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REPAIR MANUAL
DRIVEN FRONT AXLE
MT14/MT17 SERIES

MARMON-HERRINGTON ALL-WHEEL DRIVE
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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 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 reassembly operations of the individual assembly unit, stating the special tools to be used.

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

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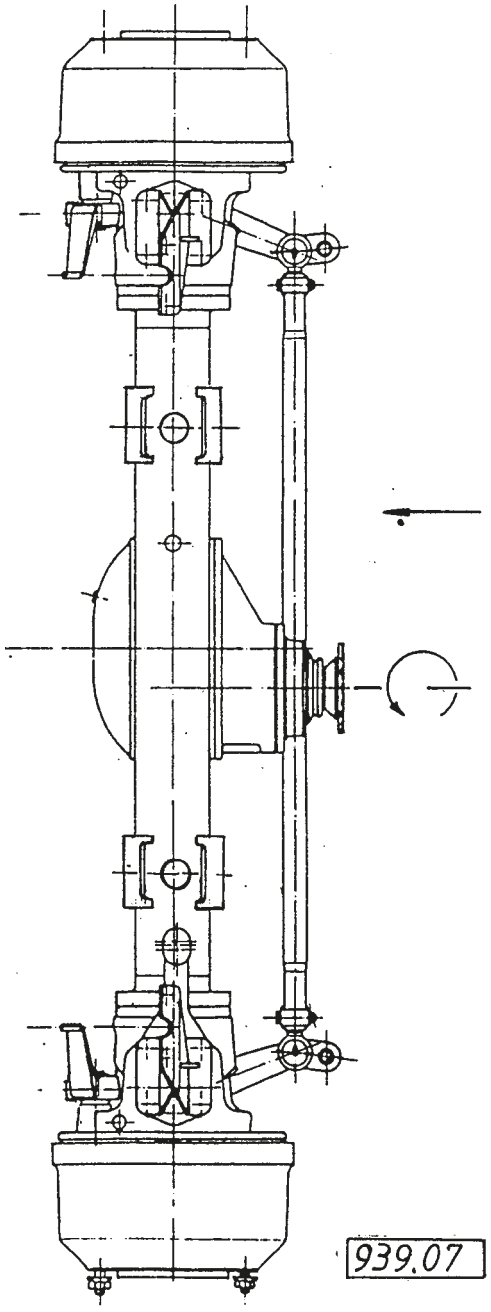
DRAWINGS OF AXLES



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

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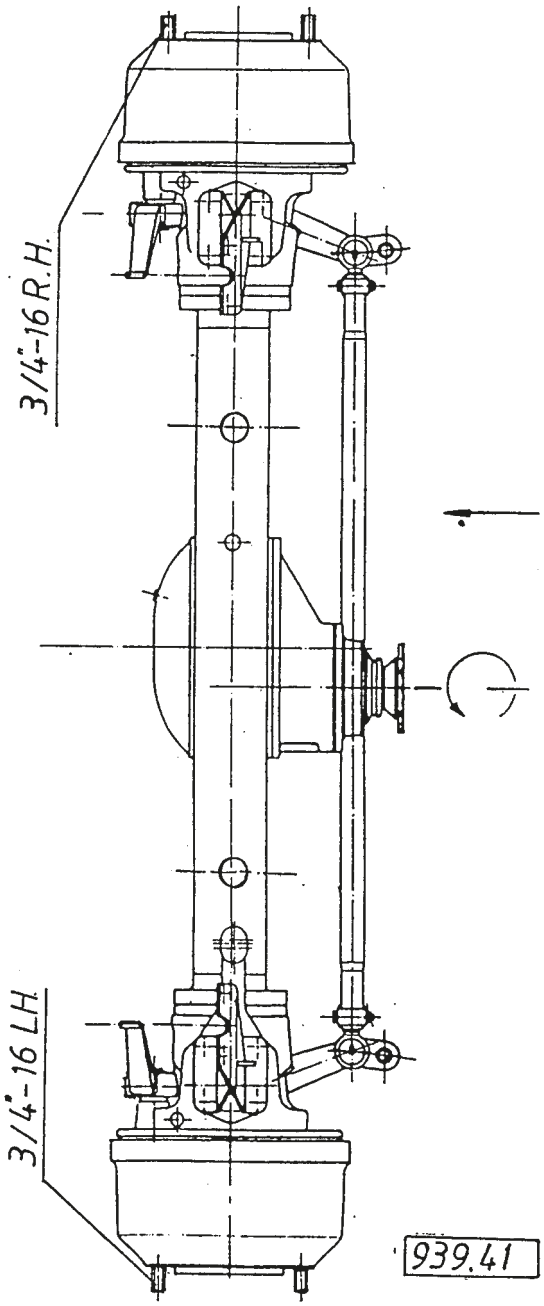

DRIVE PINION HAND OF SPIRAL	BALL SEAT WHEEL
R (bal-right-links)	

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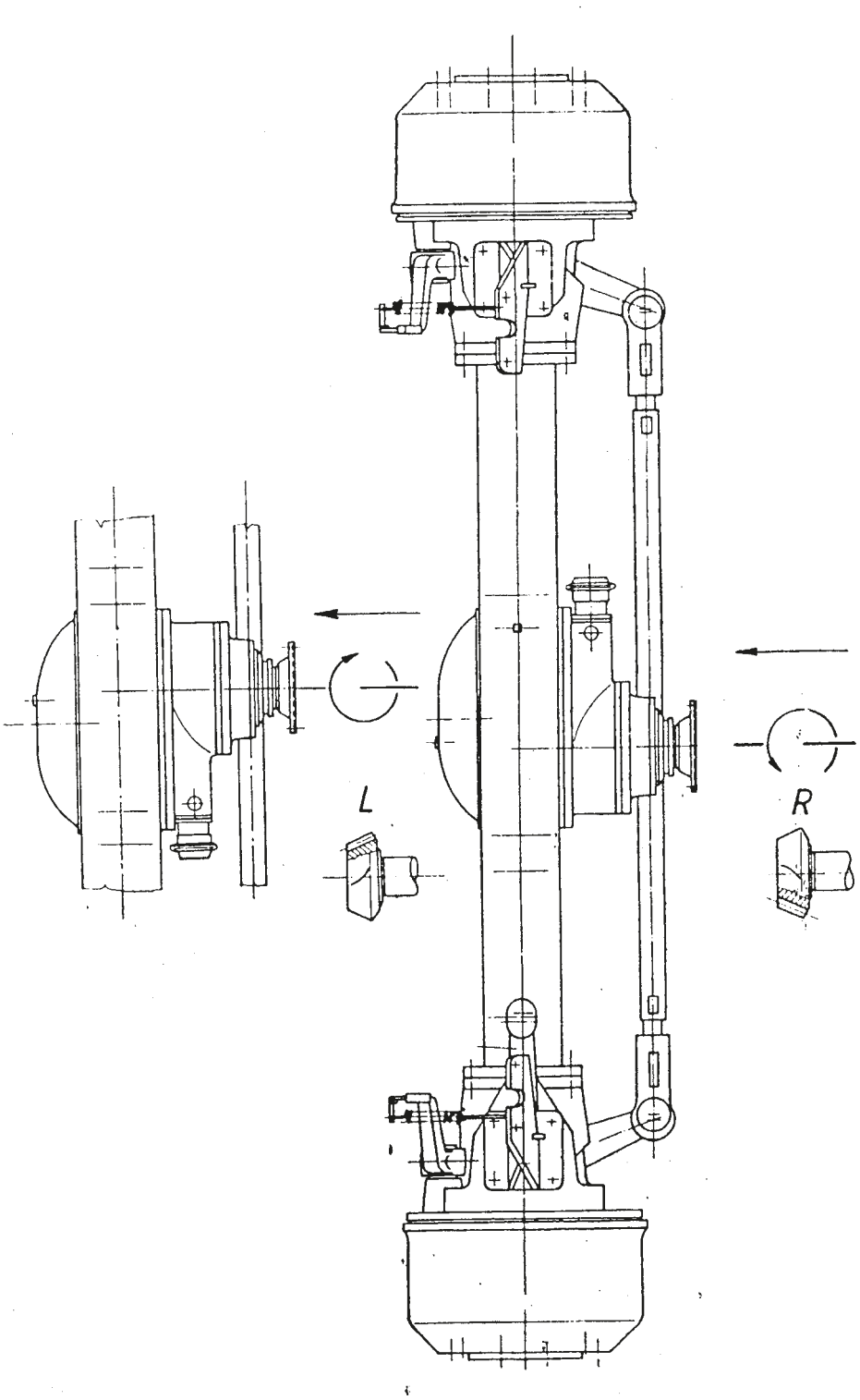

DRIVE PINION HAND OF SPIRAL	DIFFERENTIAL LOCK

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TECHNICAL DATA

DESCRIPTION	UNITS	TYPE
		MT14/MT17
SYSTEM:		
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.		
DIMENSIONS:		
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 **"TECHNICAL DATA"** related to the type versions.		

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TECHNICAL DATA

DESCRIPTION	UNITS	TYPE
		MT14/MT17
RATIOS:		
Ring gear/pinion		27/22 - 29/13 *
Planetary gear		64/26 + 1 = 3.461
Total ratio		4.248 - 7.720 *
Differential lock *		
GENERAL DATA:		
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
	kg	710 - 721 *
WHEEL HUB EXECUTION		
"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		*

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TECHNICAL DATA

DESCRIPTION	UNITS	TYPE
		MT14/MT17
WHEEL BRAKE		
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
SLACK ADJUSTER		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
ANTI-FRICTION BEARINGS IN WHEEL HUB		
Outer: Taper Roller Bearing		30218 A MGM
Inner: Taper Roller Bearing		32218 A MGM
IN WHEEL HUB PLANETARY GEAR:		
Cylindric Roller Bearing		K 30x42x30 MGM
ON DRIVE PINION:		
Outer: Taper Roller Bearing		32312 B X7JU MGM
Inner: Taper Roller Bearing		32314 B X7JU MGM
ON DIFFERENTIAL:		
On Half Case:	Taper Roller Bearing	30215 A MGM
On Flanged Case Half:	Taper Roller Bearing	32215 A MGM

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TECHNICAL DATA

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

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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” -
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	588 - 637
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

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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

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ADJUSTMENT DATA

DESIGNATION	UNITS	TYPE
		MT14/MT17
NOTE: mm to inch = mm ÷ 25.4 (Ex. 0.15 mm ÷ 25.4 = .006 inch)		
WHEEL HUB, AXLE HOUSING	210/1	Nm
WHEEL HUB:		
Axial play of wheel hub bearings (adjusted by shims)	mm	0.01 - 0.04
Shim thickness	mm	0.2; 0.25; 0.3; 0.5;1.0
STEERING KNUCKLE:		
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	mm	1.5 ± 1.5
Max. Inner wheel turn angle		40°
WHEEL BRAKE:		
Shoe clearance (during adjustment)	mm	0.3 - 0.6
Axial play of camshaft	mm	0.1 - 0.5
DIFFERENTIAL CARRIER HEAD		
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	mm	88.00
(“AXIS DISTANCE”)		
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

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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 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 **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, xing 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-insert hammer.

Before installing the oil seals make sure to check if the sealing lip is sound and apply speci ed 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 manu-

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

Thread adhesive	**LOCTITE 277**
Thread locker	**LOCTITE 242**
Surface Sealant	**LOCTITE 515**

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 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.

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WHEEL DRIVE, WHEEL HUB

WHEEL DRIVE, WHEEL HUB SECTIONAL VIEW

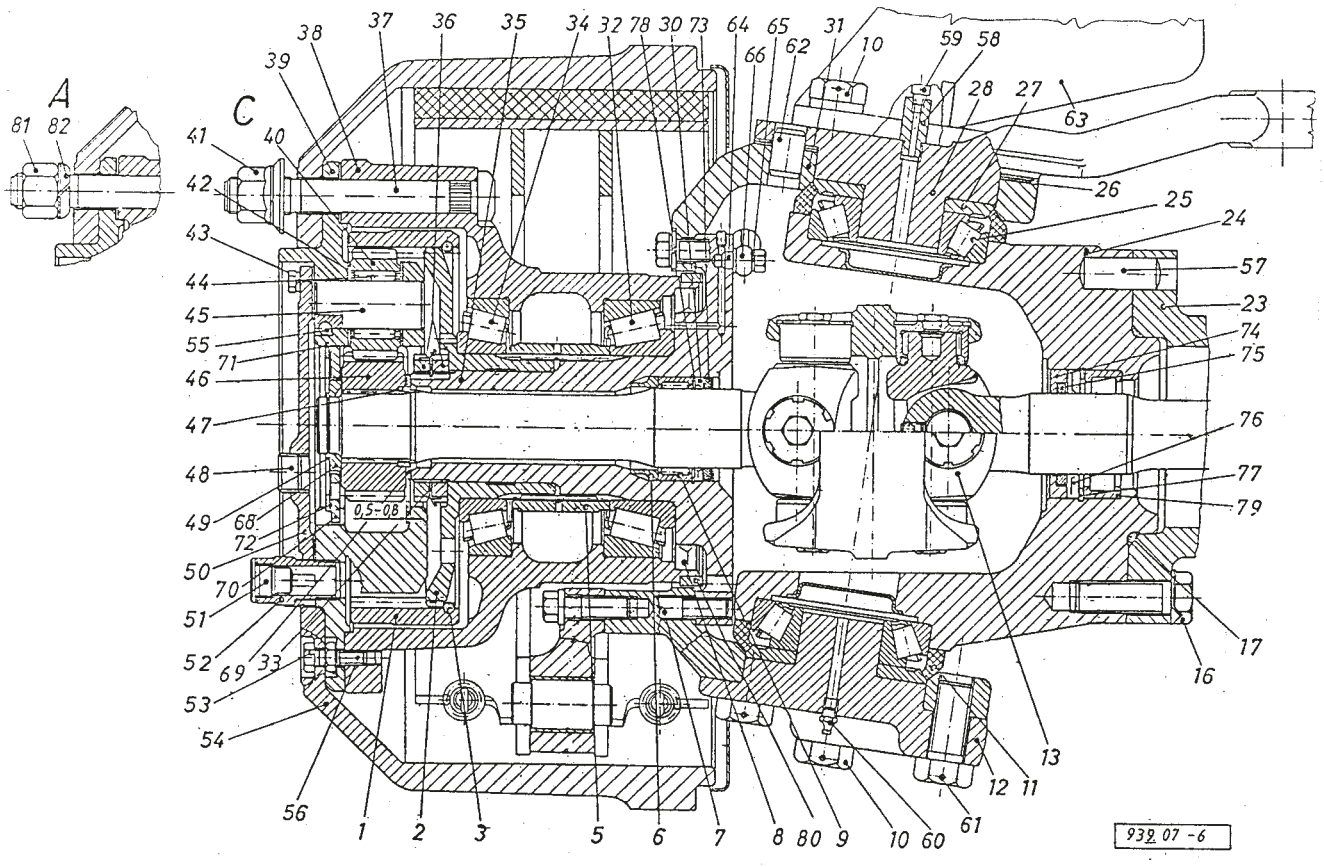

Fig. 1.: WHEEL DRIVE, WHEEL HUB SECTIONAL VIEW

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PARTS OF THE WHEEL DRIVE, WHEEL HUB

1 — Ring gear
2 — Ring gear Support
3 — Circlip
5 — Spacer sleeve (toothed)
6 — Spacer sleeve
7 — Hex. bolt
8 — Sealing ring
9 — Needle roller bearing
10 — Hex. bolt
11 — Gasket
12 — Tie-rod arm
13 — Double-joint shaft
16 — Hex. bolt with lock plate
17 — O-ring
23 — Axle housing
24 — Knuckle support (trunnion)
25 — Taper roller bearing
26 — Shims
27 — Washer
28 — Steering arm (cover)
30 — Sealing ring
31 — Knuckle housing
32 — Taper roller bearing
33 — Lock plate
34 — Taper roller bearing
35 — Spindle
36 — Spindle-end nuts
37 — Wheel bolt
38 — Wheel hub
39 — Planetary carrier
40 — Planetary pinion
41 — Wheel nut
42 — Spacer plate
43 — Hex. bolt with spring washer
44 — Cylindric roller bearing
45 — Planetary pin
46 — Sun gear
47 — Spacer ring
48 — Taper screw plug
49 — Snap ring
50 — End — cover with seal ring
51 — Oil drain plug
52 — Threaded stub
53 — Hex. bolt
54 — Brake drum
55 — Steel ball
56 — Hex. bolt
57 — Dowel pin
58 — Extension

61 — Lock wire
62 — Dowel pin
63 — Air chamber bracket
64 — Hollow screw
65 — Seal rings
66 — Vent tube
— Breather
68 — Distance ring
69 — Friction disk
70 — Friction disk
71 — Spoon pin
72 — Shim
73 — Sealing ring
74 — Seal retainer
75 — Sealing ring
76 — Sealing ring
77 — Snap ring
78 — Snap ring
79 — Cylindric roller bearing
80 — Impulse ring
81 — Wheel nut
82 — Lock washer

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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

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 ange 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

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 ange 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 ange 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 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 **0.5 - 0.8 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 nally install the snap ring.

