASSEMBLY SECTIONAL VIEW

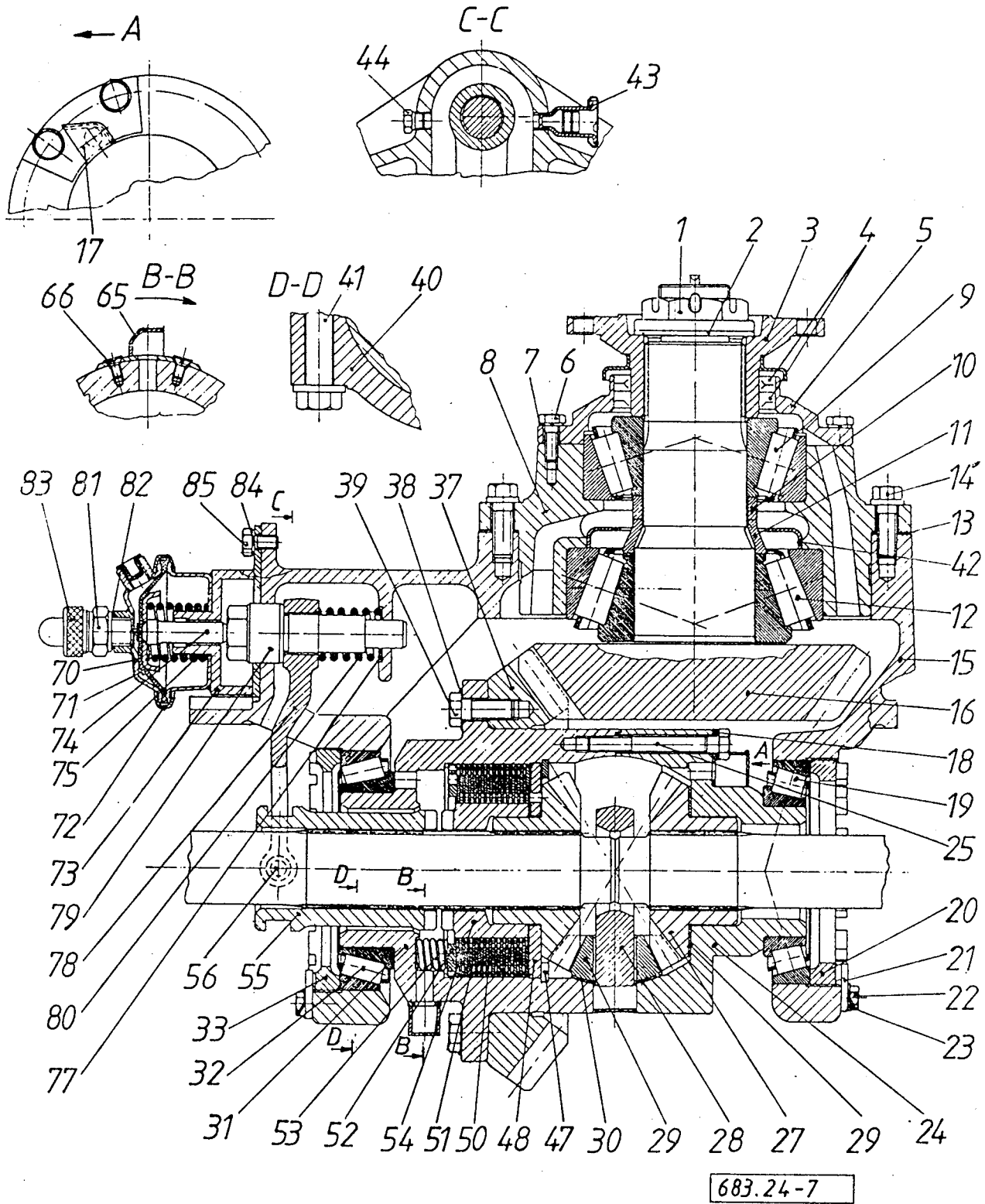


Fig. 2.: LIMITED SLIP DIFFERENTIAL CARRIER ASSEMBLY SECTIONAL VIEW



## SECTION 311

### PARTS OF THE DIFFERENTIAL CARRIER ASSEMBLY

1 – Flanged castle nut with cotter pin	23 – Lock plate	51 – Outer disks
2 – Washer	24 – Differential case half	52 – Backing disk
3 – Companion flange I.	25 – Clamp bolt	53 – Thrust springs
4 – Sealing rings	26 – Spacer	54 – Toothed hub
5 – Cover	27 – Differential gear	55 – Clutch sleeve
6 – Hex. bolt	28 – Spider	56 – Thrust pad
7 – Lock washer	29 – Differential pinion	–
8 – Bearing cage	30 – Shim	65 – Oil scoop
9 – Taper roller bearing (32312 B X7 JU MGM)	31 – Differential case half (flanged)	66 – Sunk.head screw
10 – Distance ring	32 – Taper roller bearing (32215 A or 32018 X MGM)	–
11 – Distance sleeve	33 – Bearing adjuster	70 – Pneumatic chamber cover
12 – Taper roller bearing (32314 B X7 JU MGM)	–	71 – Diaphragm
13 – Shims	37 – Drive gear	72 – Clamp
14 – Hex. flanged bolts	38 – Lock plate	73 – Pneumatic chamberhousing
15 – Differential carrier	39 – Hex. bolt	74 – Spring retainer
16 – Drive pinion	40 – Bearing cage	75 – Spring
17 – Oil catch plate	41 – Hex. flanged bolt	–
18 – Washer	42 – Oil baffle plate	77 – Stop insert
19 – Taper roller bearing (30215 A MGM)	43 – Vent valve	78 – Shift yoke
20 – Bearing adjuster	44 – Screw plug	79 – Shift bar
21 – Tab lock plate	–	80 – Spring
22 – Hex. bolt	47 – Snap ring	81 – Reporting switch
	48 – Insert disk	82 – Washer
	–	83 – Connecting
	50 – Inner disks	84 – Lock washer
		85 – Hex. bolt

## SECTION 312

### REMOVING AND REINSTALLING THE DIFFERENTIAL CARRIER ASSEMBLY

Before removing the differential carrier assembly from the axle drain the oil.

For removing the differential carrier pull the inner axle-shafts of the double-joint out of the differential. This can be performed in two ways:

- 1./After removing the wheel hub and the steering knuckle, remove the double joints as described in Section 243.
- 2./ Assembly can be performed in case of removing the knuckle carrier, as well. Perform removal and reinstallation of the knuckle carrier as described in Section 248.

Remove the hex. flanged bolts attaching the differential carrier assembly to the axle housing and lift out the carrier.

### REINSTALLING THE DIFFERENTIAL CARRIER ASSEMBLY

As described in the “GENERAL SERVICE INSTRUCTIONS” apply oil-proof surface sealant to flange of the axle body and to connecting flange of the differential carrier.

Install one **M12** stud bolt to two opposite bores in the axle body, then fit the differential carrier into the axle housing and secure by hex. flanged bolts coated with thread locker.

Tighten the bolts diagonally to **88 - 98 Nm** torque.

Install the double joints as described in Section 243.

## SECTION 313

### REMOVING AND REINSTALLING THE COMPANION FLANGE AND THE COVER, REPLACING THE SEALS IN THE COVER

#### REMOVING THE COMPANION FLANGE

For assembling the self-lock nut (1) use the tools shown (Fig. 1.).

