



Job No.

**Checkup steering**

|  |         |
|--|---------|
| Checking play of steering components .....   | 46-I 10 |
| Checking start of manual restriction .....   | 120     |
| Checking oil pressure of steering pump ..... | 130     |

**Steering gear**

|  |       |
|--|-------|
| Removal and installation of power steering ..... | 4 1 2 |
|--|-------|

**Steering linkage and pitman arm**

|   |       |
|---|-------|
| Removal and installation of pitman arm .....                            | 510   |
| Removal and installation of intermediate steering arm .....             | 5 2 0 |
| Removal and installation of track rod .....                             | 540   |
| Removal and Installation of drag link .....                             | 550   |
| Replacement of sleeves for ball joints of track rod and drag link ..... | 560   |

**Steering wheel, jacket tube, steering spindle, steering lock**

|   |     |
|---|-----|
| Removal and Installation of steering wheel .....              | 610 |
| A. Steering wheel without airbag unit .....                   |     |
| B. Steering wheel with airbag unit .....                      |     |
| Removal and Installation of steering lock .....               | 640 |
| A. Removal and installation of ignition starting switch ..... |     |
| B. Removal and Installation of locking cylinder .....         |     |
| C. Complete removal and installation of steering lock .....   |     |
| Removal and installation of power steering pump .....         | 710 |
| 1st version .....   |     |
| 2nd version (single belt drive)-diesel engines .....          |     |
| 2nd version (single belt drive)-gasoline engines .....        |     |

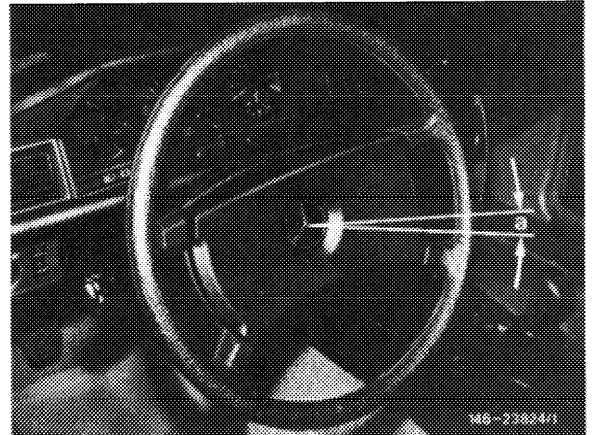
**Power steering gear**

|   |        |
|---|--------|
| Differentiating characteristics of steering gears ..... | 46-010 |
|---|--------|

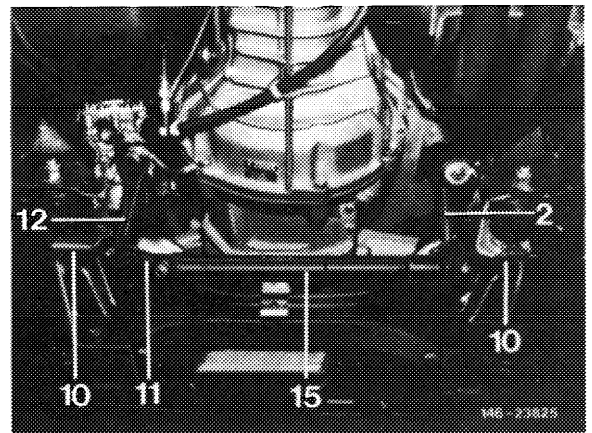
### General checkup

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1 Check play on steering wheel. On steering wheel circumference, a play of max. 25 mm is permitted in center position of steering.



2 If the steering wheel play is rather high, check steering linkage, intermediate steering arm, steering gear and bearing play of front axle.