By means of the service mandrel shown drive the planet

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SECTION 221

DISASSEMBLING AND REASSEMBLING THE PLANETARY GEAR

pins out toward direction the steel ball **(see Fig. 1.).**

Stack the sound or replaced parts one by one over the pilot mandrel

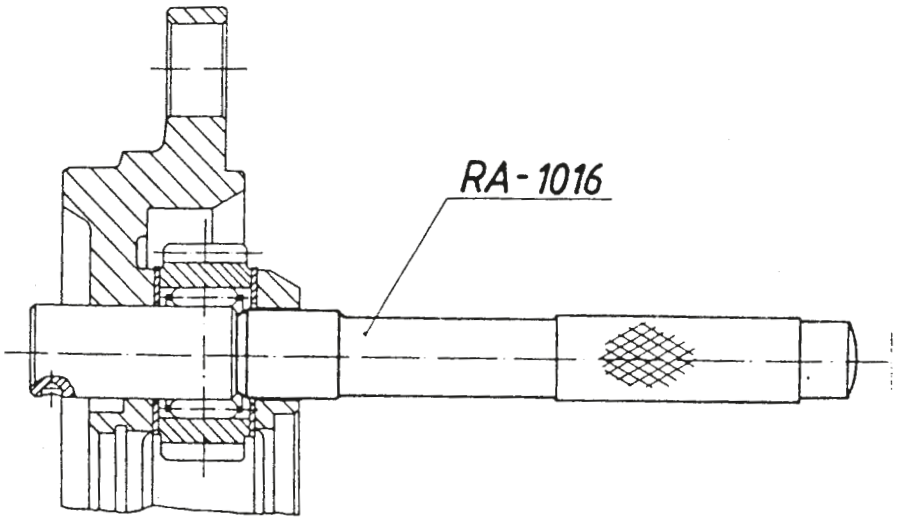

Fig. 1.: PRESSING OUT THE PLANET PINS

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.

REMOVING THE SUN GEAR

After removing the pinion carrier

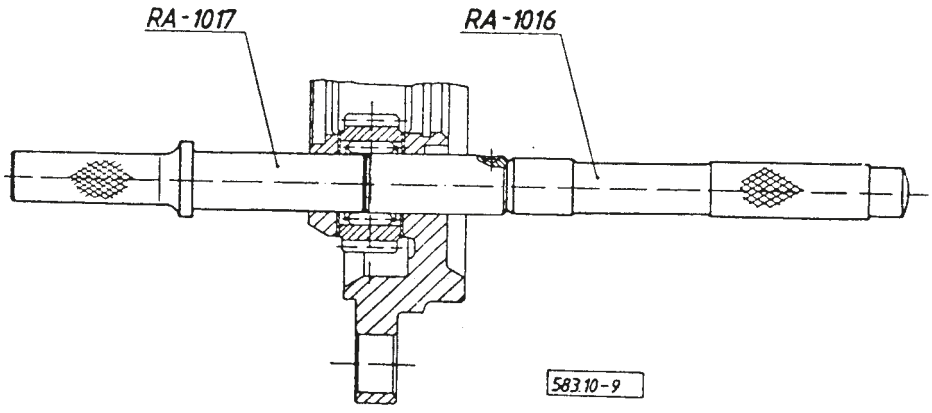

Fig 2.: PRESSING IN THE PLANET PINS

SECTION 222

REMOVING AND REINSTALLING THE SUN GEAR

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 THE WHEEL HUB

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

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SECTION 223

REMOVING AND REINSTALLING THE WHEEL HUB

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. **35º to 45º**.

Position the lock plate, install the outer shaft-end nut and tighten to **588 - 637 Nm** torque.

By means of dial indicator check if the **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)**.

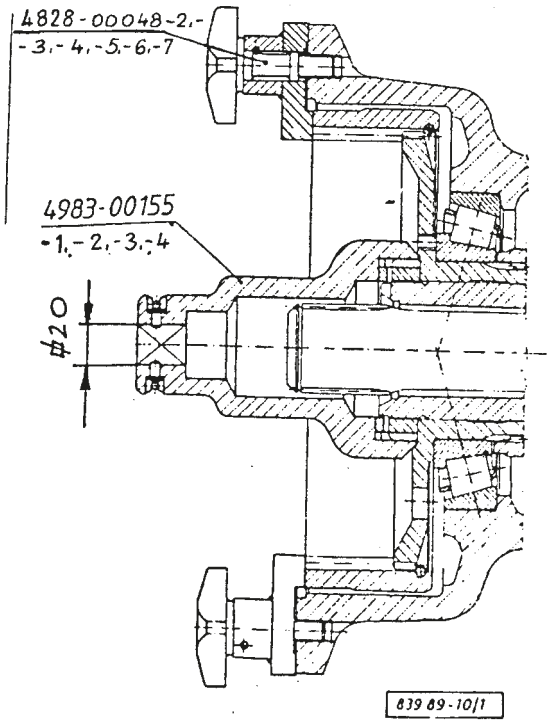

Fig. 1.: REMOVING THE SPINDLE END NUT

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

By means of simple pry remove the sealing ring **(8)** fro

SECTION 224

DISASSEMBLING AND REASSEMBLING THE WHEEL HUB

the removed wheel hub.

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

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

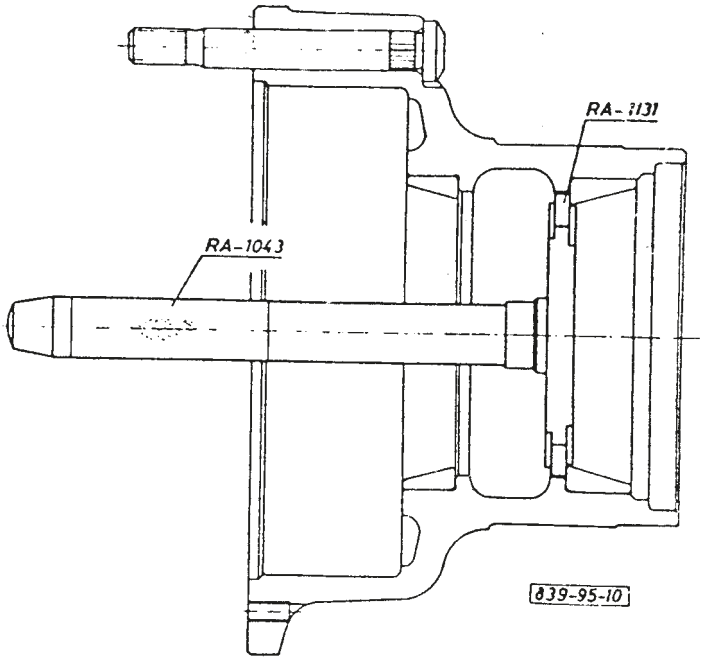

Fig. 1.: DRIVING OUT THE CUP OF THE OUTER TAPER ROLLER BEARINGS

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press in the cup of the inner taper roller bearing **(32)**, as well.

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.

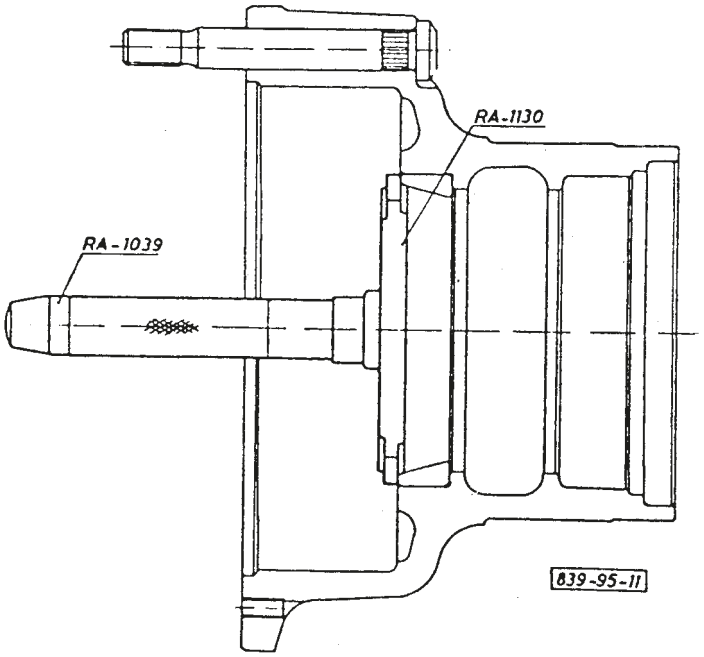

Fig. 2.: PRESSING IN THE CUPS OF THE TAPER ROLLER BEARINGS

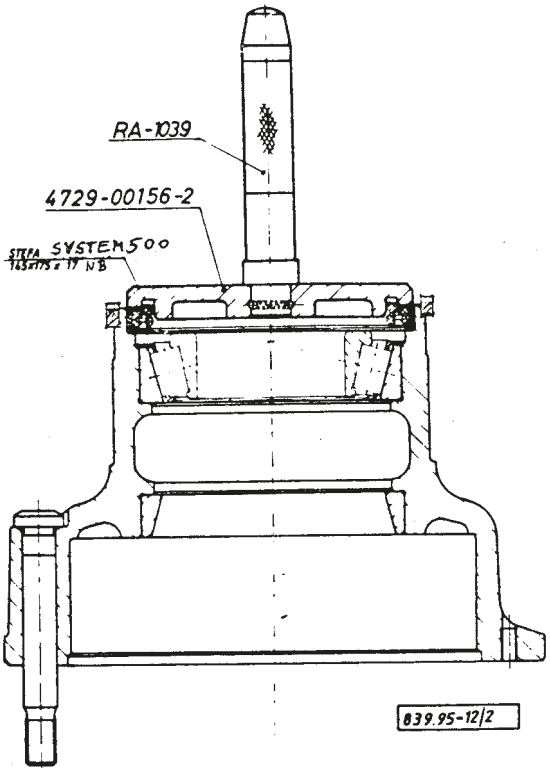

Fig. 3.: PRESSING IN THE SEALING RING

WARNING!

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

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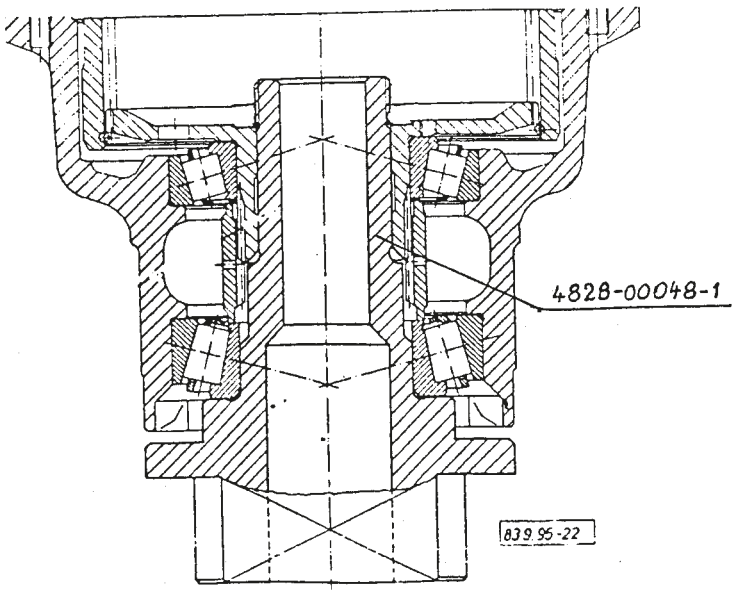
taper roller bearing and the seal ring. Place in the engaged spacer sleeve **(5)**.

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.

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 ange press off the taper roller bearing inner race **(see Fig. 1.)**.

REASSEMBLING THE RING GEAR SUPPORT

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

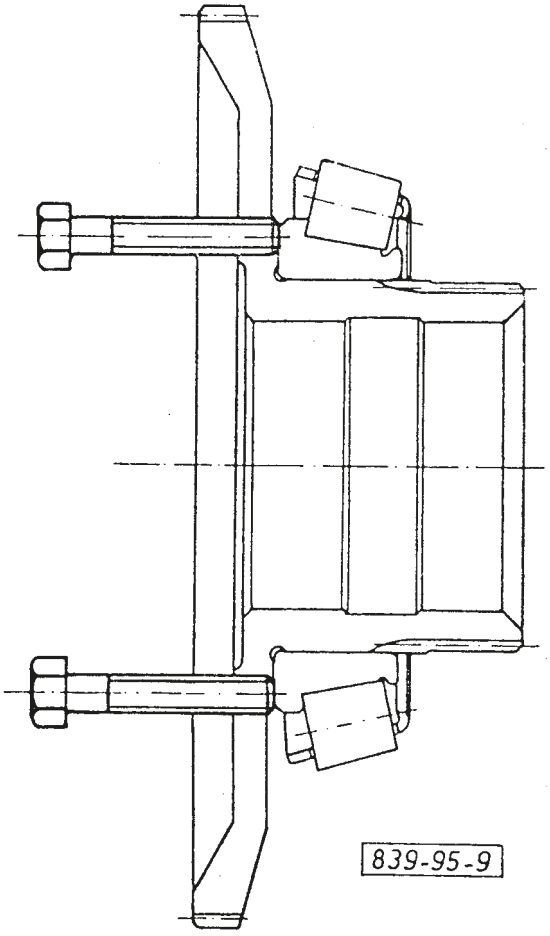


Fig. 1.: PRESSING OFF THE TAPER ROLLER BEARING INNER RACE

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

SECTION 229

INSTALLATION INSTRUCTIONS FOR THE PARTS OF ANTILOCKING SYSTEM

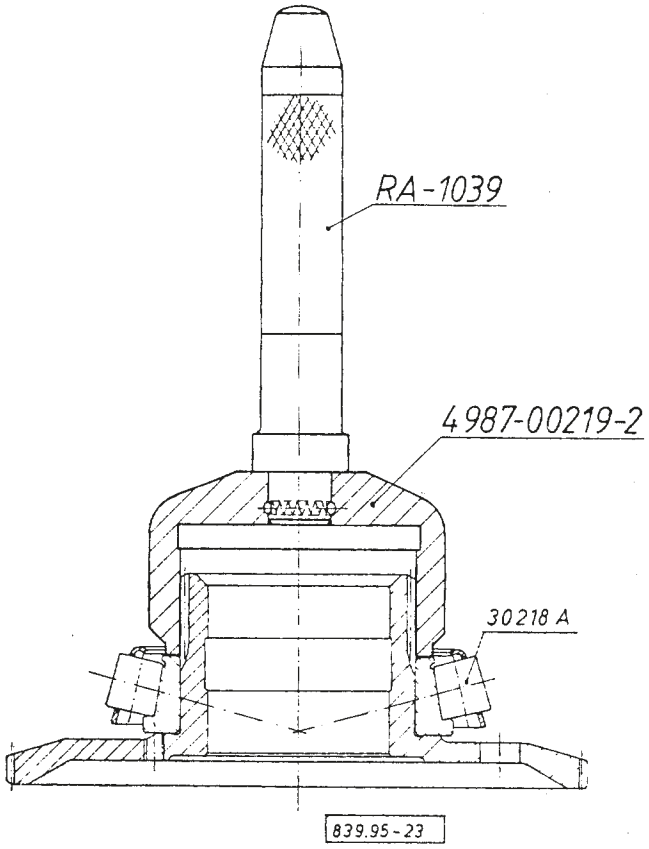


Fig. 2.: PRESSING ON THE TAPER ROLLER BEARING INNER RACE

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.