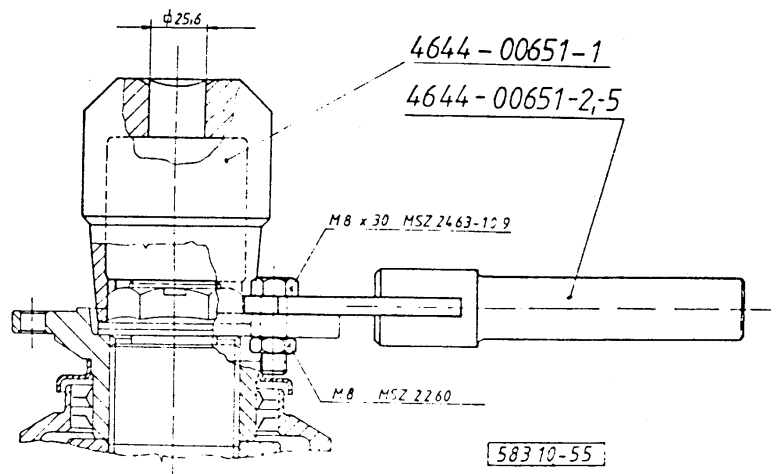
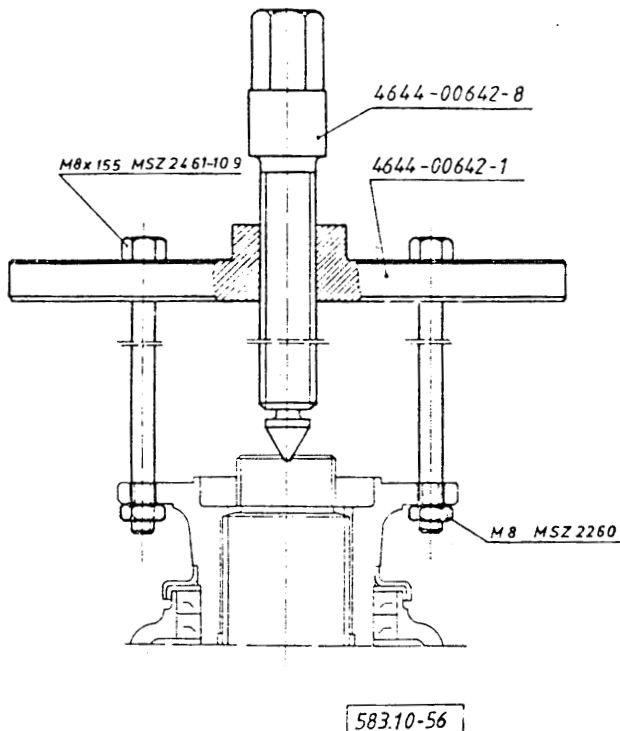


Fig. 1.: ASSEMBLING THE SELF-LOCK NUT



For the pitch diameter **184.15 mm** companion flanges use the shown counter-support No. **4644-00651-2, -5** while for those of pitch diameter **155.5 mm** the counter-support No. **4644-00651-4, -5**.

For pulling off the companion flange use the device arranged from the shown parts (**Fig. 2.**).

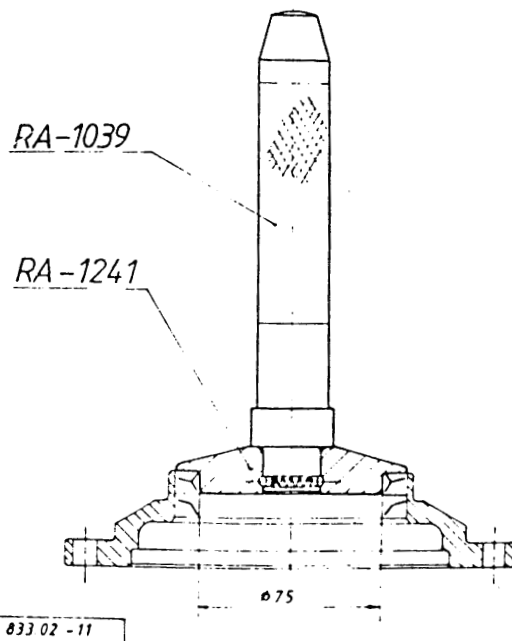


*Fig. 2.: PULLING OF THE COMPANION FLANGE*

### REPLACING THE SEALING RINGS IN THE COVER

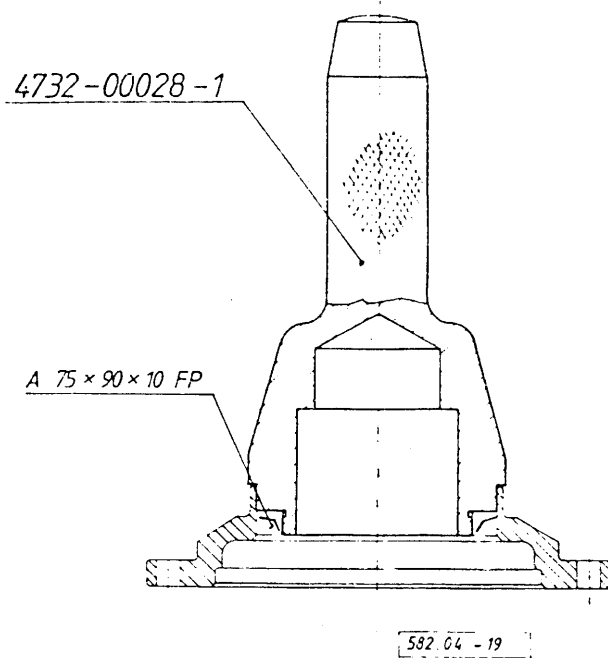
Back out the hex. bolts (6) and remove the cover (5).

By means of the tools shown remove the used sealing rings (4) from the cover (**see Fig. 3.**).



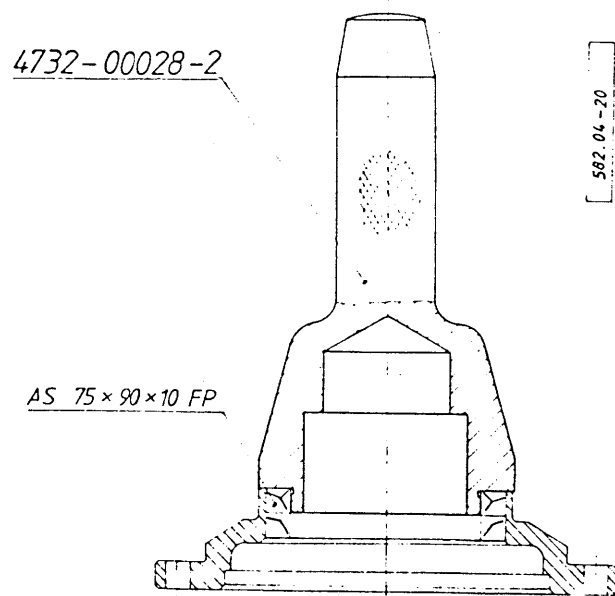
*Fig. 3.: DRIVING OUT THE SEALING RINGS*

Drive in the inner sealing ring (**see Fig. 4.**).



*Fig. 4.: DRIVING IN THE INNER SEALING RING*

Drive in the outer sealing ring, as well, by means of the tool shown (**see Fig. 5.**)



*Fig. 5.: DRIVING IN THE OUTER SEALING RING*

Apply specified grease between the sealing lip and the dust protection edge of the outer sealing ring and apply thin coat grease to the inner one.