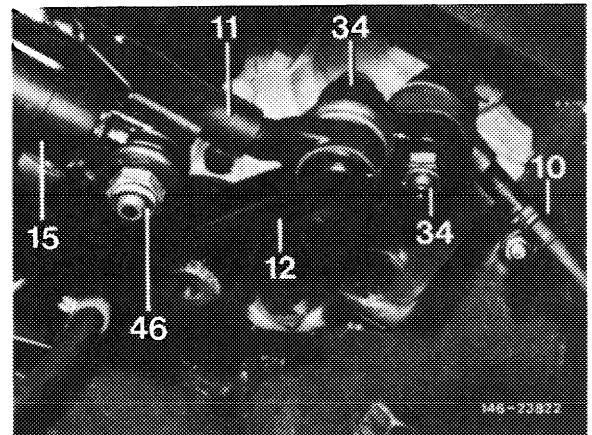


- 2 Intermediate steering arm
- 10 Track rod
- 11 Drag link
- 12 Pitman arm
- 15 Steering shock absorber

### Steering linkage

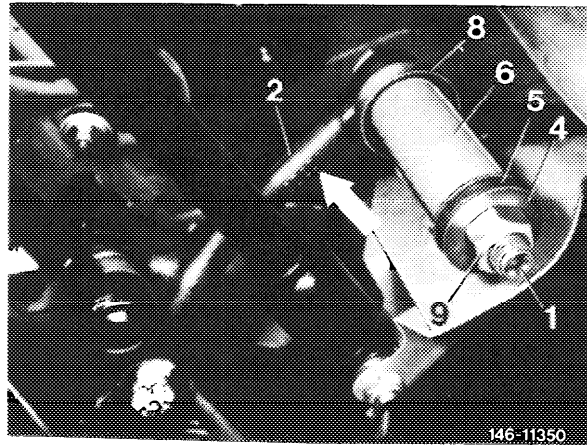
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3 Check play of steering linkage by energetically shaking track rods and drag link. If required, replace drag link or ball joints of track rods.



## Intermediate steering arm

4 Check play of intermediate steering arm by energetically pushing arm up and down. If required, replace rubber slide bearing in journal bearing.



## 46–120 Checking start of manual restriction

### Data

|   |                                 |             |
|---|---------------------------------|-------------|
| Start of manual support with a force at steering wheel circumference of |                                 | approx. 7 N |
| Start of manual restriction measured                                    | on steering shaft               | 5-7 Nm      |
|   | on steering wheel circumference | 23-33 N     |

### Special tool

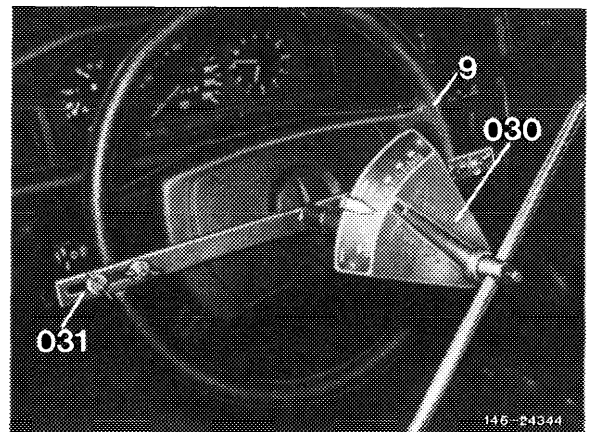
Carrier for torque wrench  
1/2" square



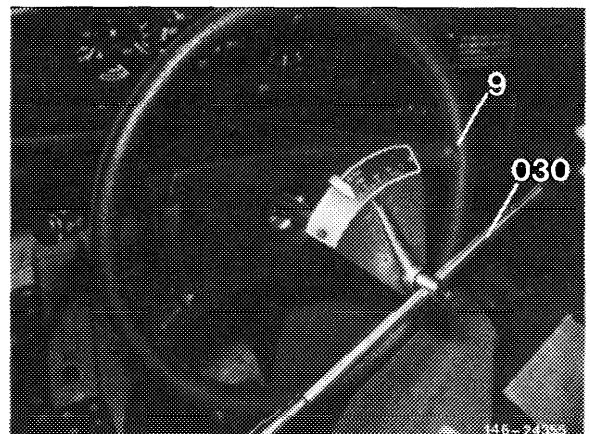
126589136300

### Checkup

- 1 Fasten carrier for torque wrench on steering wheel.
- 2 Run engine at idle speed,