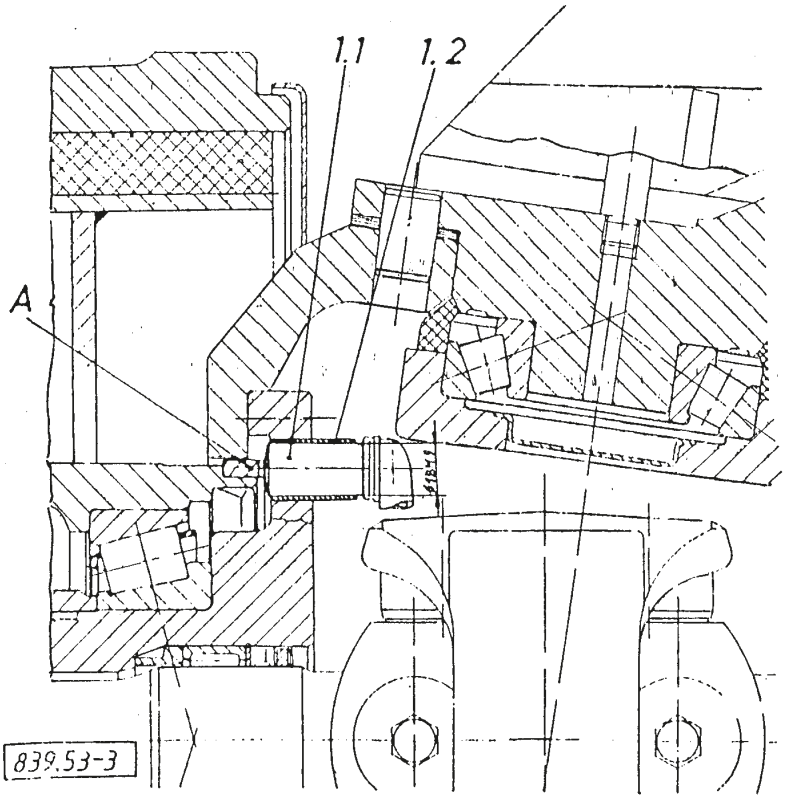
The models given **"TECHNICAL DATA"** contain the items (A,C) necessary at the installation of the anti-lock and anti-skid systems (1).

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

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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 radius 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 headted uniformly to 150 Cº 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.).**

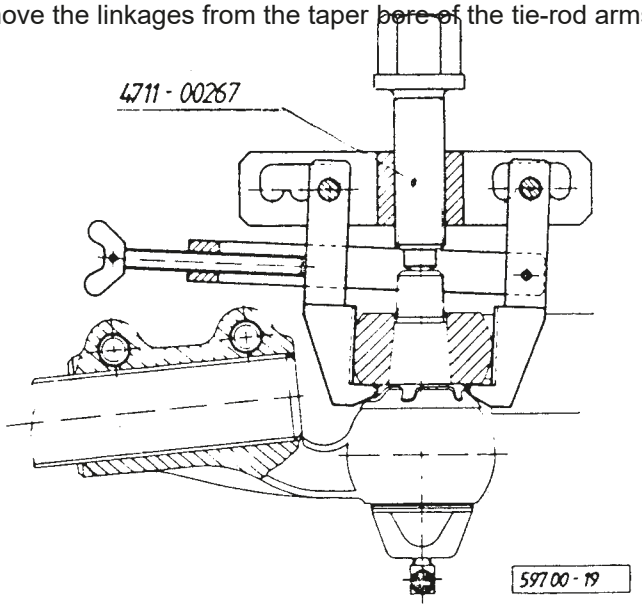

Fig. 1: PRESSING OUT THE BALL STUDS

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 The value “B” measured in front is smaller.

TOE-IN = A - B = 1.5 ± 1.5 mm.

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

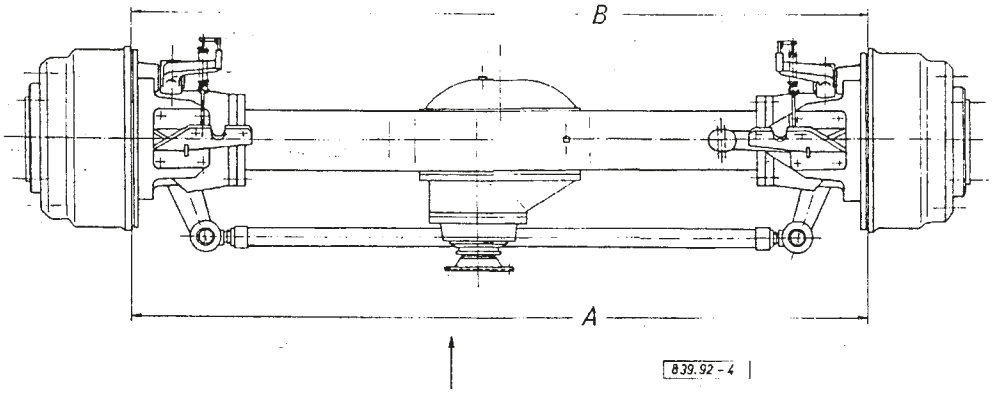

Fig. 2.: TOE-IN

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nuts to the torque 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 in the **"TECHNICAL DATA",** adjust th stop bolt so, to bottom out against the axle bod **(Fig. 3.)**.

WARNING!

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

Secure the stop bolt by tightening the hex. jamnu 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.

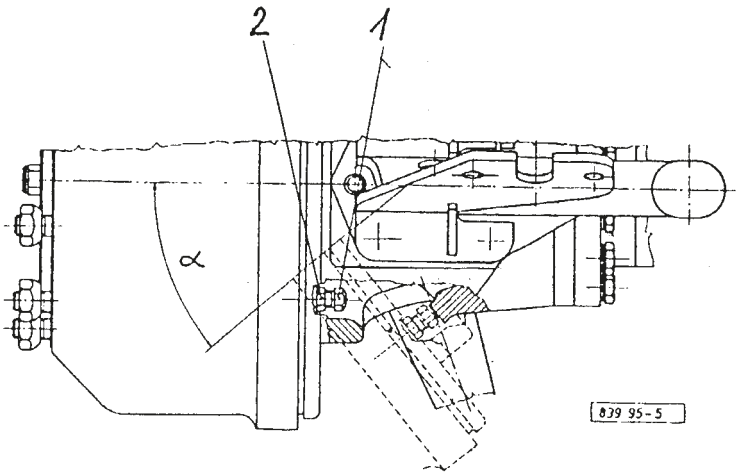

Fig. 3.: ADJUSTING THE MAX. INNER WHEEL TURN ANGLE

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 toe-in tighten the self-lock nuts of the shackles to **75 - 90 Nm** torque.

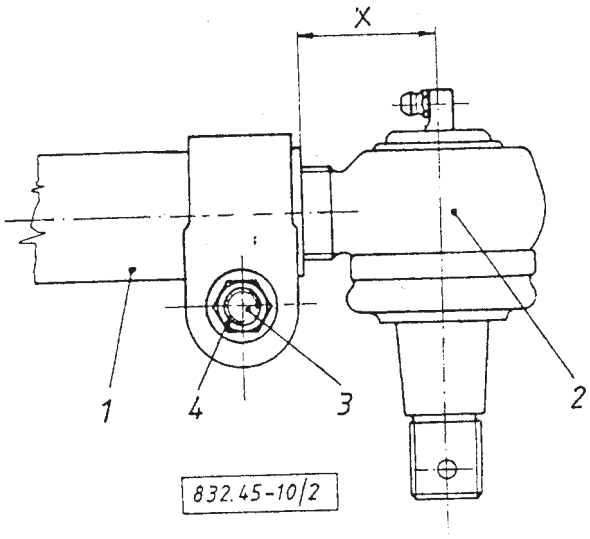

Fig. 1.: THE TIE-ROD

SECTION 243

REMOVING AND REINSTALLING THE STEERING KNUCKLE

HOUSING THE SPINDLE

After the wheel hub is dismounted (Section 223) remove the steer arms **(28)** and the tie-rod arms

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(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 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 **(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 ever 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 with 2 bolts of **M12** driven

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)**.

SECTION 245

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

REMOVING THE STEERING AND TIE-ROD ARMS

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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)**, 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

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 tings **(59) and (60)** with the extension **(58)** and ll the pins or the taper roller bearings with

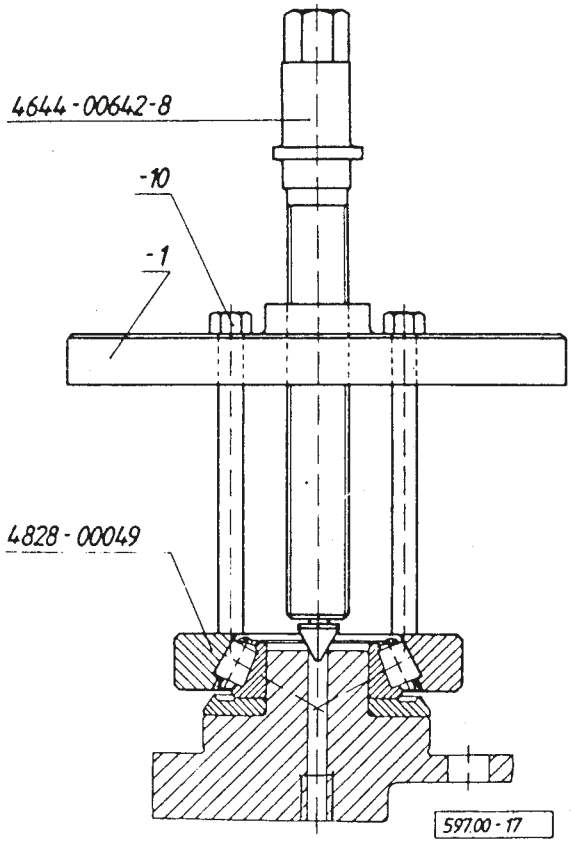

Fig. 1.: PULLING OUT THE INNER PORT OF THE TAPER ROLLER BEARING

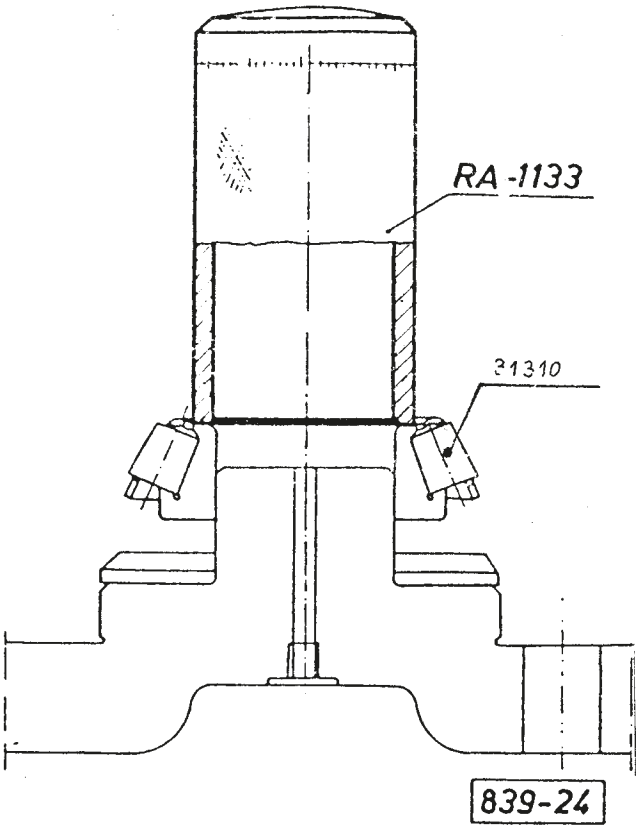

Fig. 2.: PRESSING ON THE TAPER ROLLER BEARING INNER RACE

SECTION 246

ASSEMBLING THE DOUBLE-JOINT (AXLE-SHAFT REPLACEMENT)

REMOVING THE AXLE-SHAFTS FROM THE DOUBLE-JOINT

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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 bearin from the carrying ring on both the sides, by sc the bolt of the puller to place of the screw plug **(s 1.)**.

Mark the removed parts to assure reinstallat their original place.

After removing the bearing caps remove the axl together with outer spider from the carrying ring.

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

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.).**

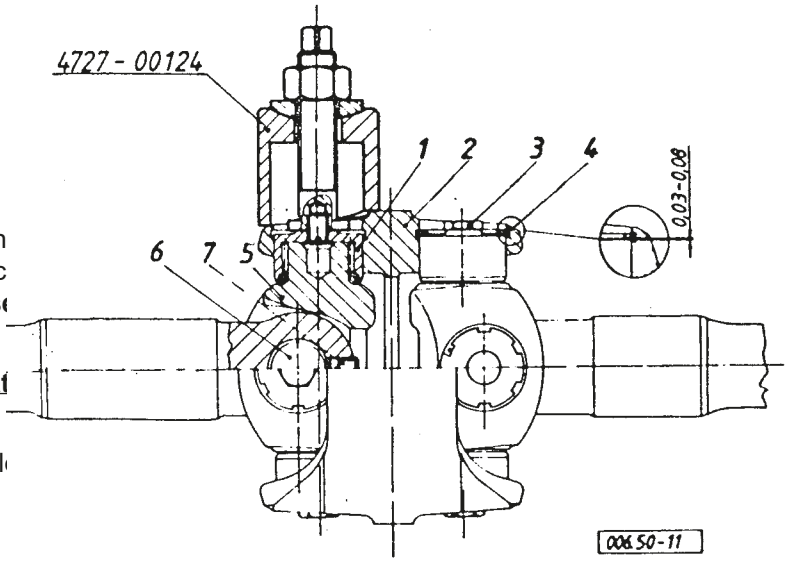

Fig. 1.: PULLING OUT THE BEARING BUSH

REASSEMBLING THE DOUBLE JOINT

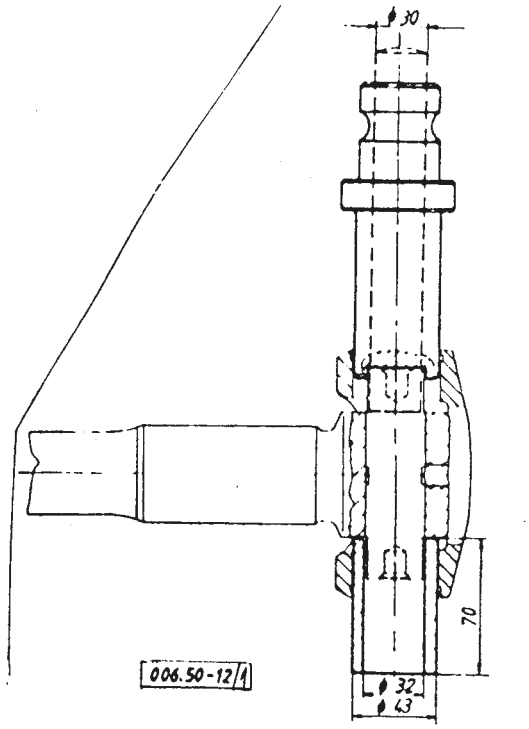

Fig. 2.: DRIVING OUT THE KNUCKLE PINS

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

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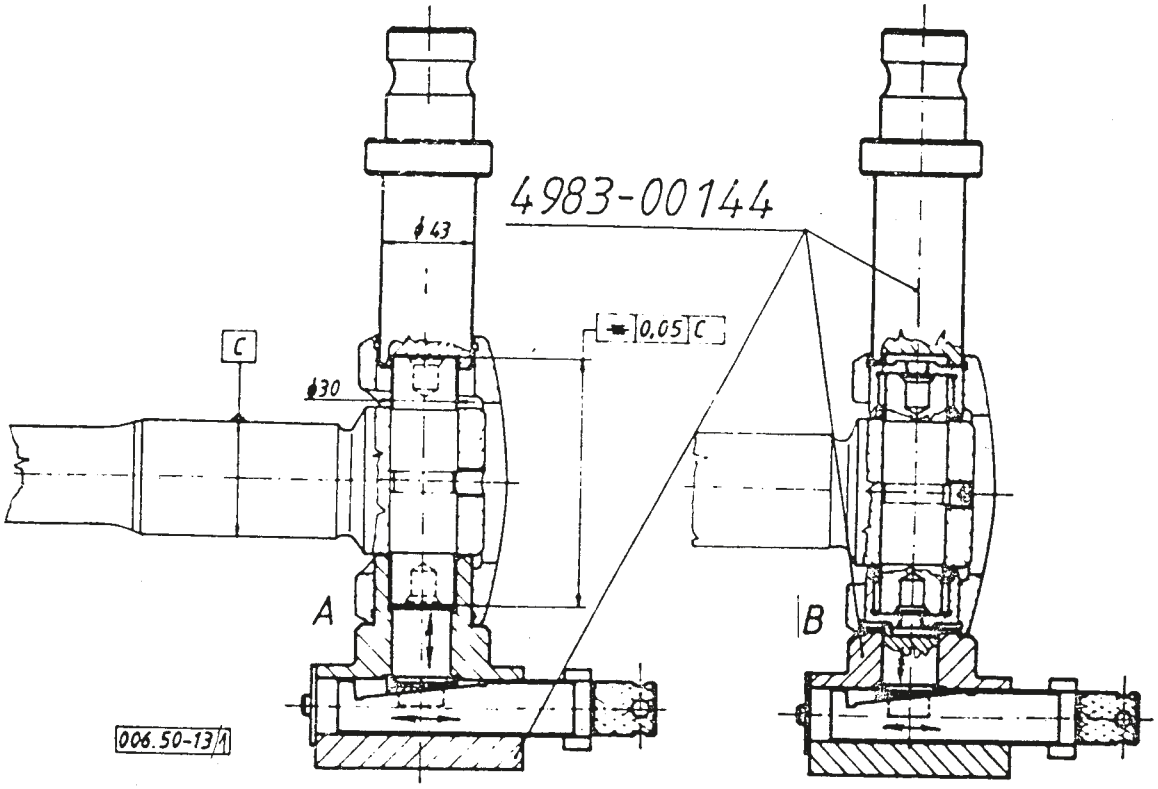

Fig. 3.