### REINSTALLING THE COVER

As described in the "**GENERAL SERVICE INSTRUCTIONS**" apply oil-proof surface sealant to inner flange of the cover (5) subassembled with sealing rings (4), then



aligning the bores attach the cover to the bearing cage by means of lock washers (7) and hex. bolts (6). Diagonally tighten the bolts to 20 - 30 Nm torque.

### REINSTALLING THE COMPANION FLANGE

By means of the tool shown press the companion flange (3) to the drive pinion splines to bottom out (Fig. 6.).

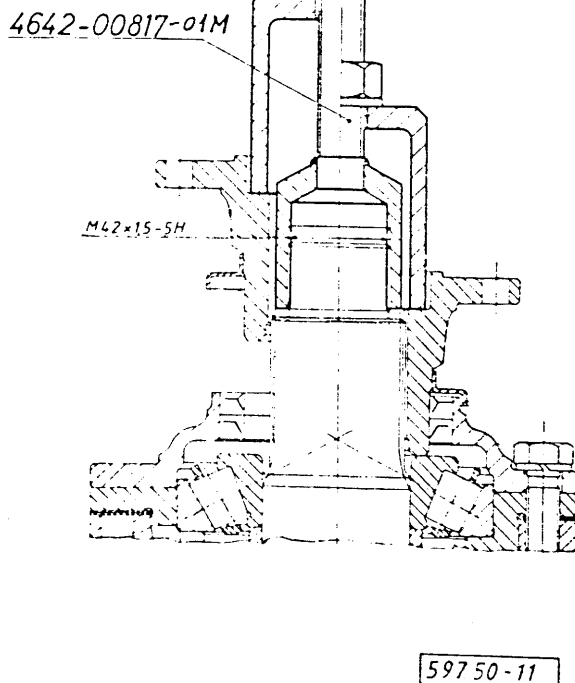


Fig. 6.: PRESSING ON THE COMPANION FLANGE

Install the washer (2), screw on the self lock nut (1) and tighten to 540 - 590 Nm torque.

### SECTION 314

## REMOVING AND REINSTALLING THE DIFFERENTIAL, ADJUSTING THE BACKLASH AND THE CONTACT PATTERN

Back out the hex. bolts (22) and remove the lock plates (23) and the tab lock plates (21).

By means of the tool shown remove the bearing adjusters (20) from both sides (see Fig. 1.).

By means of the tool shown in Fig. 2. tap the differential toward the flanged differential case half (31) so, the outer race of the taper roller bearing (19) shall fall out.

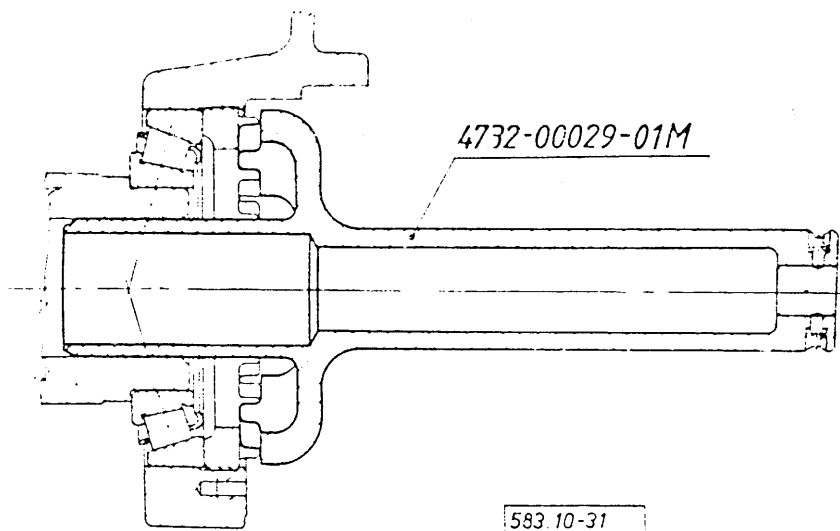


Fig. 1.: ASSEMBLING THE BEARING ADJUSTERS

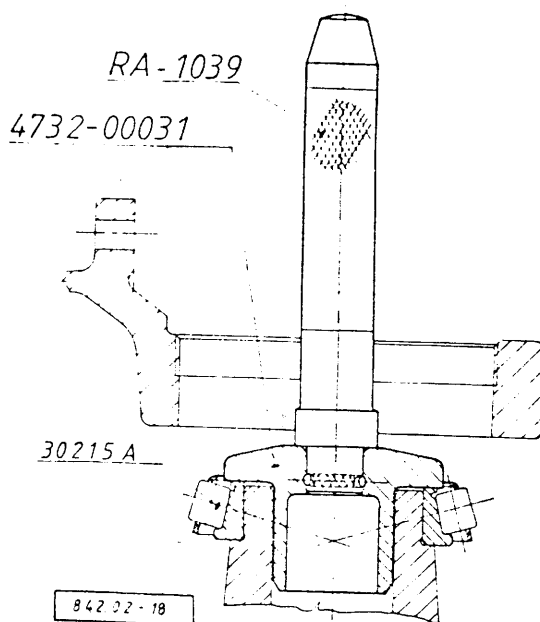


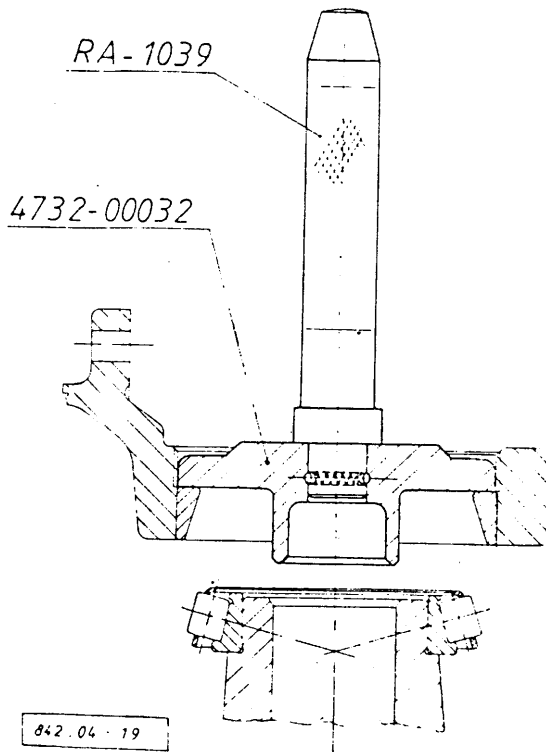
Fig. 2.: DRIVING ON THE TAPER ROLLER BEARING CONE

Due to the taper roller bearing cones the differential can be removed only if disassembled.

Back out the differential case halves clamp bolts (25), then remove the separated case halves and the other parts from the carrier.



Drive the outer race of the other taper roller bearing out of the leg bore in the differential carrier by means of the tool shown in **Fig. 3**.



*Fig. 3.: DRIVING IN THE TAPER ROLLER BEARING CUP*

### REINSTALLING THE DIFFERENTIAL

Reinstall the differential only after installing the bearing cage and adjusting the axis distance (**see Section 316**).

Position the assembled differential into the differential carrier. Turn the differential carrier over so, the differential shall be supported by its flanged case half.