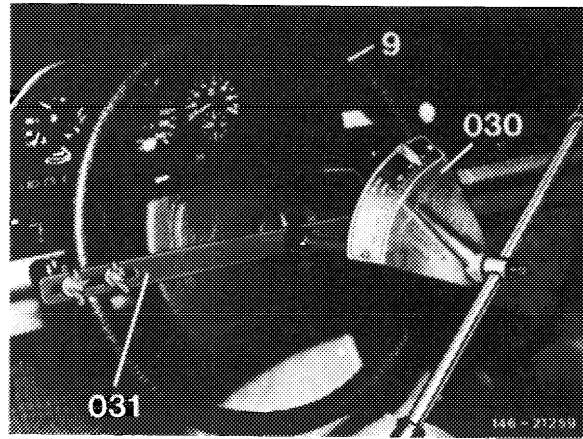


**Note:** On vehicles without restraining system, the start of manual restriction can well be measured without the carrier. For this purpose, remove company symbol from pad with a small screw driver and insert torque wrench by means of the 10 mm socket wrench (hexagonal recess) into countersunk screw for fastening steering wheel.



3 Insert torque wrench into carrier and measure the force required for turning steering shaft which should not exceed 5-7 Nm.

4 Remove carrier from steering wheel.



## 46–130 Checking oil pressure of power steering pump

### Data

|                                |                           |                         |
|--------------------------------|---------------------------|-------------------------|
| Model                          | 201.03                    | 201.02, 201 .12         |
| Circulating pressure           | max. 5 bar gauge pressure |                         |
| Pressure relief valve opens at | 85 + 5                    | 65 ± 5 bar gauge press. |

### Oil grades/Filling capacity and oil level checkup

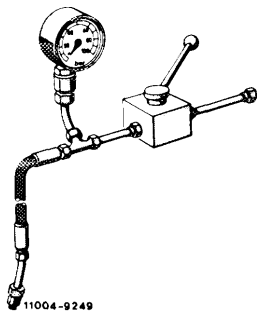


|  |  |
|--|--|
| Automatic transmission fluid (ATF) or transmission oil | refer to Specifications for service products page 236.2<br>refer to Specifications for service products page 237 |
|--|--|

|                  |                   |
|------------------|-------------------|
| Filling capacity | approx. 0.6 litre |
|------------------|-------------------|

|                   |   |
|-------------------|---|
| Oil level checkup | When the oil is at operating temperature (approx. 80 °C), the oil level in supply tank should be at cast-in mark (approx. 20 mm below rim of tank). With the oil cold or at ambient temperature, oil level is at 6-8 mm below mark. For topping-up, use perfectly clean oil only, since even the smallest dirt particles may cause trouble in hydraulic system. |
|-------------------|---|

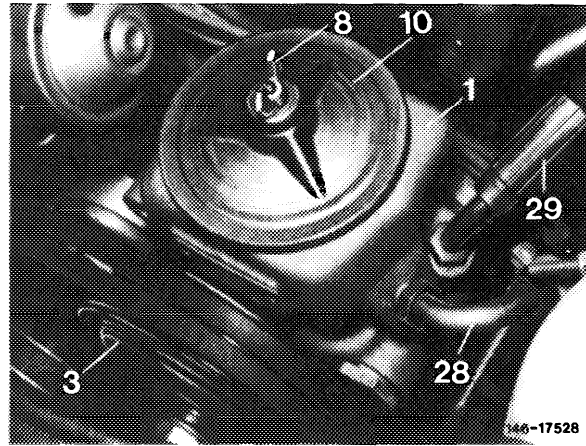
|  |       |
|--|-------|
| <b>Tightening torque</b>                       | Nm    |
| Coupling screw on high-pressure expanding hose | 25-30 |

### Special tools

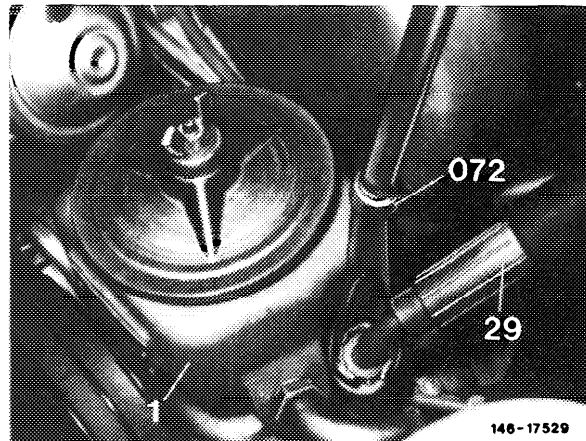
|   |   |                  |
|---|---|------------------|
| Tester                                      | <br>11004-9249  | 115589132100     |
| Connecting socket to tester                 | <br>11004-11836 | 201 589 02 63 00 |
| Box wrench insert open<br>17 mm 1/2" square | <br>11004-6359  | 000589680300     |

## Checkup

1 Remove closing cover and draw off oil with a syringe, since otherwise the oil will run out when unscrewing high-pressure expanding hose.