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 **± 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.

Fill up the roller spaces of the bearing bushes equipped with oil seal, as well as the bores of the knuckle pins and

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 we recommend that only a needle attachment be used to lube into these joints. Adding lube under pressure may result in the failure of the cup seal.

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 rst install the next higher thickness step snap ring instead of the "standard" thickness one. If the joint in spited 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 subassembled 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 with grease.

SECTION 247

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

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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. 1.).**

REMOVING THE KNUCKLE SUPPORT BEARING

By m ort.

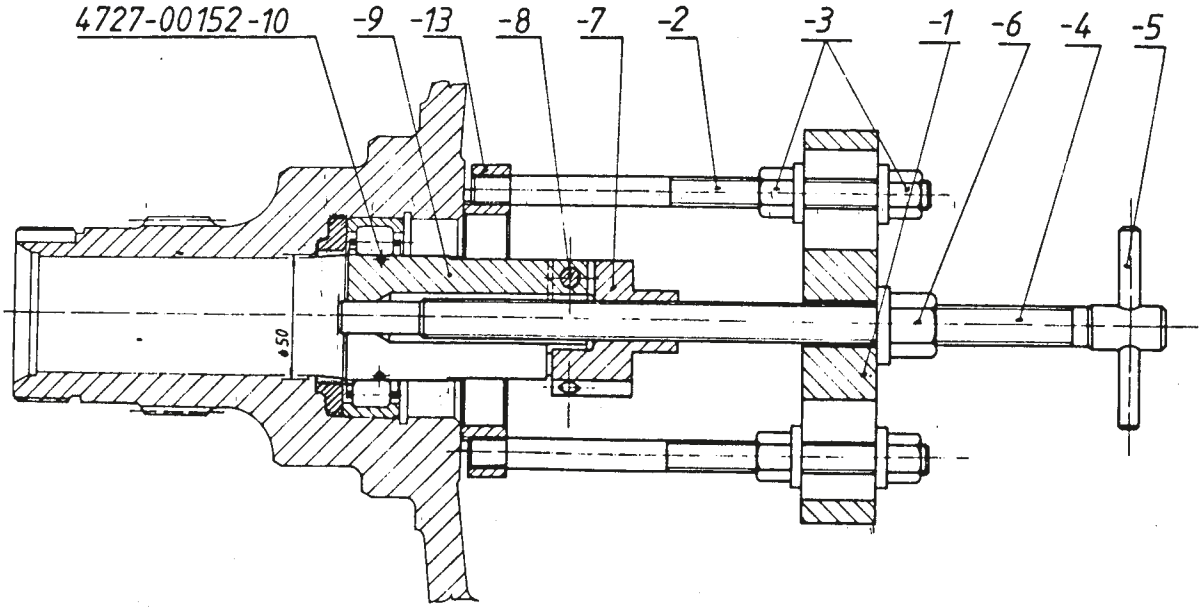

Fig. 1.: PULLING OUT THE CYLINDRIC ROLLER BEARING FROM THE SPINDLE

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.)**.

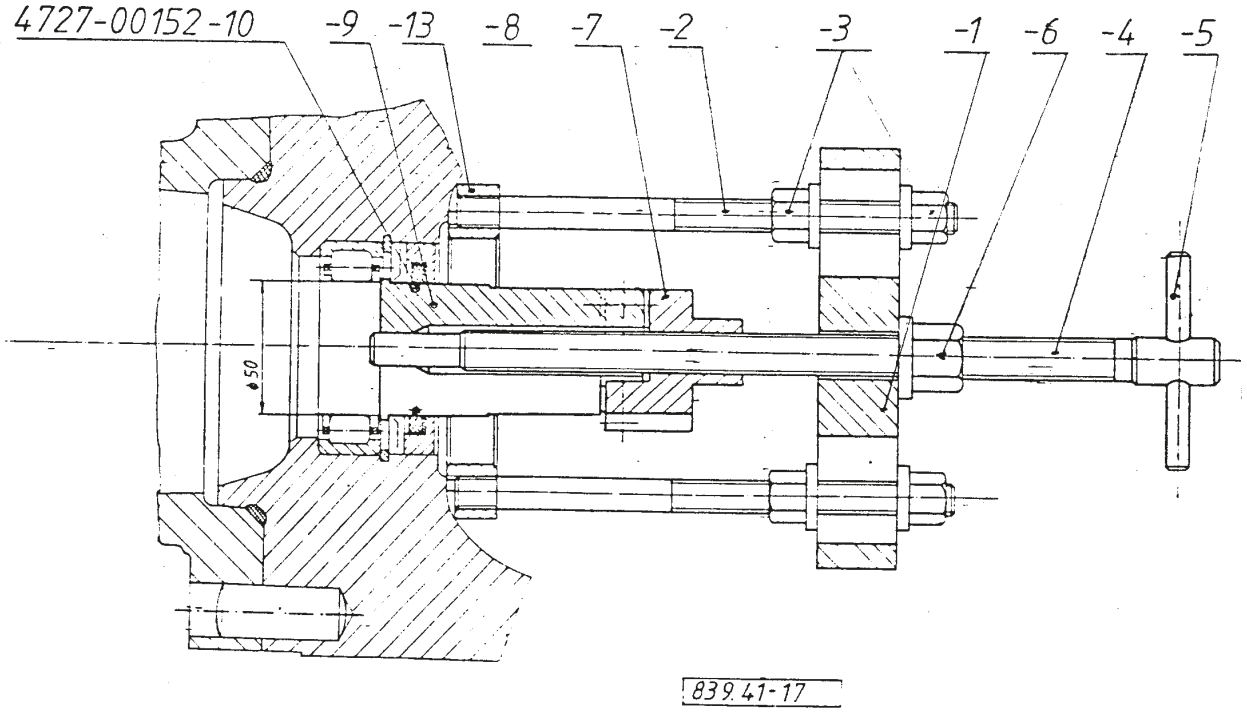

Fig. 2.: REMOVAL OF KNUCKLE SUPPORT BEARING

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When assembling the knuckle support.

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

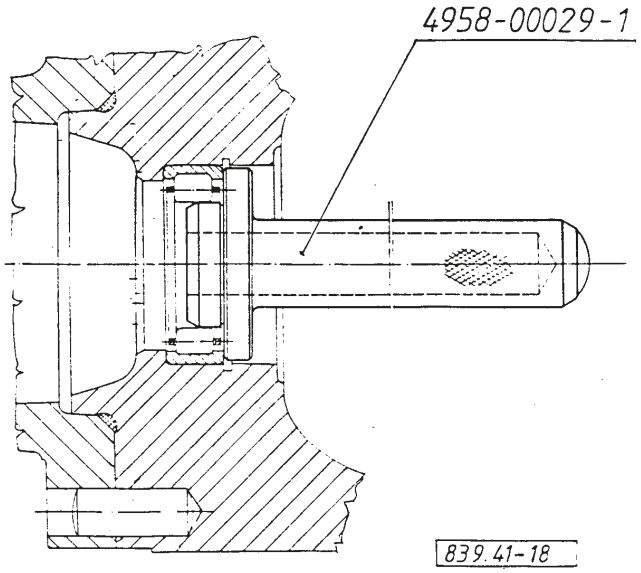


Fig. 4.: DRIVING IN THE CYLINDRIC ROLLER BEARINGS INTO THE KNUCKLE SUPPORT

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

FRONT WHEEL BRAKE

SECTION 360

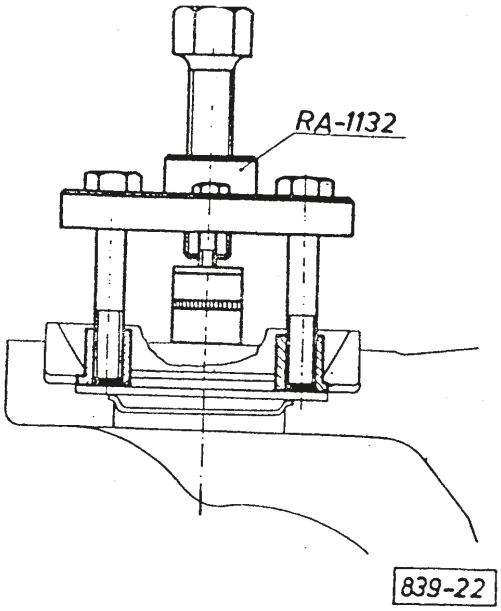
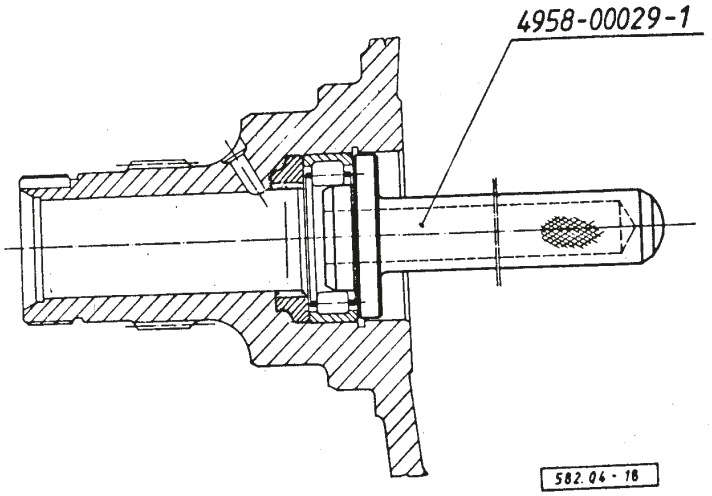


Fig. 5.: PULLING OUT THE TAPER ROLLER BEARING CUPS



DRAWING OF THE FRONT WHEEL BRAKE

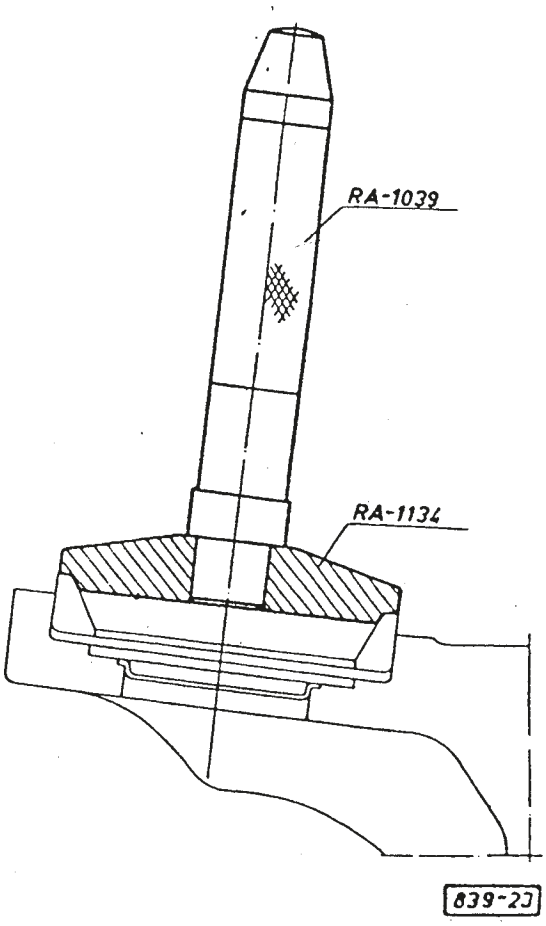


Fig. 6.: PRESSING IN THE TAPER ROLLER BEARING CUP

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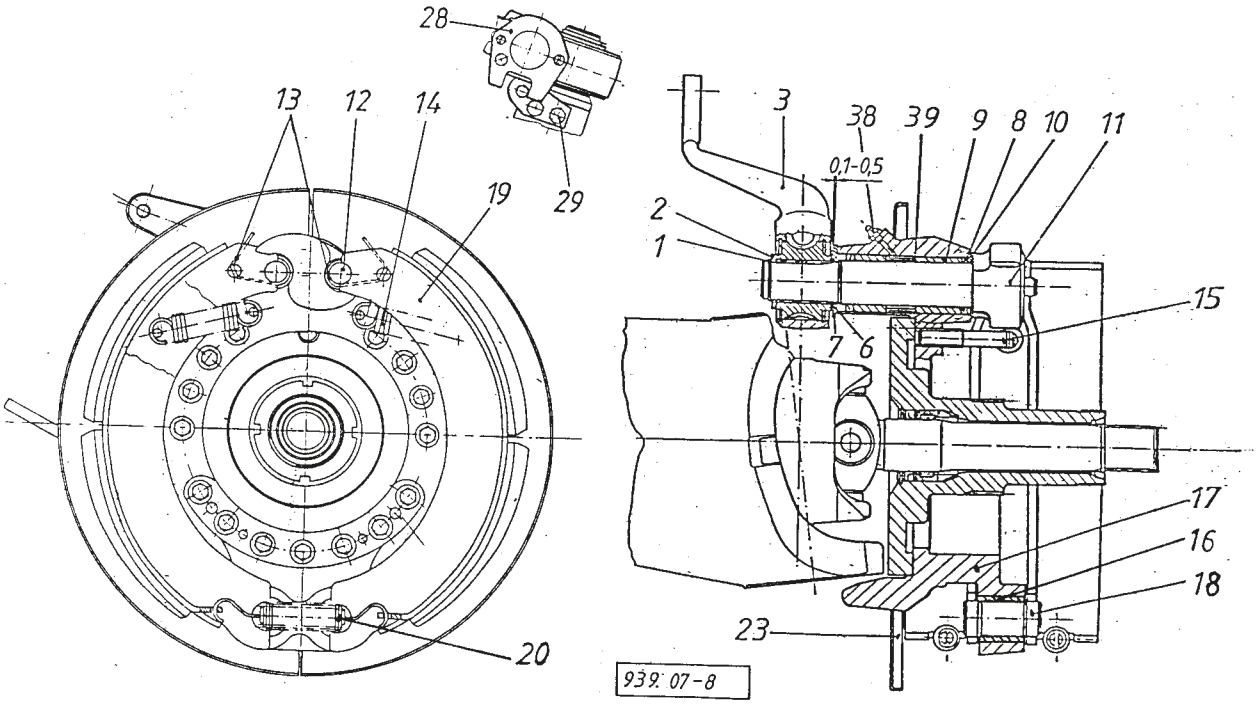
SECTION 261

PARTS OF THE FRONT WHEEL BRAKE



3 - Brake lever

6 - Shims

7 - Spacer

8 - Sealing ring

9 - Bearing bush

10 - Spacer washer

11 - Camshaft

12 - Roller

13 - Roller locking spring

14 - Brake shoe return spring, long

15 - Spring support pin

16 - Bushing

17 - Brake Bracket (steering knuckle housing)

18 - Brake shoe anchor pin

19 - Brake shoes

20 - Brake shoe return spring, short

23 - Dustshield

28 - Stop

29 - Hex. bolt, Flat lock washer

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)**.

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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 the 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

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 vmin = 7 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.