Position the cone of the taper roller bearing (19) to the differential case half (24) and by means of the tool shown drive on to bottom out (**see Fig. 2**).

Position the taper roller bearing outer race into the bearing bore in the differential carrier and drive in by means of the tool shown (**see Fig. 3**).

Screw in the bearing adjusters (20).

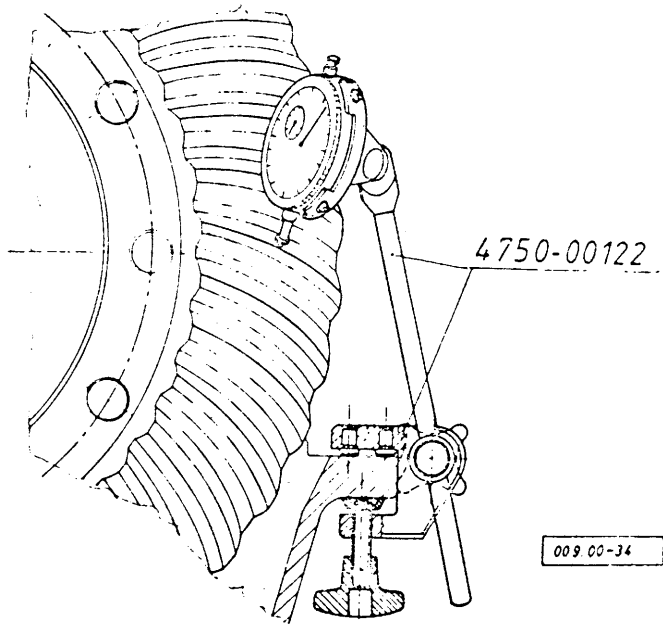
Turn the differential carrier over and drive the taper roller bearing cone to the flanged case half (31), then by the same tool as at the other side the bearing cup. Screw in the bearing adjusters (20).

### ADJUSTING THE BACKLASH AND THE BEARING PRELOAD

By means of the bearing adjusters adjust the drive pinion to gear backlash (**at KLINGELNBERG toothing**) to **0.15 - 0.25 mm**.

Locking the drive pinion measure the backlash by dial indicator at four places diagonally on the drive gear

toothing, perpendicularly to the tooth surface by the dial indicator (**Fig. 4**).



*Fig. 4.: CHECKING THE BACKLASH*

Maintaining the backlash install the differential taper roller bearing (19 and 32) with no clearance. Tighten the bearing adjusters (20) so, to obtain **0.000 mm** axial play of the drive gear.

After adjusting the backlash and the **0.000 mm** bearing clearance check the contact pattern as follows.

### ADJUSTING THE CONTACT PATTERN

Apply indicator paint to **3 opposite teeth pairs** of the drive gear.

Rotate the drive pinion to both directions for **approx. 15 sec**, while braking the drive gear by a piece of wood.

### PROPER CONTACT PATTERN

If a contact pattern shown in **detail 1 of Fig. 5** is obtained, the drive gear-pinion pair is installed properly.

**Practically the perfect contact pattern shown in the figure cannot be obtained, but it is important that the pattern shall nowhere reach the edge of the tooth surface.**

D = Large diameter

1 = Proper contact pattern

2 = Too deep contact

3 = Too high contact

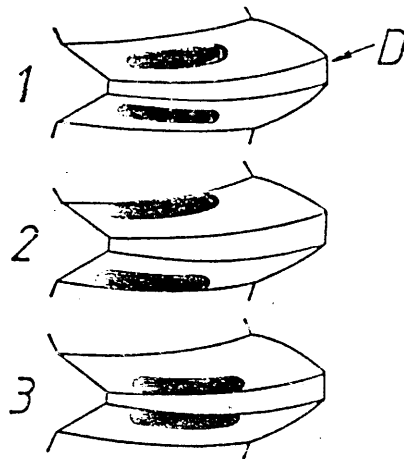
In case of **GLEASON toothing** the contact pattern along the tooth is shifted toward the small diameter of the drive gear.





### TOO DEEP CONTACT

If the contact pattern is shifted to the dedendum as shown in **detail 2 of Fig. 5.**, increase the “**AXIS DISTANCE**” by increasing the thickness of the shim pack (13) and simultaneously reduce the increased backlash by shifting the drive gear so, to obtain the contact pattern shown in **detail 1 of Fig. 5.**



118.00-20

Fig. 5.: THE CONTACT PATTERN

### TOO HIGH CONTACT

If the contact pattern is shifted to the addendum as shown in **detail 3 of Fig. 5.**, reduce the “**AXIS DISTANCE**” by reducing the thickness of the shim pack (13) and simultaneously increase the reduced backlash by shifting the drive gear so, to obtain the contact pattern shown in **detail 1 of Fig. 5.**

After each contact pattern adjustment measure the backlash and check if the bearing clearance is **0.00 mm**.

After adjusting the proper contact pattern and gear clearance tighten the bearing adjusters on both sides by **0.75 - 1.25 pitch (approx. 7.5 ° - 15 °)** to be able to secure them by one of the tab lock plates (21).

Secure the tab lock plates on both sides by means of the hex. bolts (22). Tighten the bolts to **15 - 20 Nm** and secure by folding the corners of the lock plates (23) to flats of the bolts.

When the adjustment and the operation is proper, remove bearing cage assembled with drive pinion and according to the “**GENERAL SERVICE INSTRUCTIONS**” apply oil-proof surface sealant to the inner flange, then fit back the bearing cage and secure by hex. flanged bolts (14) coated with thread locker. Diagonally tighten the bolts to **88 - 98 Nm** torque.



### SECTION 315

## DISASSEMBLING AND REASSEMBLING THE DIFFERENTIAL

Pull the inner race of the taper roller bearings (19 and 32) from the removed differential (see Fig. 1.).

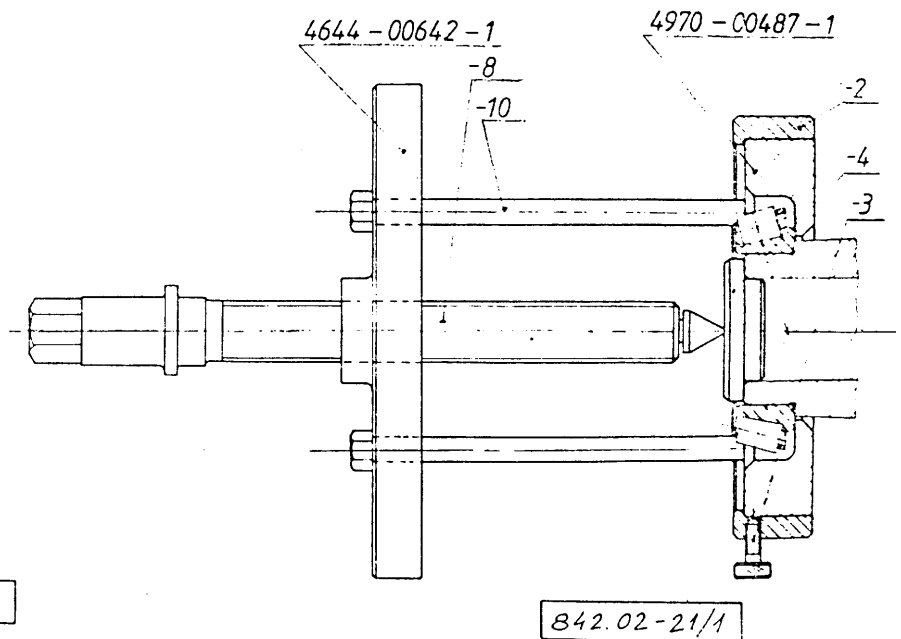


Fig. 1.: PULLING OFF THE TAPER ROLLER BEARING CONES

For disassembling the differential case remove the hex. bolts (25) clamping the case halves (24 and 31) together and separate the case halves.