2 Unscrew high-pressure expanding hose (29) on power-steering pump with open double box wrench (072).

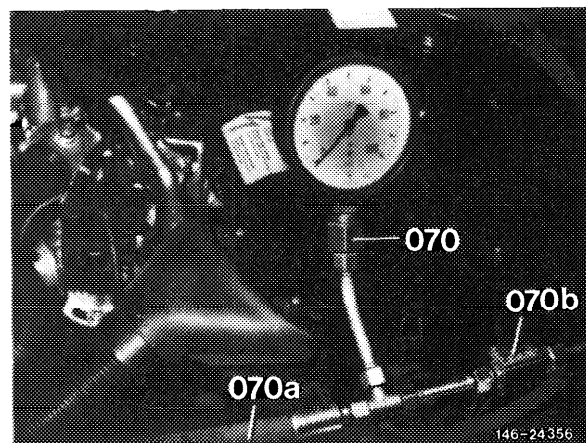


3 Connect high-pressure expanding hose (070a) of tester as well as high-pressure expanding hose (29) using the two connecting sockets on tester (070), fill supply tank with specified oil.

4 Run engine at idle speed and perform the following measurements:

a) **with throttle valve (070b) opened, measure circulating pressure which should not exceed 5 bar gauge pressure.** Do not move steering wheel when measuring, since this would activate the control valve and the pressure would increase.

b) **Close throttle valve** on tester **and measure max. pressure** of power steering pump, while accelerating engine to maintain a speed of approx. 1000/min.



The max. pressure can also be measured by turning the steering to left-hand and right-hand lock. **Caution, do not spend too much time for measuring**, since this would cause the oil temperature to rise to non-permissible limits, which in turn would result in damage to power steering pump.



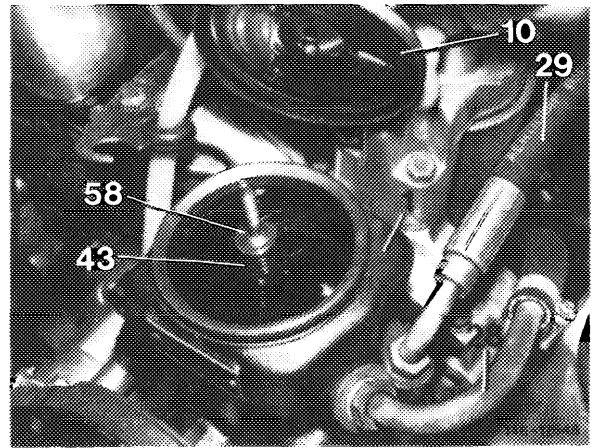
c) If the pump does not attain the specified pressure, check volume control valve and pressure relief valve and replace, if required.

5 Disconnect high-pressure expanding hose on tester, remove tester, connect high-pressure expanding hose to power steering pump. Tighten coupling screw to 25-30 Nm.

6 Fill servo system with specified oil, with engine running add oil up to mark.

7 Turn steering several times completely to left-hand and righthand lock to bleed the system.

8 Restore oil level and check servo system for leaks.



## 46-412 Steering gear – removal and installation of power steering

### Data

| Model                           | Steering gear | Part number                 | Steering version                | Pitch of ball circuit | Ratio in center position<br>i = | Total ratio in center position<br>j = | Remarks        |
|---------------------------------|---------------|-----------------------------|---------------------------------|-----------------------|---------------------------------|---------------------------------------|----------------|
|                                 |               | 201 460 57 01 <sup>1)</sup> | Lefthand steering <sup>1)</sup> |                       |                                 |                                       |                |
| 201.022<br>201.023              |               | 201 460 58 01 <sup>1)</sup> | Righthand steering              |                       |                                 |                                       | Malleable iron |
| 201.024<br>201 ,122<br>(option) | 765.900       | 201 460 43 01 <sup>1)</sup> | Lefthand steering               | 10                    | 14.61                           | 16.66                                 |                |
|                                 |               | 201 460 49 01 <sup>1)</sup> | Righthand steering              |                       |                                 |                                       | Light alloy    |
|                                 |               | 201 460 66 01 <sup>2)</sup> | Lefthand steering               |                       |                                 |                                       |                |
|                                 |               | 201 460 67 01 <sup>2)</sup> | Righthand steering              |                       |                                 |                                       |                |
| 201.034                         | 765.902       | 201 460 60 01               | Lefthand steering               | 11                    | 13.28                           | 15.27                                 | Light alloy    |