The brake shoes equipped with new linings should be in

-

cal requirements shown in **Fig. 1.**

1 - Max. Zed-area

3 - Dimension data

4 - Check dimension

For riveting use ONLY the rivets corresponding to Fig. 2

TECHNICAL REQUIREMENTS:

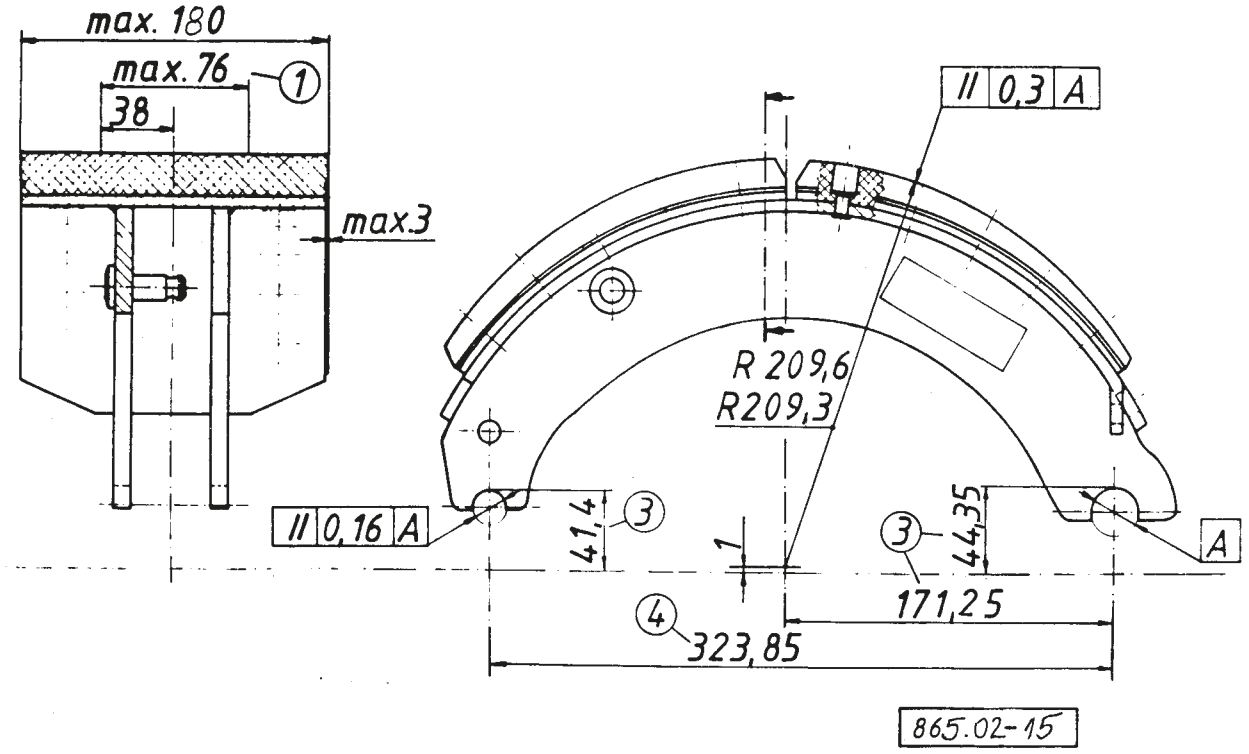

Fig. 1.: DATA FOR TRUEING UP THE BRAKE SHOES WITH NEW LININGS.

2 - Copper plated

3 - Tolerance of the untolerated dimensions is ± 0.254

4 - Tolerance of the untolerated angles is ± 1°

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For riveting use the device equipped with tool developed according to **Fig. 3.**

1 - Rivet set, upper

2 - Rivet set, lower

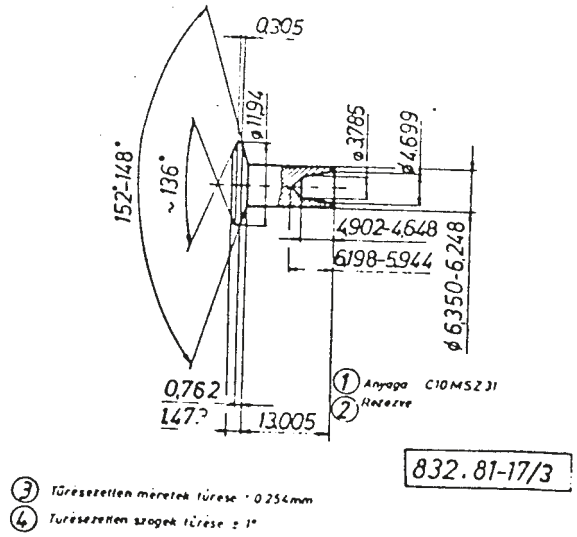
3 - Globe R 2.4 mm

Perform riveting in sequence shown in **Fig. 4.**

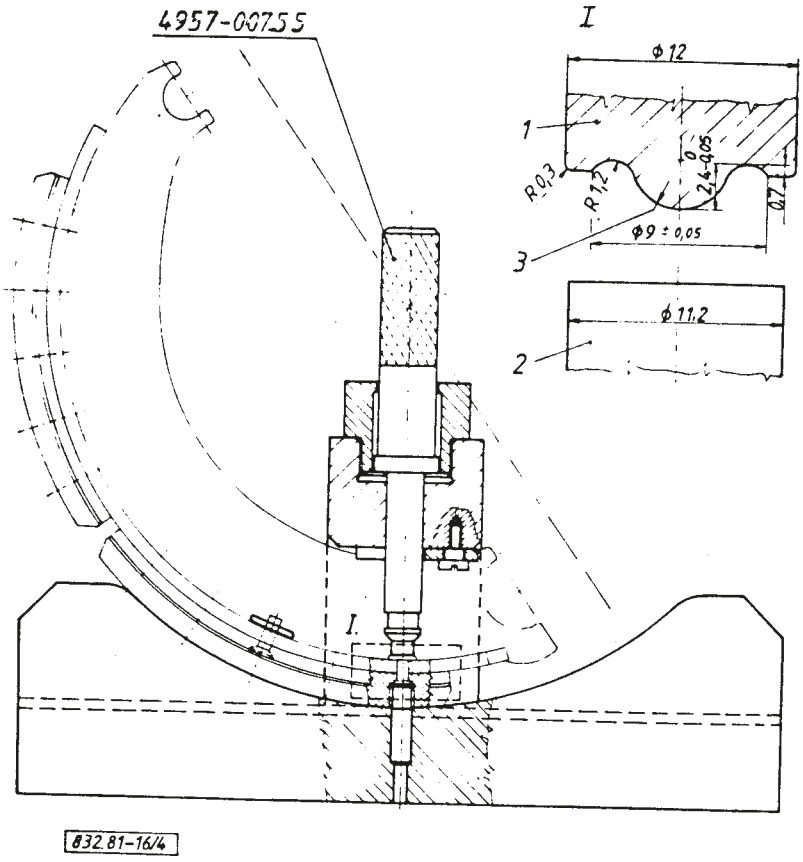
1 - Center of the brake shoe

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**



2.: DIMENSIONS OF THE RIVETS



face for parallel.

That to the dimension **"A"** so, the dimension **"A"** by a **ø 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

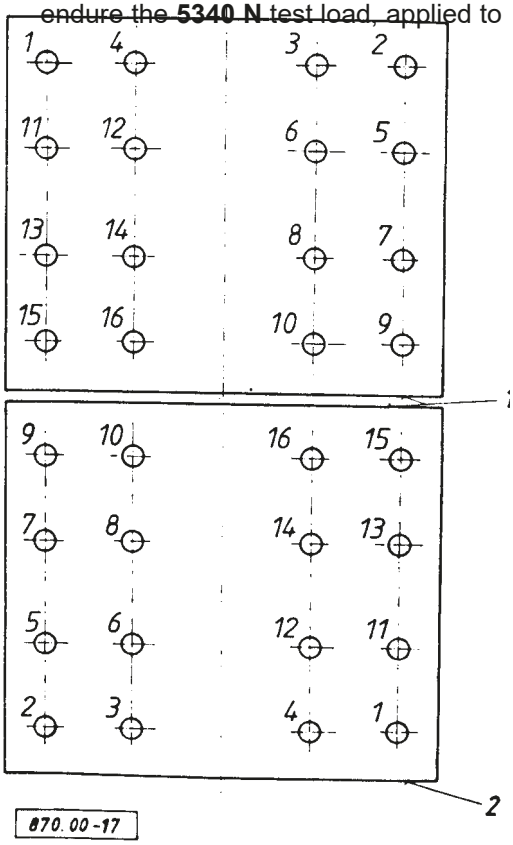


Fig. 4.: RIVETING SEQUENCE

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bottom of the **ø 3.784 mm** bore, without loosening.

On each lining **2** rivet 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 **ø 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.

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 CAMSHAFT

REMOVING THE CAMSHAFT

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

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

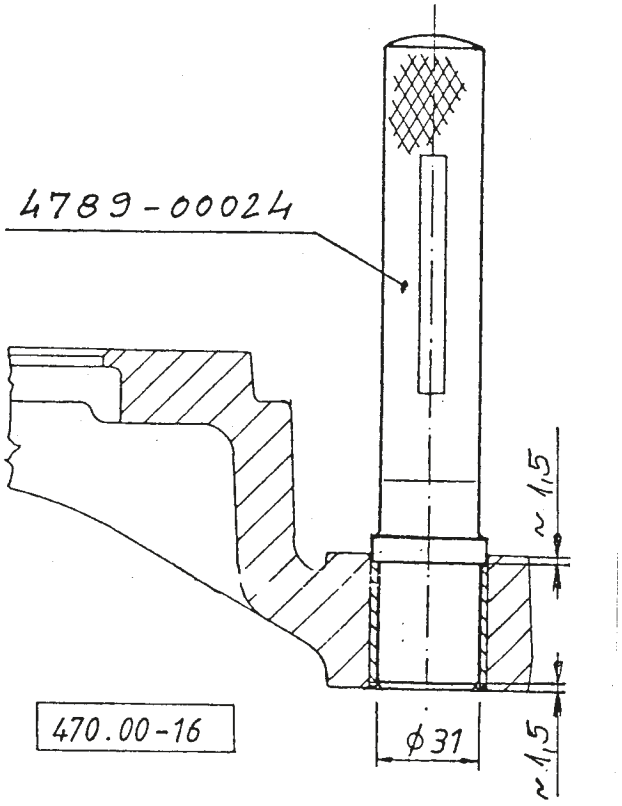

Fig. 1.: PRESSING THE BUSHINGS IN AND OUT

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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"** 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).

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 BEARING SUPPORT

REMOVING THE BEARING BUSHINGS AND THE SEALING RINGS

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

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

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 speci ed 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.).**

REINSTALLING THE SEALING RINGS

When reinstalling the se check if the sealing lips brake cam head and on

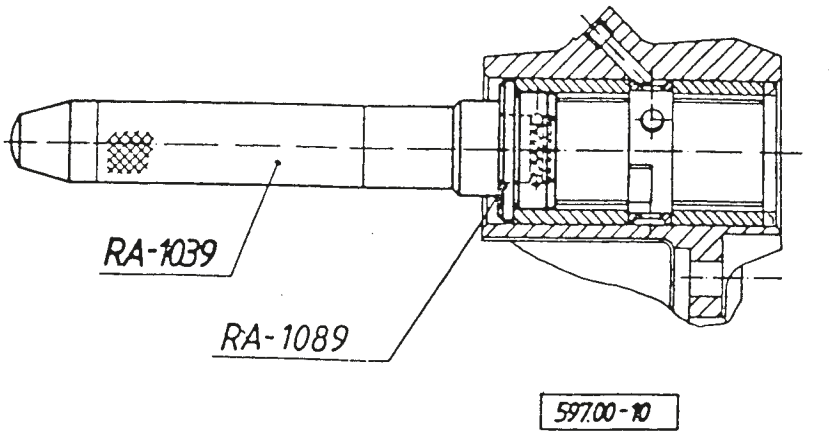

Fig. 1.: PRESSING OUT THE BEARING BUSHINGS

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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 sealing rings before the bushings **(see Fig. 3.)**.

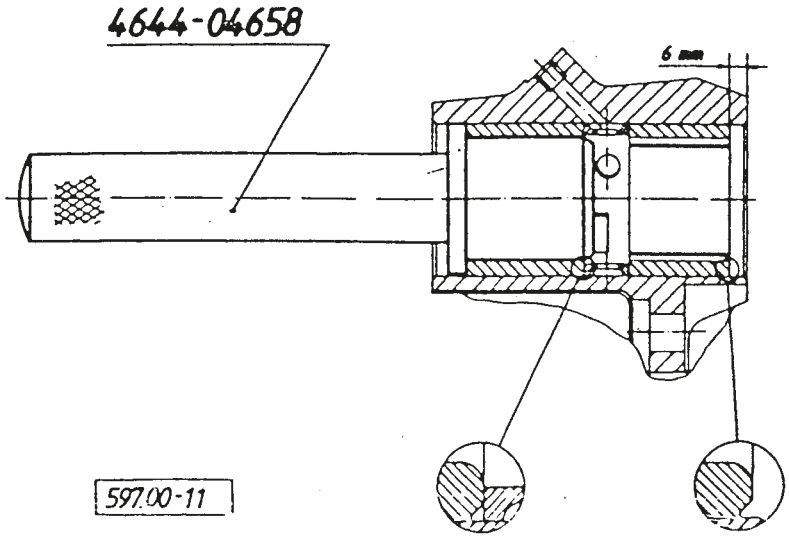

Fig. 2.: DRIVING IN THE BEARING BUSHINGS

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.

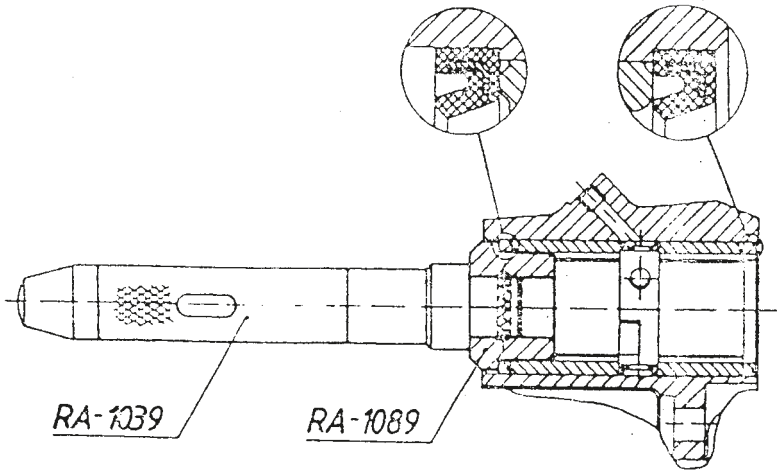

Fig. 3.: PRESSING IN THE SEALING RING

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Drive the bushing **(1)** out of the brake lever also, if required, and drive in the new bush to with side surface of the brake lever.

1 - Bushing
2 - Brake lever
3 - worm
4 - Backing disk
5 - Shim
6 - Snap ring

8 - Worm gear
9 - Snap ring
10 - Steel ball

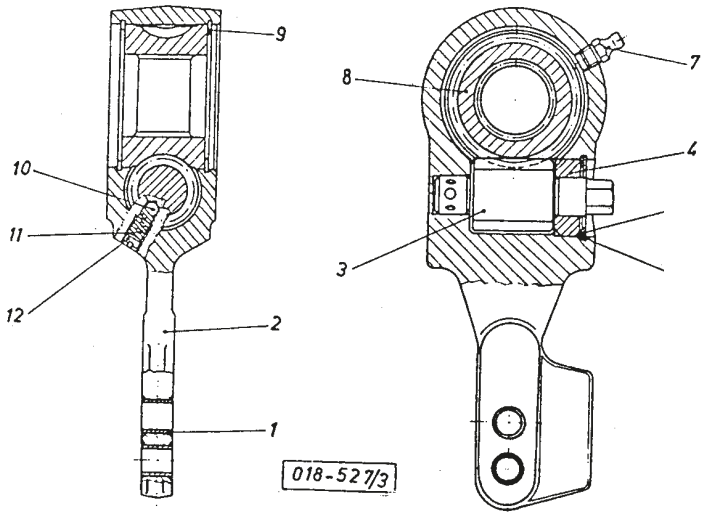

Fig. 1.: MANUAL SLACK ADJUSTER

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.

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

5 - Hex. adjusting ring (hex. distance 32)

6 - Stop pin

7 - Plastic thread protector

ADJUSTMENT DATA:

A = Distance between the chamber holder plane and

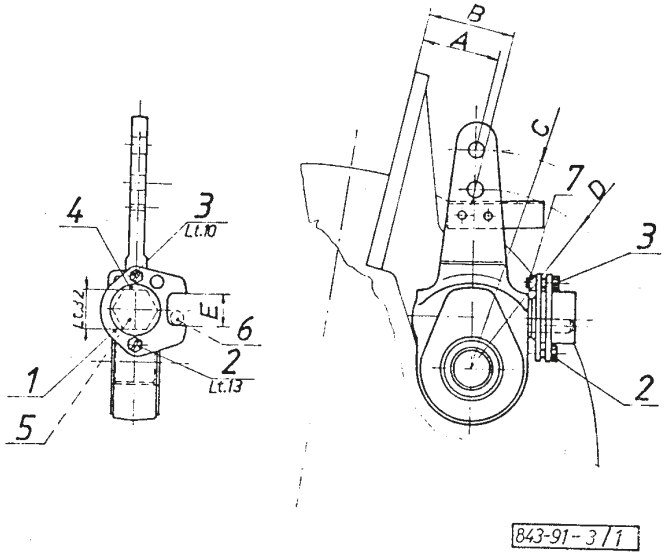

Fig. 1.: AUTOMATIC SLACK ADJUSTER

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).