Remove the spider (28) together with the differential pinions (29) and shims (30) as well as the differential gears (27) and the spacers (26).

**Replace the drive gear ONLY together with the matched drive pinion.**

The match-marks are stamped to one end of the drive pinion and to one tooth end on the outer taper surface of the drive gear.

The match-marks indicate the identification number of the matched drive gear-pinion pair and the deviation — true-to-sense — from the theoretical “**AXIS DISTANCE**” measured between the drive pinion face and the drive gear centerline. **For example: 1250, + 0.04.**

**The differential case halves are match pairs, thus assemble only match-marked case halves according to the mark.**

Pull the flanged differential case half (31) over the lower service mandrel (see Fig. 2.). Insert the spacer (26) and the differential gear (27) as well as the spider (28) subassembled with shims (30) and differential pinions (29). Following this insert the other differential gear and the spacer.

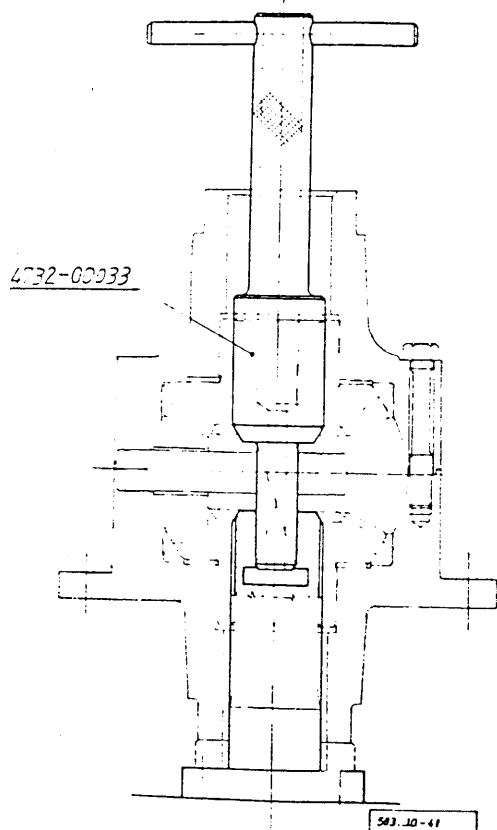


Fig. 2.: ASSEMBLING AND CHECKING THE DIFFERENTIAL

According to the match-marks and aligning the bores fit the differential case halves together, then install the clamp bolts (25). By means of the upper service mandrel lock the differential and tighten the clamp bolts to 49 - 59 Nm. Remove the upper service mandrel and rotate the differential on the lower mandrel.

**The differential should roll evenly and smoothly without jamming and jerks.**

Apply thin coat of oil to the mating surface of the drive gear. Aligning the bores position the drive gear to the flanged differential case half. Thru the flange bore drive 4 hex. bolts with completely screwed on nut into the drive gear and gradually tightening the nuts pull the drive on to bottom out (Fig. 3.).

Secure the drive gear by means of bolts (even at the place of the puller bolts) applied with thread locker. Tighten the bolts to 98 - 118 Nm torque.

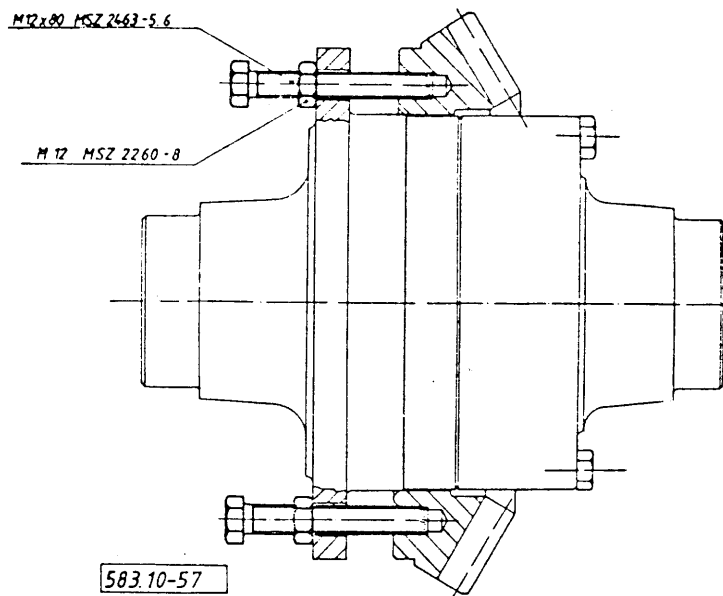


Fig. 3.: PULLING ON THE DRIVE GEAR

## REASSEMBLING AND DISASSEMBLING THE LIMITED SLIP MECHANISM

### CAUTION!

**The springs in the limited slip mechanism are under tension.**

By means of the device shown, pull the disks together to bottom out securing the spring force and remove the snap ring (47). (Fig. 1.).

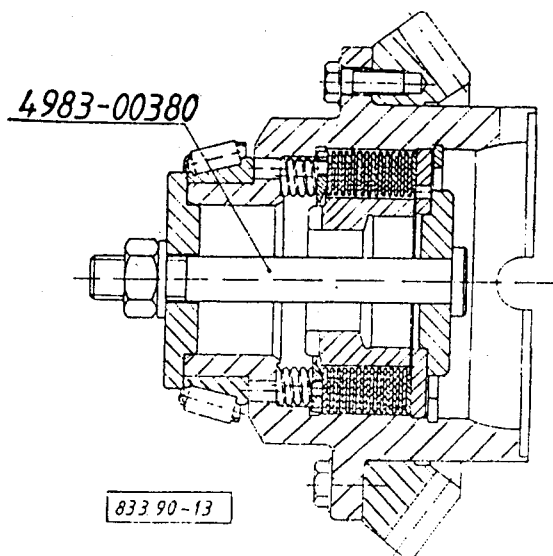


Fig. 1.:

After removing the locking tool, remove the thrust disk (48), the inner and the outer disk (50 and 51), the backing disk (52), the toothed hub (54) and the thrust springs (53).





After removing the parts of the limited slip mechanism tap the inner race of the taper roller bearing (32) off the differential case thru the 4 Ø10 mm bores in the empty differential case half (31).

Spaced 4x3 position the 12 thrust springs (53) into the flanged differential case half (31) so that no spring flush with the 4 bores of 10 mm.

Above the springs position the backing disk (52) and pull the thrust disk off by means of the device shown in Fig. 3.

Following this insert the proper quantity of inner and the outer disks (50 and 51) alternately.

For the axles of 6,500 kg axle load install 8 outer and inner disks. For the axles of 10,000 kg axle load install 13 outer and inner disks.

After positioning the disks install the toothed hub (54) by means of the tool shown in Fig. 3.

After installing the toothed hub insert thrust disk (48) and finally secure by snap ring (47).

Following this remove the device installed for securing the springs.