<sup>1)</sup> 1st version with clamping sleeve, without steering coupling  
<sup>2)</sup> 2nd version without clamping sleeve, with steering coupling

### Oil grades/Filling capacity and oil level checkup

Automatic transmission fluid (ATF) or steering gear oil refer to Specifications for service products page 236.2 refer to Specifications for service products page 237

Filling capacity approx. 0.6 litre

Oil level checkup With the oil at operating temperature (approx. 80 °C), the oil level in supply tank should reach up to cast-in mark (approx. 20 mm below edge of tank). With the oil cold and at ambient temperature, oil level is 6-8 mm below mark. For filling up, use perfectly clean oil, since even the smallest particles of dirt may cause trouble in hydraulic system.

| Tightening torques   | Nm    |
|--|-------|
| Locking screws for fastening steering gear to longitudinal member of frame floor | 70-80 |
| Hex. socket screw to lower steering spindle or steering gear coupling            | 25    |
| Self-locking hex. nut to track rod and drag ling                                 | 35    |
| High-pressure expanding hose to steering gear                                    | 25-30 |
| Return flow pipe to steering   | 35-40 |

## Special tools

Puller for ball joints of track rod on pitman arm, intermediate steering arm and steering knuckle arm



201 589 08 33 00

Puller for ball joints on drag link on pitman arm and intermediate steering arm



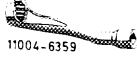
201 589 07 33 00

Check screw for center position of steering gear



201 589 06 21 00

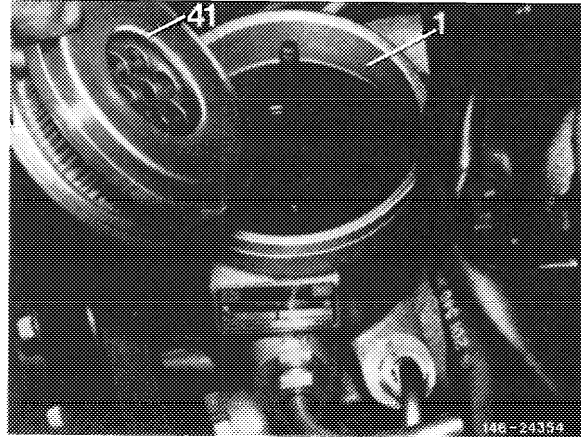
Socket wrench open 19 mm 1/2" square



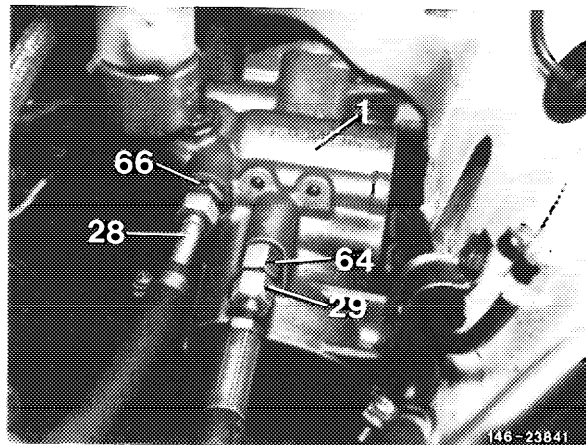
314 589 01 03 00

## Removal

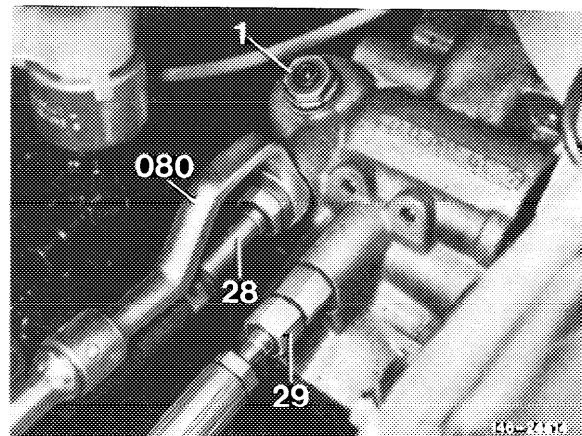
1 Remove cover from supply tank of power steering pump, take out filter element and draw off oil by means of a syringe.