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— Remove the adjusting plate **(1)** and the plastic protection cap **(4)**.

— By turning the hex. adjusting ring **(5)** to proper direction adjust the speci ed distance between the seating surface and the brake lever bore. (Start adjustment

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)**.

— During plane of the adjusting plate should be perpendicular to the stop pin **(6)**.

— Before installation apply graphitic grease to serration of the brake lever.

STOP STOP STOP STOP

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DIFFERENTIAL CARRIER ASSEMBLY

DIFFERENTIAL CARRIER ASSEMBLY SECTIONAL VIEW

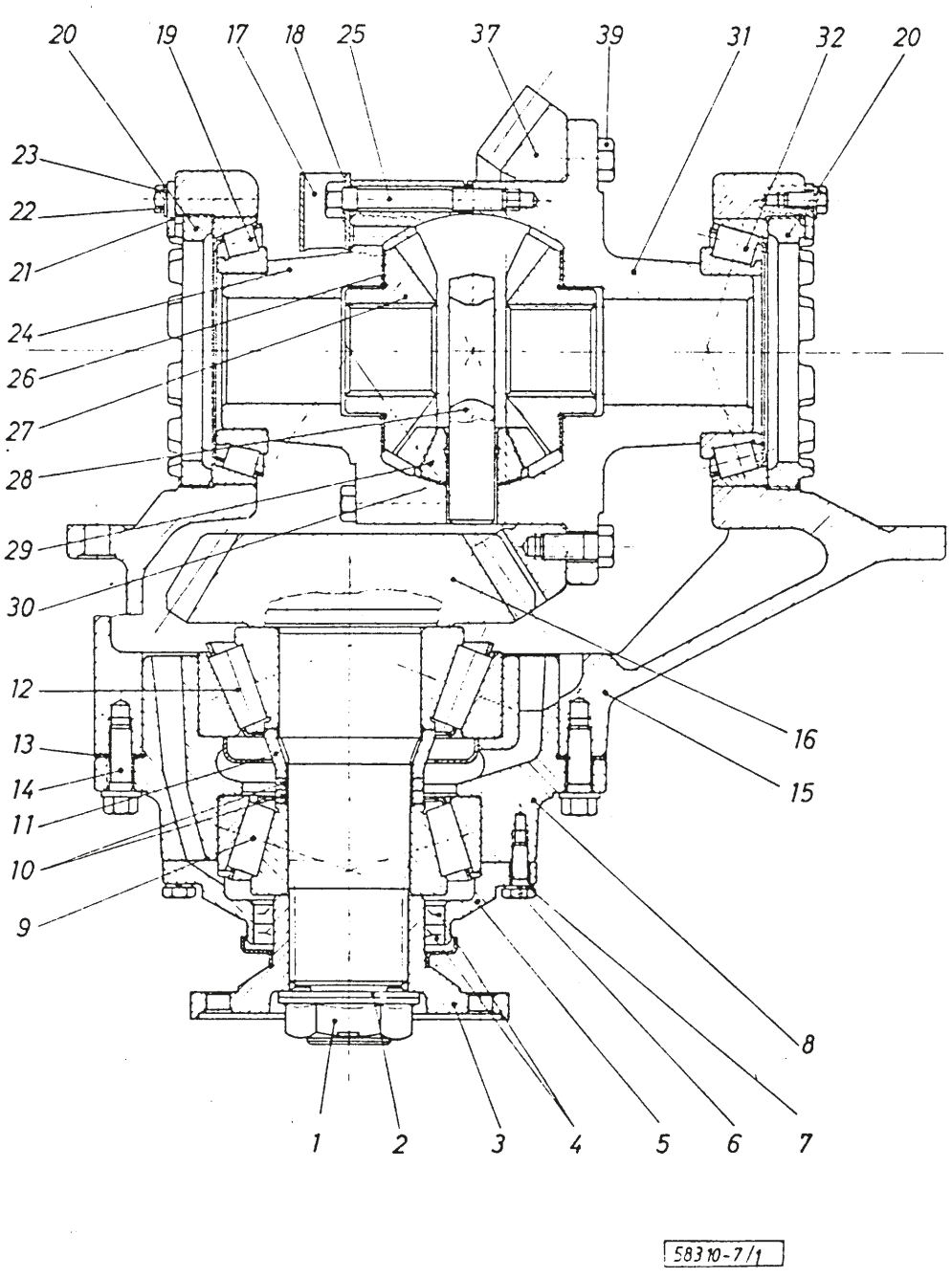

Fig. 1.: DIFFERENTIAL CARRIER ASSEMBLY SECTIONAL VIEW

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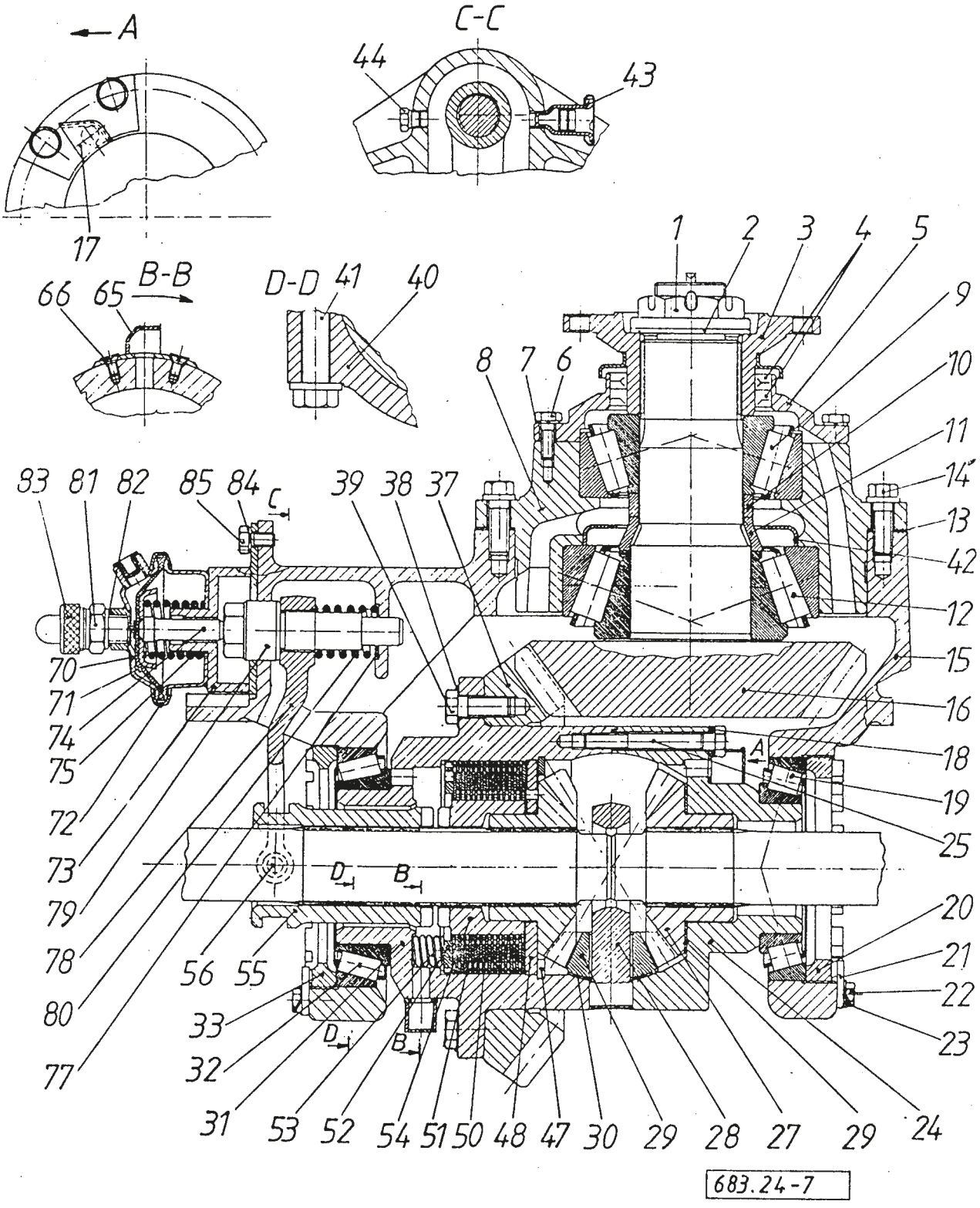

Fig. 2.: LIMITED SLIP DIFFERENTIAL CARRIER ASSEMBLY SECTIONAL VIEW

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SECTION 311

PARTS OF THE DIFFERENTIAL CARRIER ASSEMBLY

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

For the pitch diameter **184.15 mm** companion 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**.

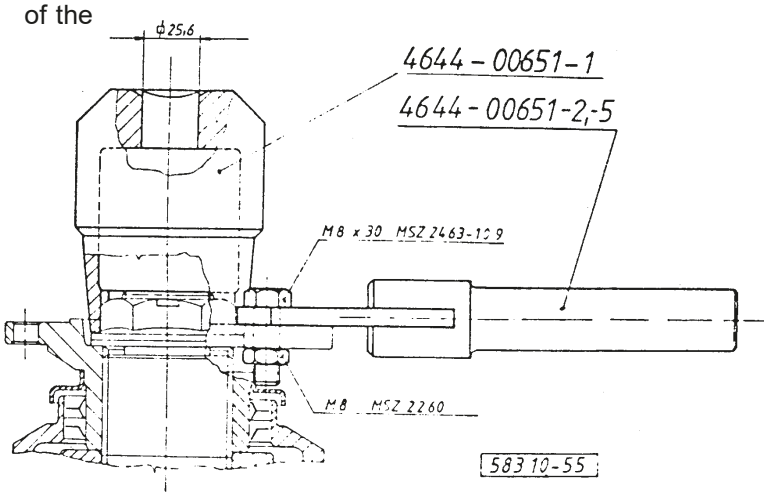

Fig. 1.: ASSEMBLING THE SELF-LOCK NUT

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

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.)**.

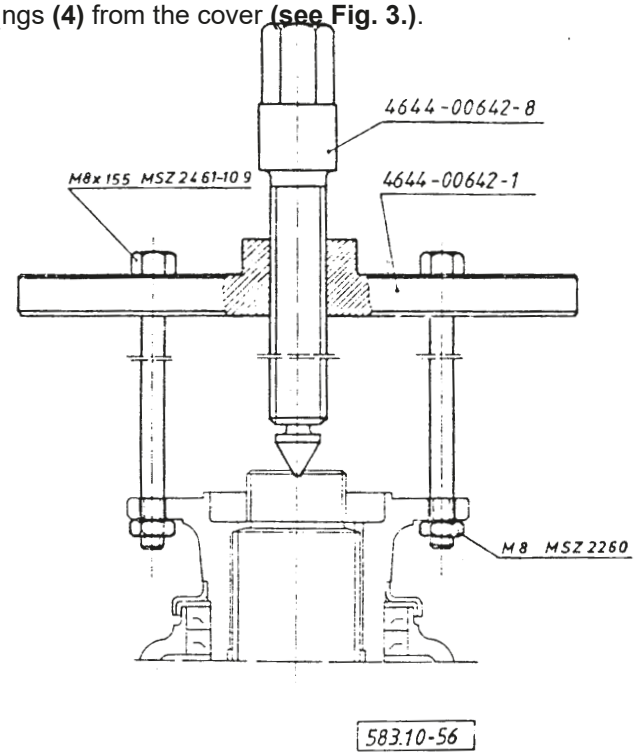

Fig. 2.: PULLING OF THE COMPANION FLANGE

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

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

Apply grease between the sealing lip and the dust protection edge of the outer sealing ring and apply

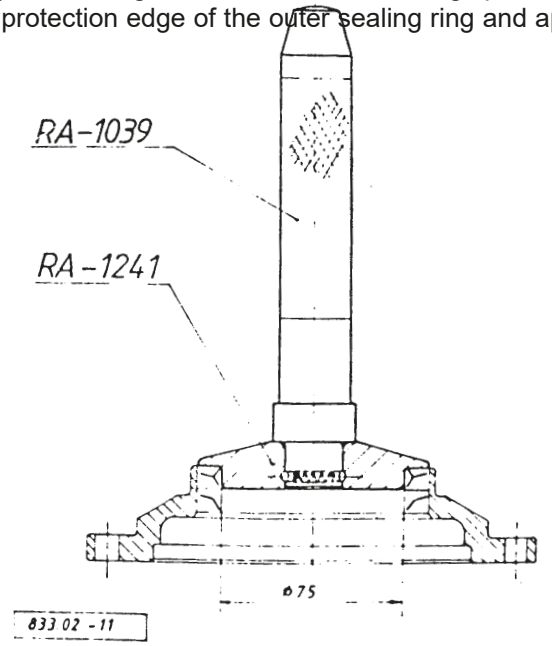

Fig. 3.: DRIVING OUT THE SEALING RINGS

thin coat grease to the inner one.

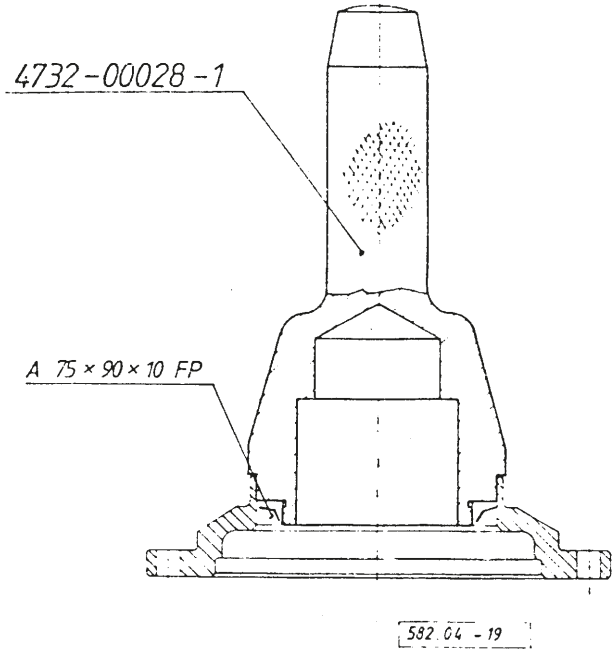

Fig. 4.: DRIVING IN THE INNER SEALING RING

REINSTALLING THE COVER

As described in the **"GENERAL SERVICE INSTRUCTIONS"** apply oil-proof surface sealant to inner of

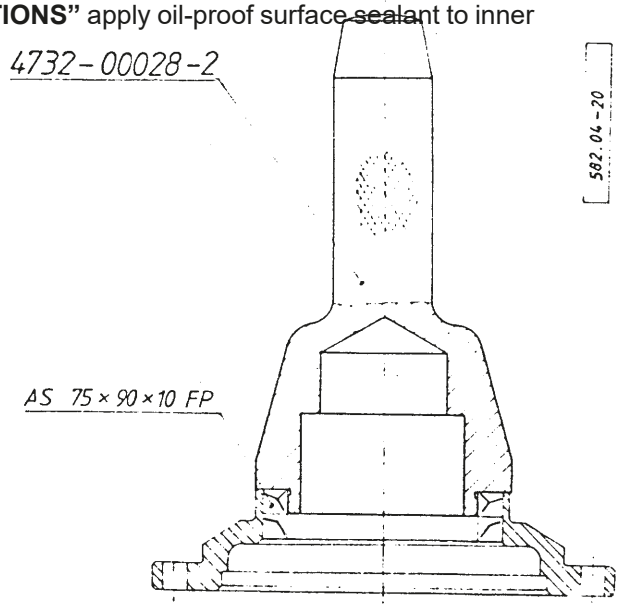

Fig. 5.: DRIVING IN THE OUTER SEALING RING

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 **(3)** to the drive pinion splines to bottom out **(Fig. 6.)**.