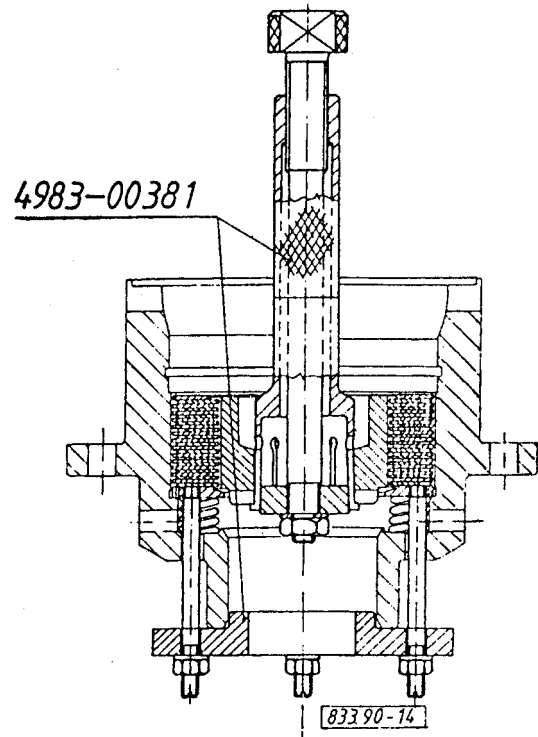


Fig. 3.:

## SECTION 316

### DISASSEMBLING AND REASSEMBLING THE BEARING CAGE ADJUSTING THE AXIS DISTANCE

Remove the hex. flanged bolts (14) attaching the bearing cage to the differential carrier.

By means of **M12** bolts of at least **65 mm** thread length driven into the two threaded bores in flange of the bearing cage (8), pull the bearing cage out of the differential carrier and remove the shims from flange of the differential carrier.

#### REINSTALLING THE BEARING CAGE TO THE DIFFERENTIAL CARRIER

After reassembling the bearing cage and adjusting the specified bearing preload adjust the axis distance (**with**

**differential removed from the carrier**).

#### ADJUSTING THE AXIS DISTANCE

For purpose of piloting, screw one **M12** stud bolts to two opposite bores in the differential carrier, position the shims (13) necessary for adjusting the drive pinion and gear contact pattern over these studs so, the extreme ones shall be the thicker. Aligning the bores push the bearing cage subassembled with drive pinion into the differential carrier (15) and provisionally secure by hex. flanged bolts (14) driven into two opposite bores and tightened to **88 - 98 Nm** torque.



On the relevant measuring pin of the accessory “A” belonging to the measuring device shown in Fig. 1. adjust the theoretical “**AXIS DISTANCE**”  $B = 88.00 \text{ mm}$ , by setting the dial indicator to zero.

Insert the measuring device to  $B = 88.00 \text{ mm}$  to the differential carrier as shown in Fig. 1. and measure the “**AXIS DISTANCE**” deviation. **Check if the reading is identical to the “AXIS DISTANCE” deviation stated on end of the drive pinion.**

In case of identity the adjustment is proper, otherwise obtain the specified value by selecting the proper shim pack (13). The permitted deviation is  $\pm 0.025 \text{ mm}$ .

**E.g.:** If the axis distance deviation stated on the drive pinion is  $+0.04$ , the value “B” to be adjusted is  $88.04 \pm 0.025 \text{ mm}$ .

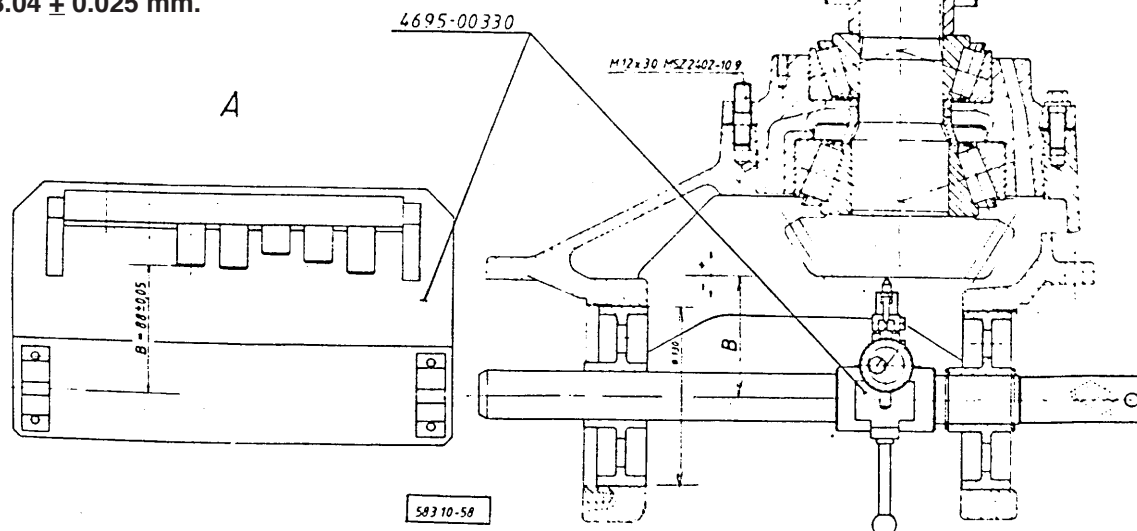


Fig. 1.: CALIBRATING THE DISTANCE

## SECTION 317

### DISASSEMBLING AND REASSEMBLING THE BEARING CAGE

By means of the device arranged from parts shown in the figure press the drive pinion (16) out of the removed bearing cage (8) (see Fig. 1.).

The drive pinion can also be removed by means of press, provided the flange of the bearing cage is properly backed up.

When pressing out the drive pinion (16) the inner taper roller bearing cone remains on the pinion.

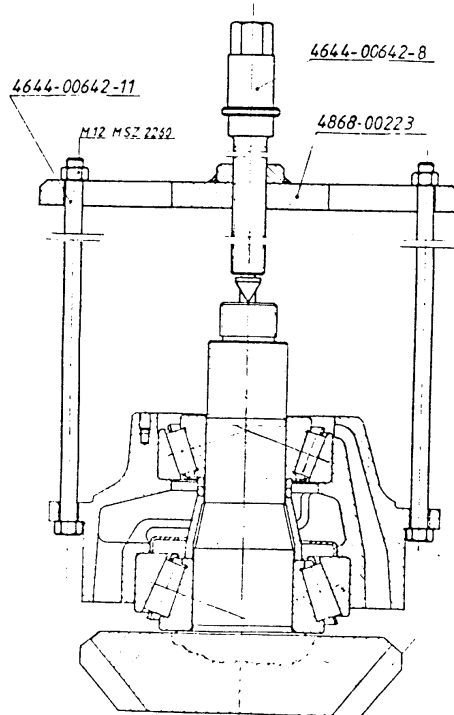


Fig. 1.: PRESSING OUT THE DRIVE PINION

82207-35/4



Pull off the cone of the taper roller bearing by means of the device shown (see Fig. 2.).