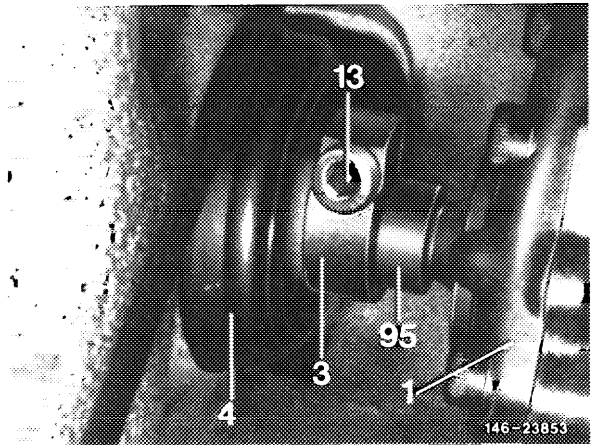
2 Loosen high-pressure expanding hose (29) and return flow line (28) on connecting socket while applying counterhold to connections. Close oil hoses and connections on steering with blind plugs.



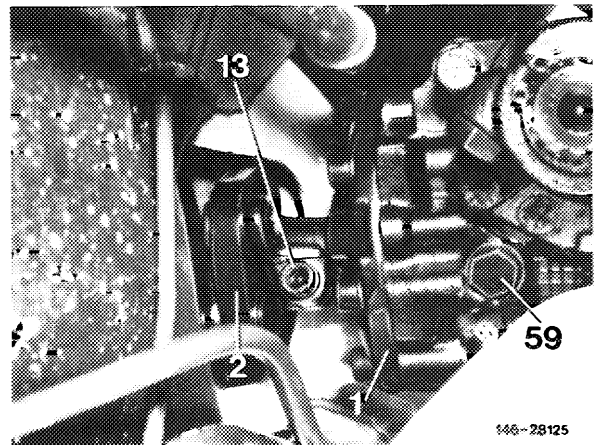
**Note:** For loosening return flow hose, use open socket wrench insert (080).



3 On steering gear 1st version (with clamping sleeve, without steering coupling) unscrew hex. socket screw (13) out of steering spindle (3).

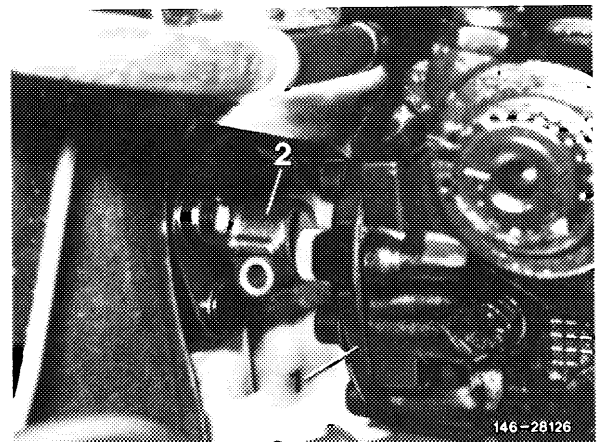


4 On steering gear 2nd version (without clamping sleeve, with steering coupling) unscrew both hex. socket screws (13) out of steering coupling (2).

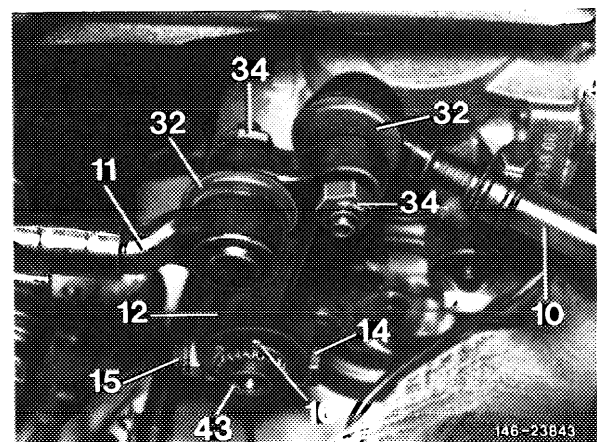


5 Slip steering coupling (2) on parallel flats of lower steering spindle (corrugated tube) in upward direction until it is no longer entering splining of steering worm.