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

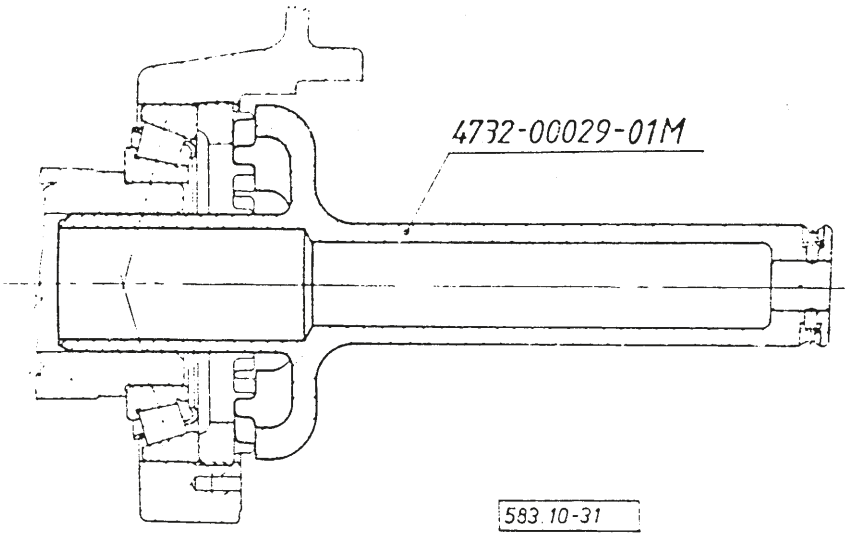

Fig. 1.: ASSEMBLING THE BEARING ADJUSTERS

SECTION 314

REMOVING AND REINSTALLING THE DIFFERENTIAL,

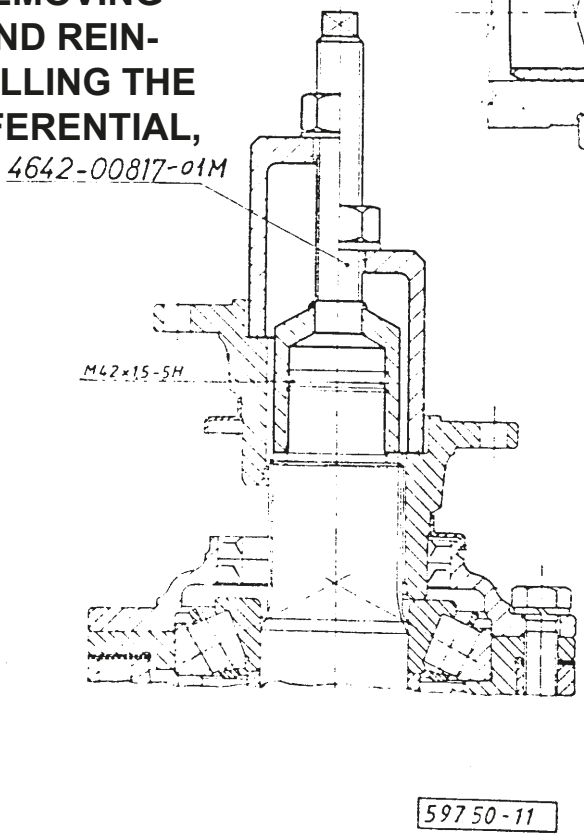

Fig. 6.: PRESSING ON THE COMPANION FLANGE

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 differential case half **(31)** so, the outer race of the taper roller bearing **(19)** shall fall out.

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**.

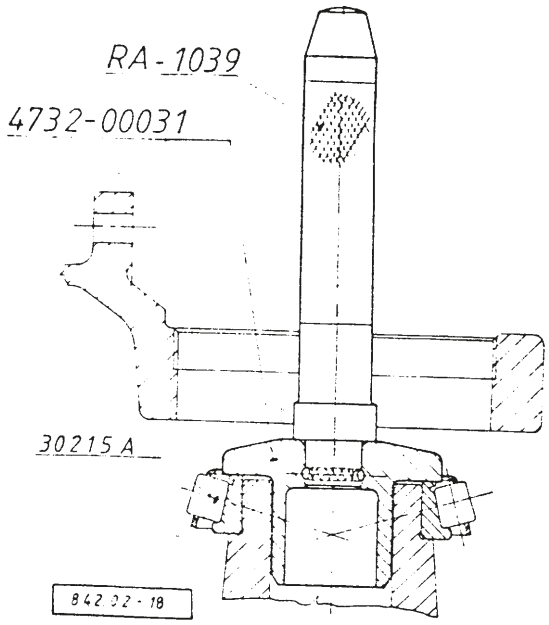

Fig. 2.: DRIVING ON THE TAPER ROLLER BEARING CONE

REINSTALLING THE DIFFERENTIAL

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

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Position the assembled differential into the differential carrier. Turn the differential carrier over so, the differential

Position the cone of the taper roller bearing **(19)** to the

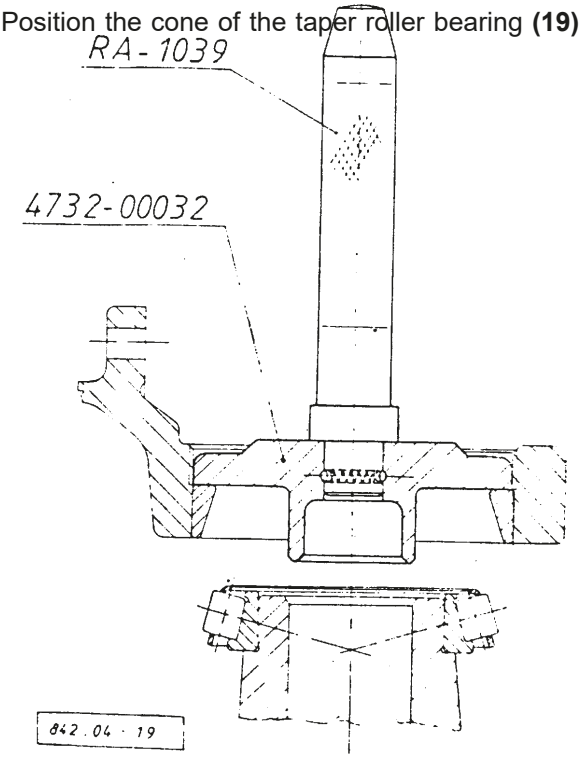

Fig. 3.: DRIVING IN THE TAPER ROLLER BEARING CUP

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 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.)**.

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

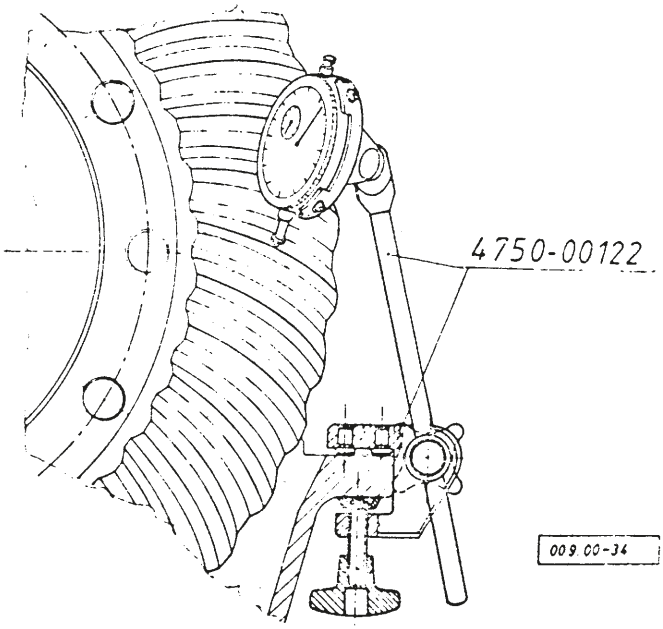

Fig. 4.: CHECKING THE BACKLASH

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 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.**

TOO HIGH CONTACT

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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

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 then back the bearing cage and secure by hex. bolts **(14)** coated with thread locker. Diagonally tighten the bolts to **88 - 98 Nm** torque.

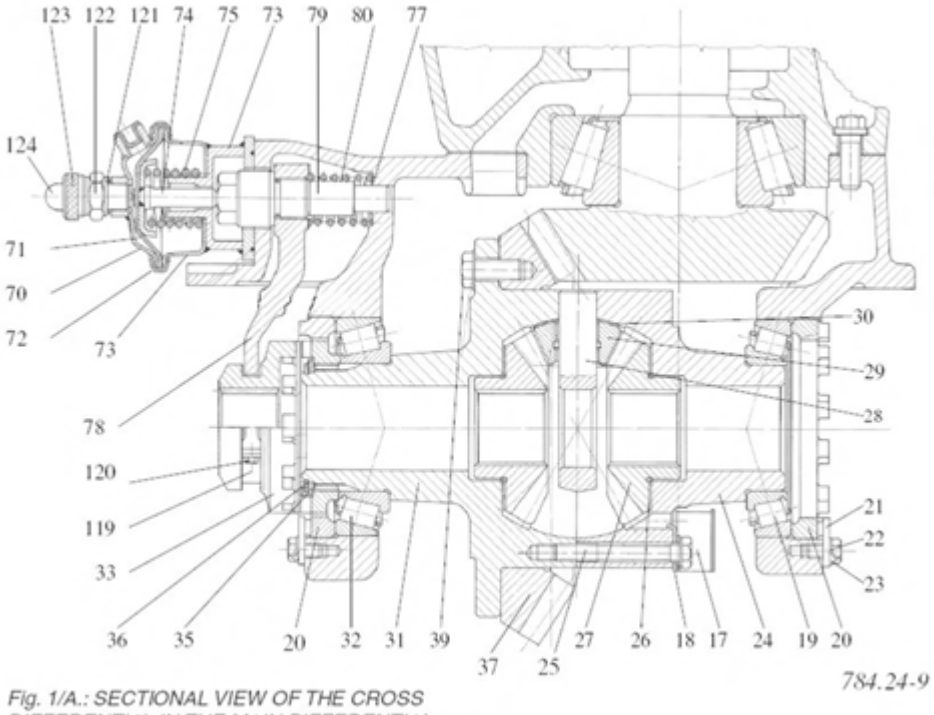

Fig. 1/A.: SECTIONAL VIEW OF THE CROSS DIFFERENTIAL IN THE MAIN DIFFERENTIAL

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.)**.

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 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 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.

According to the match-marks and aligning the bores the differential case halves together, then install the

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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.

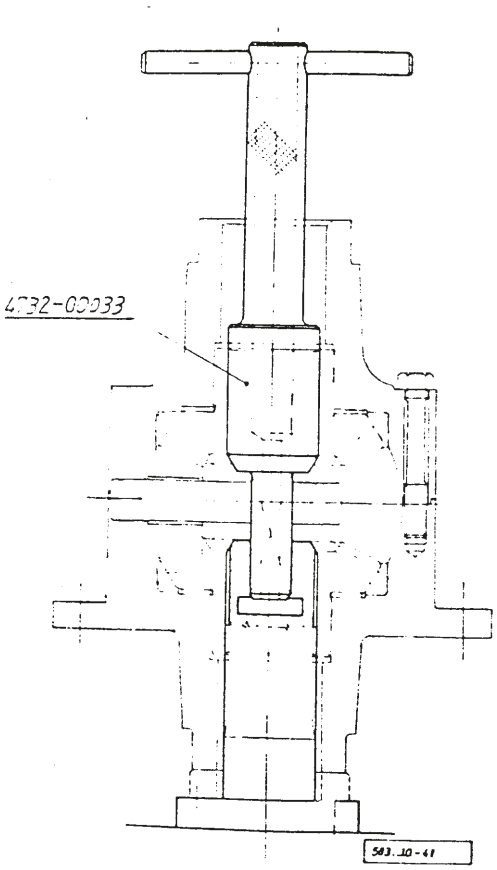

Fig. 2.: ASSEMBLING AND CHECKING THE DIFFERENTIAL

Apply thin coat of oil to the mating surface of the drive gear. Aligning the bores position the drive gear to the differential case half. Thru the 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.

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.).**

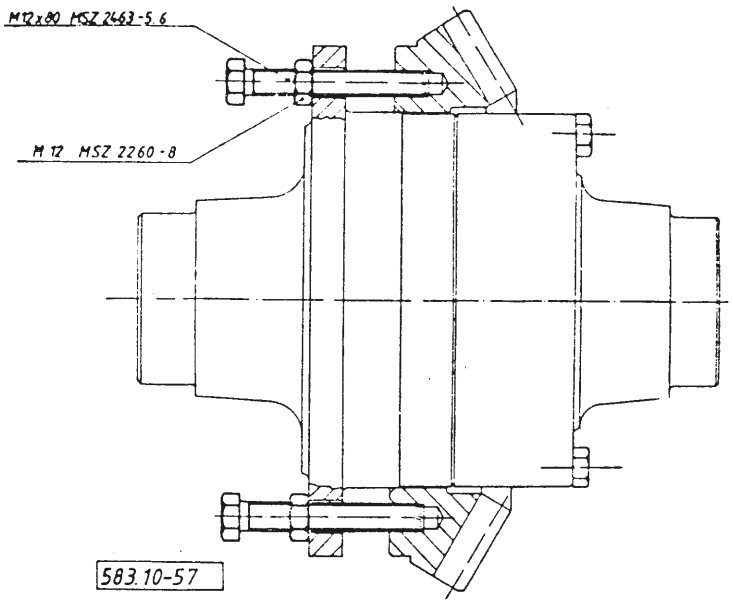

Fig. 3.: PULLING ON THE DRIVE GEAR

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

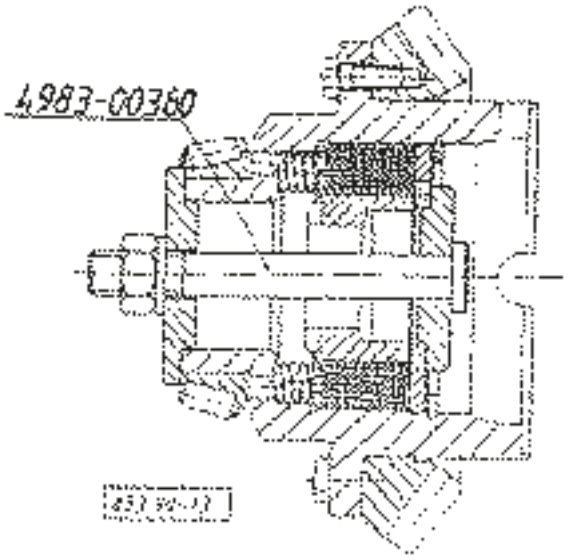

Fig. 1.:

differential case half (31) so that no spring 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

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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

Following this remove the device installed for securing the springs.

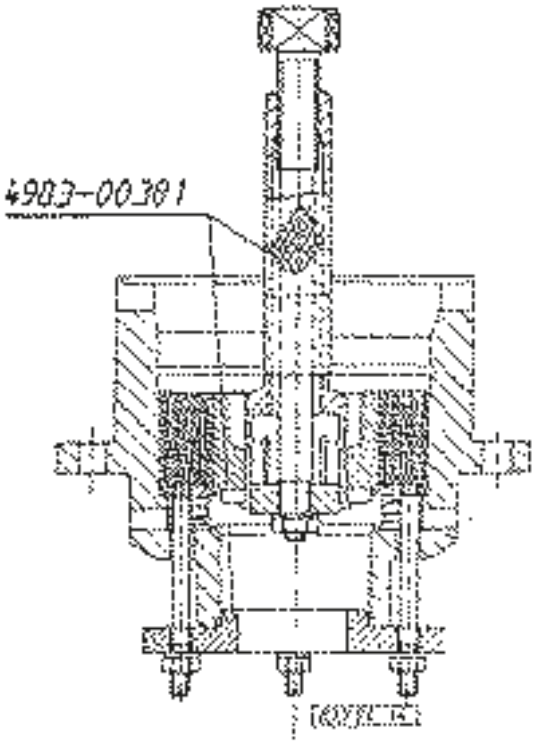

Fig. 3.:

SECTION 316

DISASSEMBLING AND REASSEMBLING THE BEARING CAGE ADJUSTING THE AXIS DISTANCE

Remove the hex. anged 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 of the bearing cage **(8)**, pull the bearing cage out of the differential carrier and remove the shims from of the differential carrier.

REINSTALLING THE BEARING CAGE TO THE DIFFERENTIAL CARRIER

After reassembling the bearing cage and adjusting the 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. anged 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 mm**, by setting the dial indicator to zero.

Insert the measuring device to **B = 88.00 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

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obtain the value by selecting the proper shim pack **(13)**. The permitted deviation is **± 0.025 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 ± 0.025 mm.

Following this reinstall the differential into the differential carrier and adjust the contact pattern as described in the Section **314**.