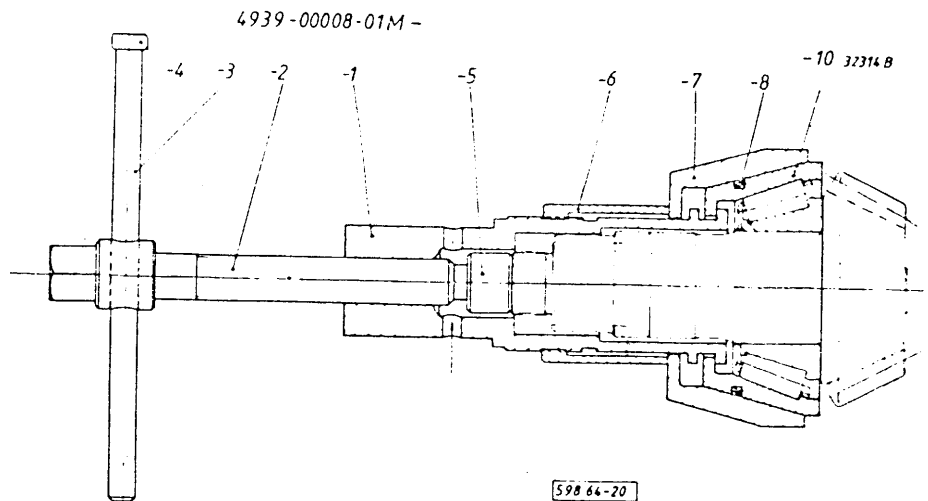


Fig. 2.: PULLING OFF THE INNER RACE OF THE TAPER ROLLER BEARING

Drive the cup of the inner taper roller bearing out of the bearing cage by means of the device shown (see Fig. 3.) and properly backing the bearing cage.

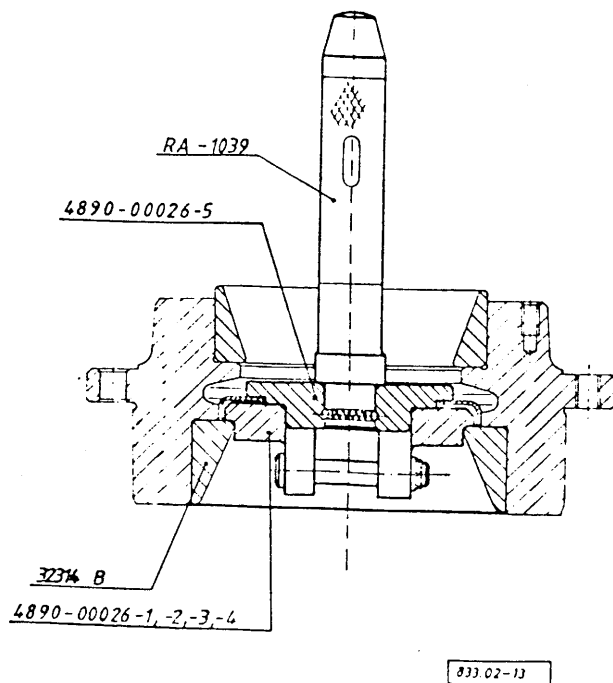


Fig. 3.: DRIVING OUT THE CUP OF THE INNER TAPER ROLLER BEARING

Turn the bearing cage over and by means of tools shown drive out the cup of the outer taper roller bearing (see Fig. 4.).

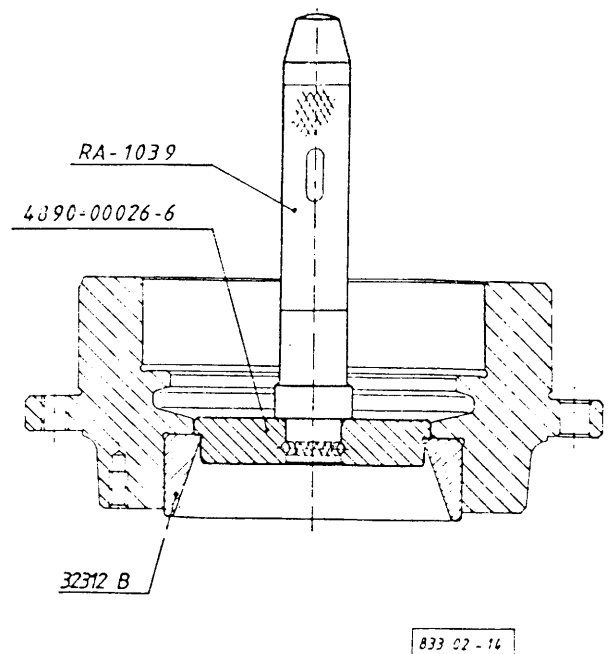


Fig. 4.: DRIVING OUT THE OUTER TAPER ROLLER BEARING CUP



Position the inner taper roller bearing cup (12) into the bearing cage, then by the tools shown drive in to bottom out (Fig. 5.).

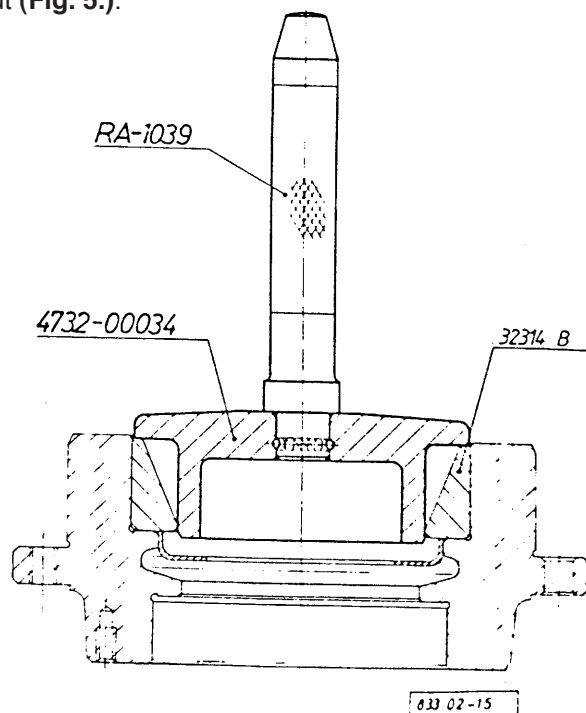


Fig. 5.: DRIVING IN THE CUP OF INNER TAPER ROLLER BEARING

Turn the bearing cage over and by means of the tools shown drive in the cup of the outer taper roller bearing to bottom out (see Fig. 6.).

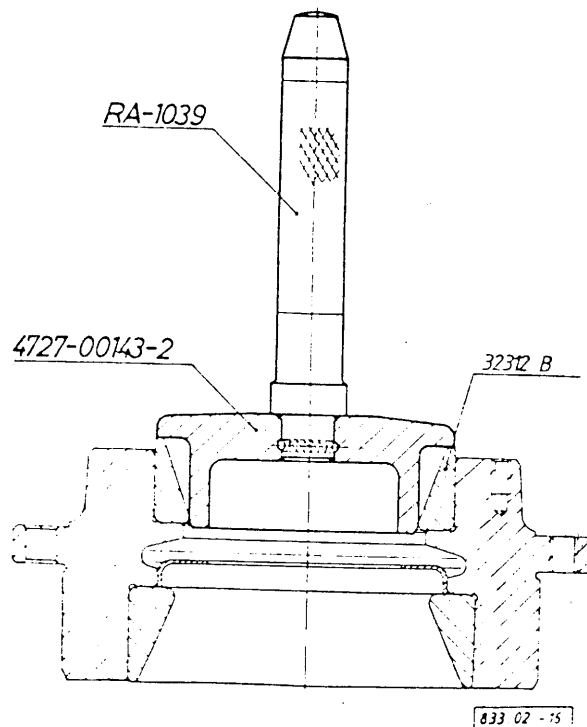


Fig. 6.: DRIVING IN THE CUP OF OUTER TAPER ROLLER BEARING

After subassembling the bearing cage with taper roller bearing cups adjust the bearing preload (see Fig. 7.).