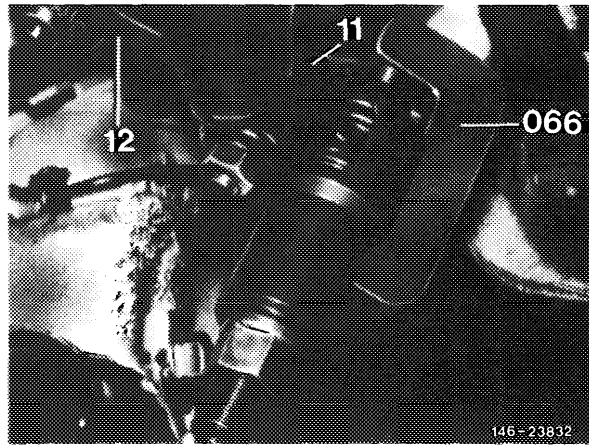
**Note:** Do not use force. If the steering coupling is hard to slide, slightly push parting joint apart by means of a screwdriver.



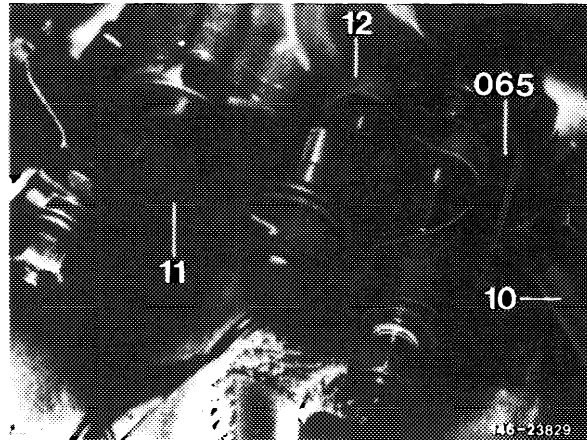
6 Unscrew self-locking hex. nut (34) from drag link and track rod.



7 Press off ball joint of drag link (11) with puller (066) from pitman arm,



8 Press off ball joint of track rod (10) with puller (065) from pitman arm.

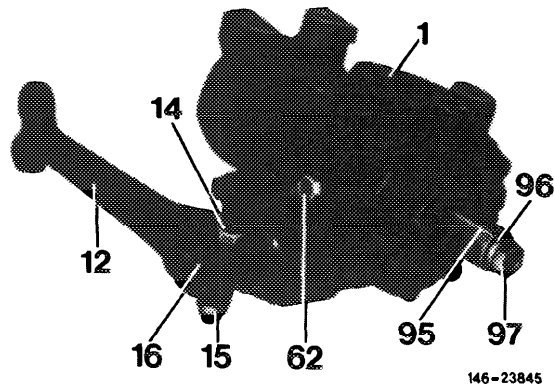


**Attention!**

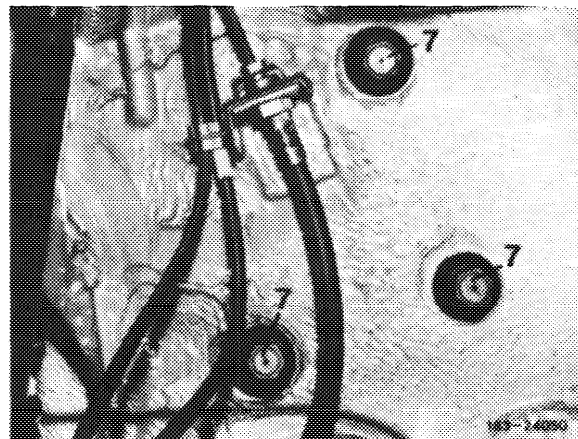
For releasing the compound pitman arm-pitman shaft, be absolutely sure to observe repair instructions (46–510).