REINSTALLING THE BEARING CASE

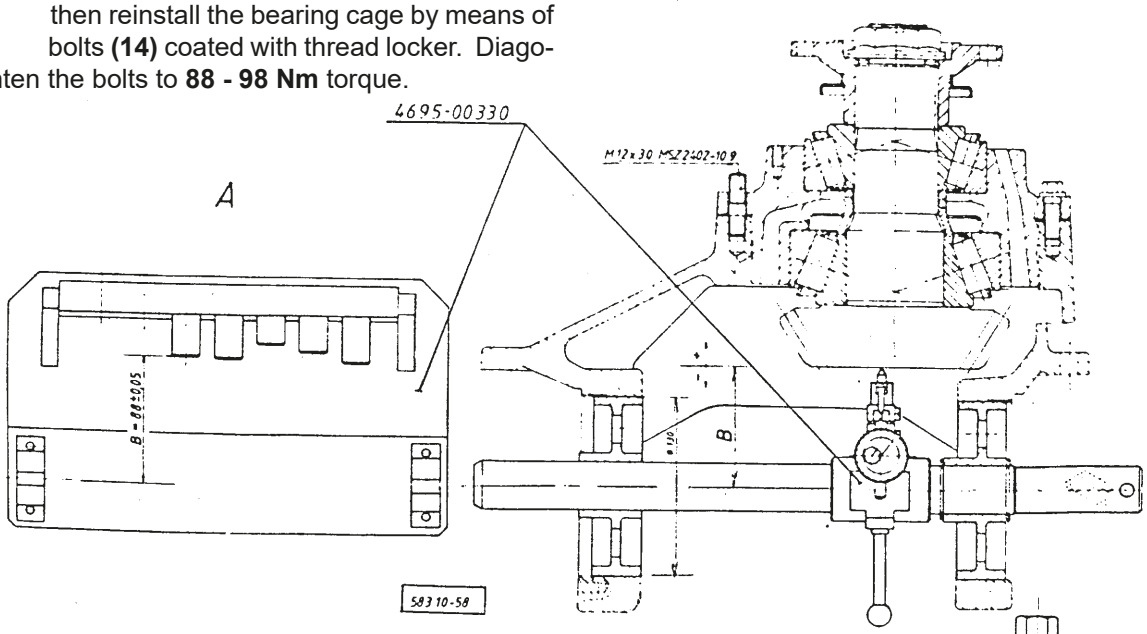
In case of proper contact pattern adjustment and operation remove the bearing cage subassembled with drive pinion and according to the **"GENERAL SERVICE INSTRUCTIONS"** apply oil-proof surface sealant to the inner then reinstall the bearing cage by means of hex. bolts **(14)** coated with thread locker. Diagonally tighten the bolts to **88 - 98 Nm** torque.

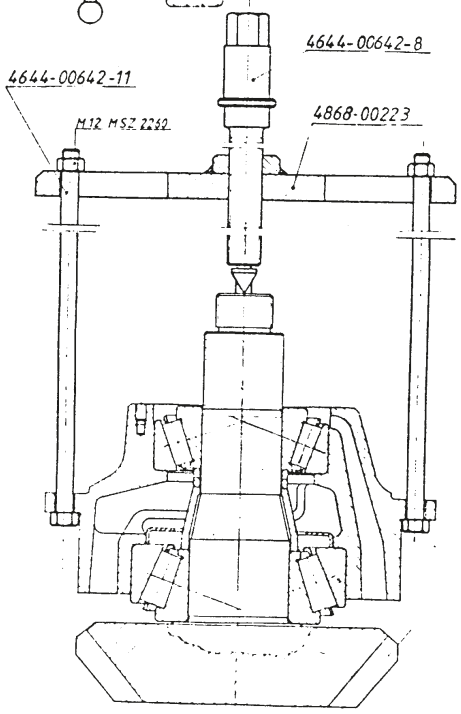
DISASSEMBLING AND REASSEMBLING THE BEARING CAGE

By means of the device arranged from parts shown in the 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 ange 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.





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

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.

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

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

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. 1.: PRESSING OUT THE DRIVE PINION

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

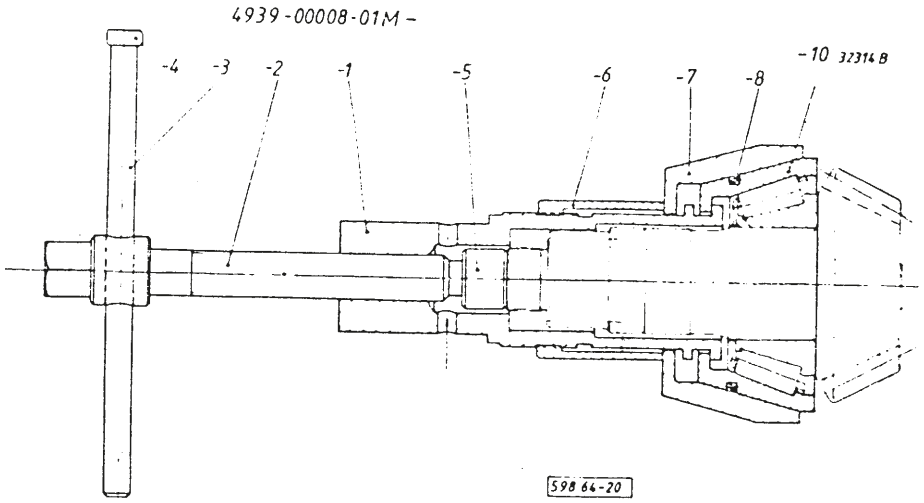

Fig. 2.: PULLING OFF THE INNER RACE OF THE TAPER ROLLER BEARING

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)**.

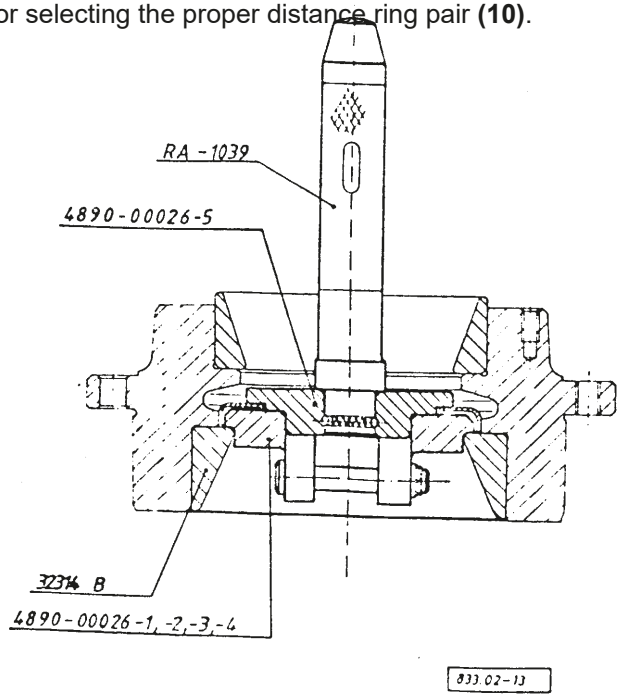

Fig. 3.: DRIVING OUT THE CUP OF THE INNER TAPER ROLLER BEARING

Stack the inner taper roller bearing cone, the distance

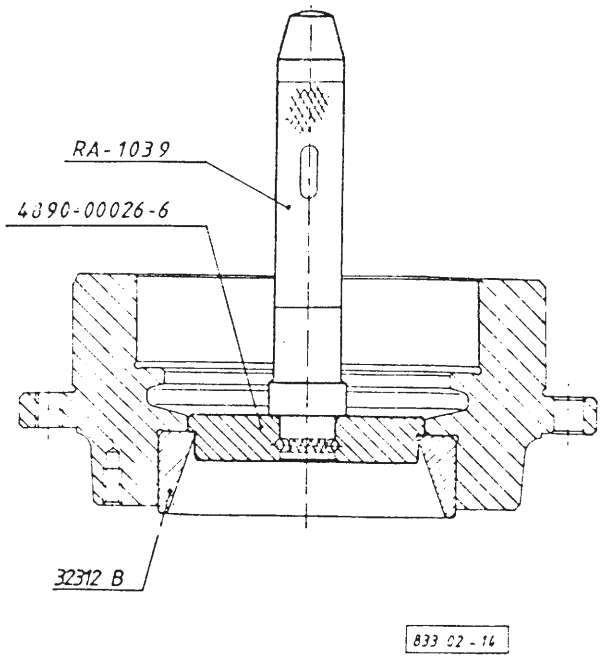

Fig. 4.: DRIVING OUT THE OUTER TAPER ROLLER BEARING CUP

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sleeve **(11)** and distance ring pair for g the gap determined by measurement, then the subassembled bearing cage and the outer taper roller bearing cone to the shown master shaft.

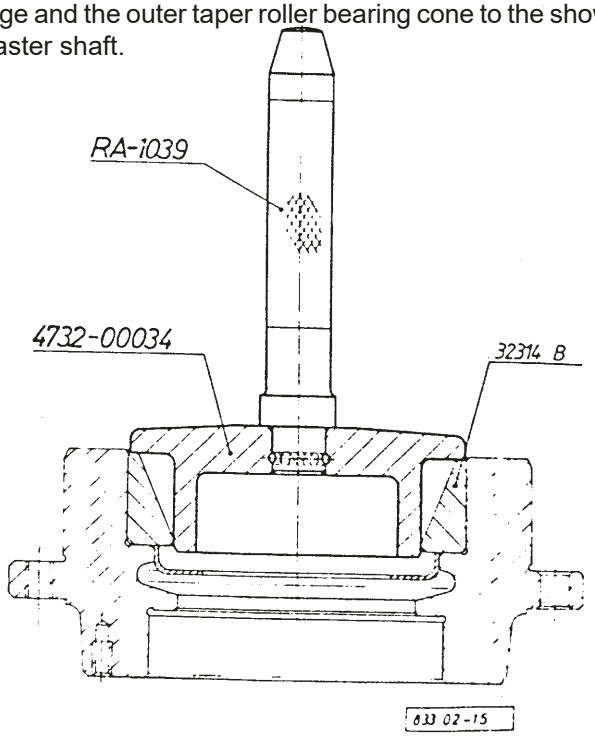


Fig. 5.: DRIVING IN THE CUP OF INNER TAPER ROLLER BEARING

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

Attach **approx. 2 mtrs** long cord to one bore in the bearing

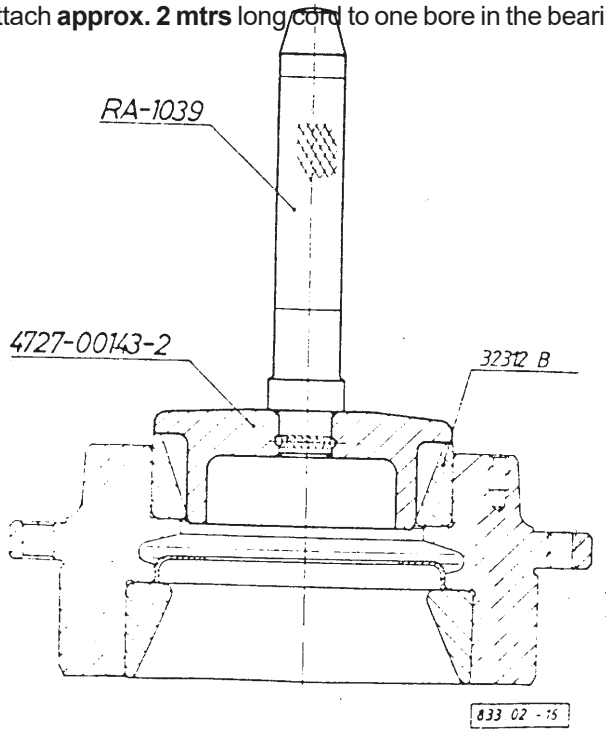
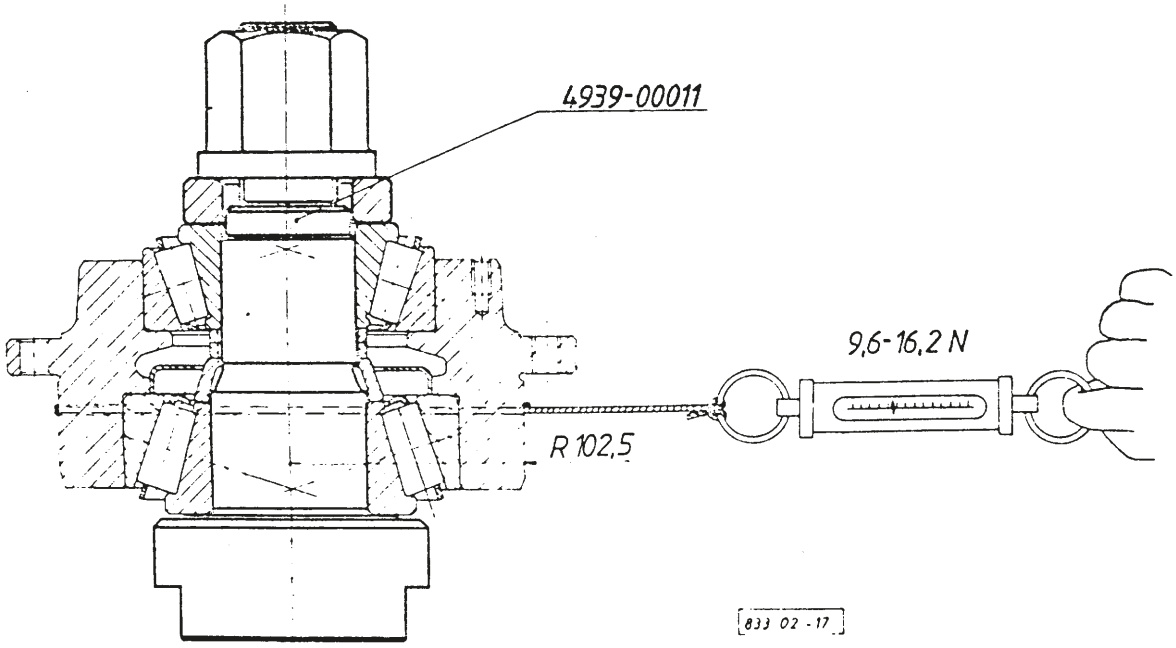


Fig. 6.: DRIVING IN THE CUP OF OUTER TAPER ROLLER BEARING

cage and wind the cord around the bearing cage. Attach to other end of the cord and measure the rolling torque.

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

In case of reused bearings adjust the rolling torque to **0.5** rings).



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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.).**

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 nge **(3)** to the drive pinion. Screw on the anged 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

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

SECTION 395

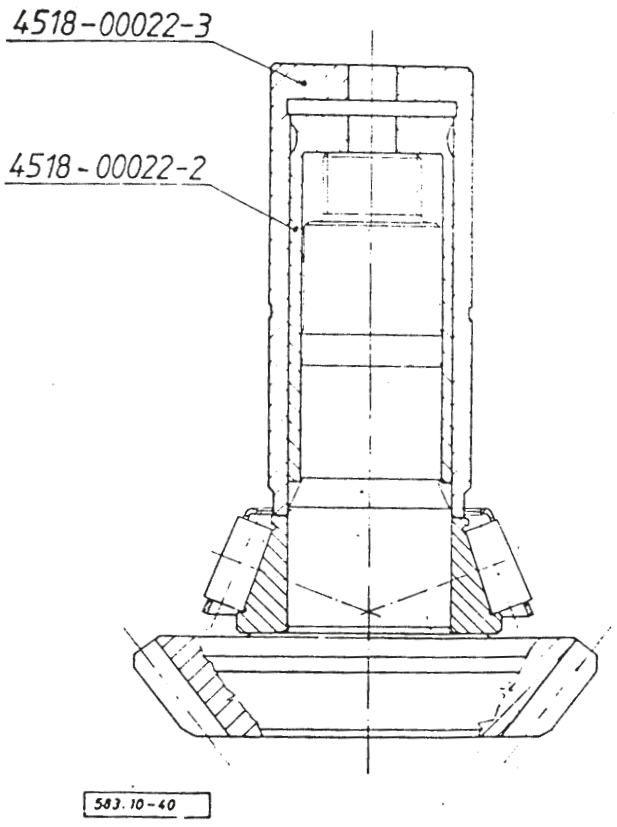

Fig. 8.: DRIVING ON THE INNER TAPER ROLLER BEARING CONE

OIL FILL-UP, RUN, CHECK

Thru the oil ller bores on the end-cover of the wheel hubs and on the axle housing up the assembled axle

Fill ONLY completely clean oil to the axle.

After oil ll-up install the ll 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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