The distance between the outer taper roller bearing cone and the distance sleeve may vary between 13.96 and 15

mm. This distance should be determined by measurement for selecting the proper distance ring pair (10).

Stack the inner taper roller bearing cone, the distance sleeve (11) and distance ring pair for filling the gap deter-

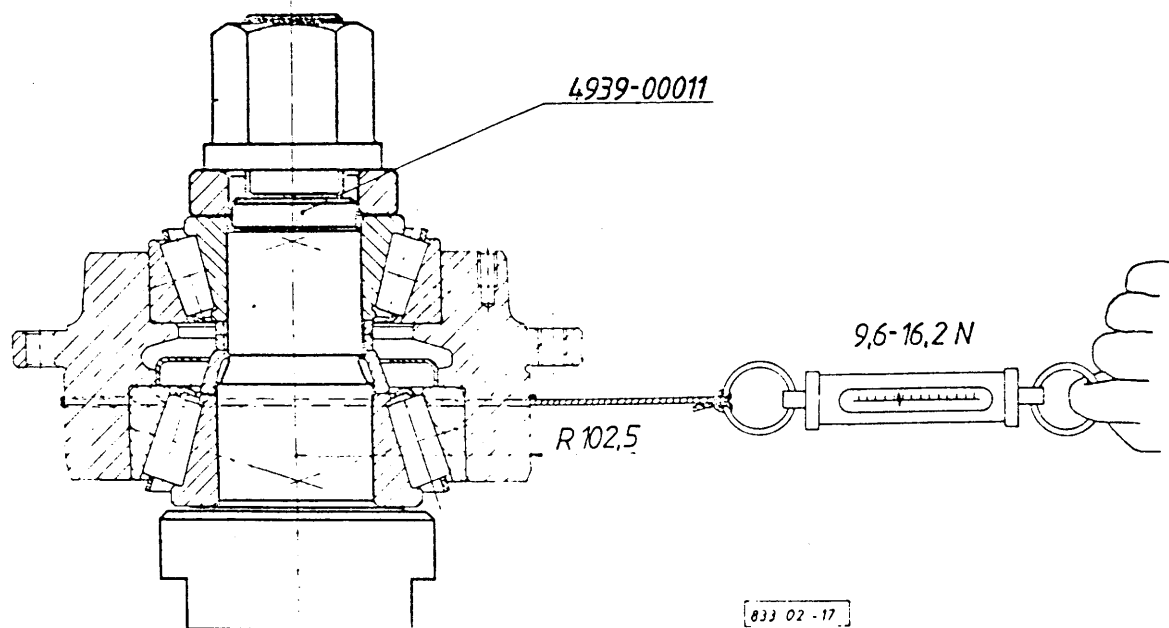


Fig. 7.: ADJUSTING THE BEARING PRELOAD



mined by measurement, then the subassembled bearing cage and the outer taper roller bearing cone to the shown master shaft.

Position the washer belonging to the master shaft to the bearing cone, screw on the flanged nut of the device and tighten to **540 - 590 Nm** torque.

Attach **approx. 2 mtrs** long cord to one bore in the bearing cage flange and wind the cord around the bearing cage. Attach fish-scale to other end of the cord and measure the rolling torque.

In case of new bearings installed the force obtained from the fish-scale at **approx. 50 rpm** should be **9.6 - 16.2 N**, which corresponds to the specified **1.0 - 1.7 Nm** rolling torque.

In case of reused bearings adjust the rolling torque to **0.5 - 0.85 Nm** (to half of the rolling torque at new bearings).

In case of deviation perform correction by replacing the distance ring. With higher rolling torque use higher distance ring, while at lower torque use lower one.

In case of proper adjustment relocate the parts from the master shaft to the drive pinion. **Make sure to install ONLY the parts used for the previous adjustment.**

By means of the tools shown drive the inner race of the inner taper roller bearing (12) onto the drive pinion (Fig. 8.).

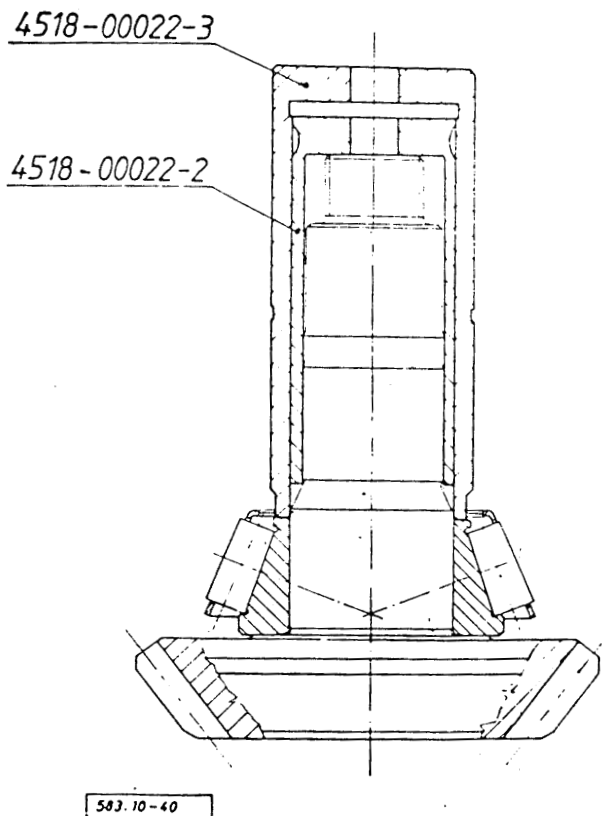


Fig. 8.: DRIVING ON THE INNER TAPER ROLLER BEARING CONE

Position the distance sleeve (11), the previously selected distance ring (10) and the bearing cage subassembled with bearing cups to the drive pinion stem, then by means of press sleeve drive on the outer taper roller bearing cone to bottom out while assuring proper connection of the bearings.

By the tool shown in **Fig. 6. of Section 313** press the companion flange (3) to the drive pinion. Screw on the flanged castle nut (1) and tighten to **540 - 590 Nm** torque.

Check the rolling torque as described earlier. If deviation is experienced repeat the adjustment until obtaining the specified value.

The oil seals (4) with the cover (5) are not installed during check.

## SECTION 395

### OIL FILL-UP, RUN, CHECK

Thru the oil filler bores on the end-cover of the wheel hubs and on the axle housing fill up the finish assembled axle with oil of grade specified in the Operators Manual.

**Fill ONLY completely clean oil to the axle.**

After oil fill-up install the fill plug to be leak-tight. Following this run the axle to both directions at varying speed.

#### DURING RUN CHECK THE FOLLOWING:

**The axle for leaks:** No leaks are permitted.

**The axle for operation:** No excessive sound of friction or unusual noise is permitted at the rotary mechanism in the differential and the wheel hubs. The meshing gears should roll on one another smoothly without unusual noise.

**The brake for operation:** In initial position no friction is permitted between the brake shoes and the brake drum. During brake application the brake spanner may not jam in the brake spanner bearing and upon termination of the braking force it should return to initial position.

**The axle for warming:** At the end of running the maximum temperature of the wheel hub may be approx. **60° C**, while at the input section approx. **80° C**.





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