A spare steering gear will be supplied including pitman arm.

- |                          |                    |
|--------------------------|--------------------|
| 1 Steering gear          | 16 Locking ring    |
| 12 Pitman arm            | 62 Locking screw   |
| 14 Hex. screw            | 95 Clamping sleeve |
| 15 Self-locking hex. nut | 96 Tapered ring    |
|                          | 97 Hex. nut        |



9 Screw out locking screws (7) for attaching steering gear to longitudinal member of frame floor.



10 Remove steering gear 1st version in forward direction from lower steering spindle.

Remove steering gear 2nd version in downward direction.

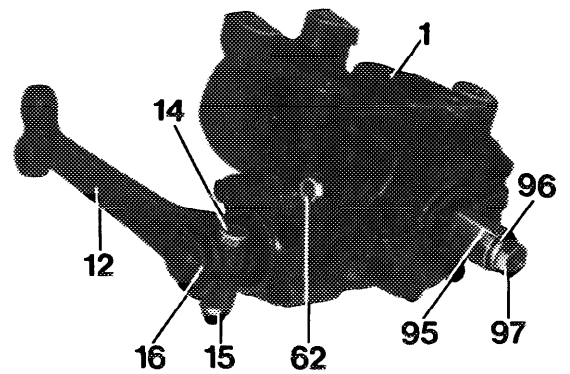
**Note:** Release steering gear 2nd version only after the steering coupling is no longer entering the steering worm, since otherwise the lower steering spindle (corrugated tube) will be damaged.

## Installation

11 Unscrew closing plug (62) from steering gear.

### Steering gear 1 st version

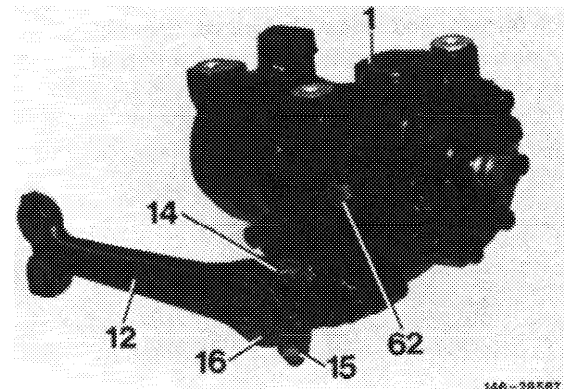
- |                          |                          |
|--------------------------|--------------------------|
| 1 Steering gear          | 62 Closing plug          |
| 12 Pitman arm            | 95 Clamping sleeve       |
| 14 Hex. head bolt        | 96 Supporting ring       |
| 15 Self-locking hex. nut | 97 Self-locking hex. nut |
| 16 Locking ring          |                          |



146-23845

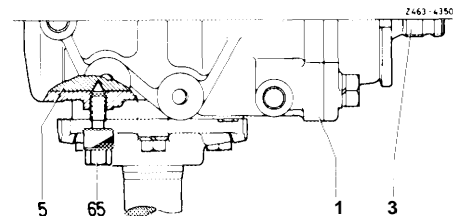
### Steering gear 2nd version

- |                   |                          |
|-------------------|--------------------------|
| 1 Steering gear   | 15 Self-locking hex. nut |
| 12 Pitman arm     | 16 Locking ring          |
| 14 Hex. head bolt | 62 Locking screw         |



146-28587

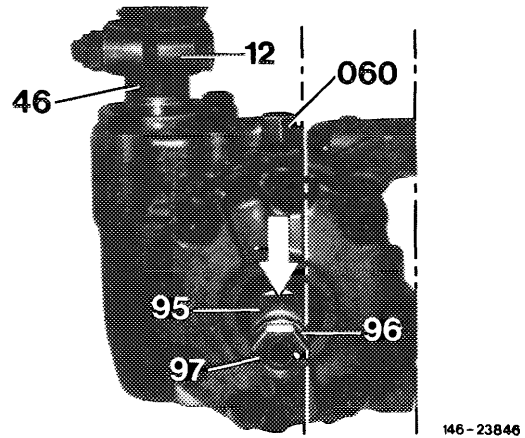
12 Turn steering worm until the center point in operating piston (5) is accurately under threaded bore.



2463-4150

13 Screw center position check screw (060) into steering housing and locate power piston.

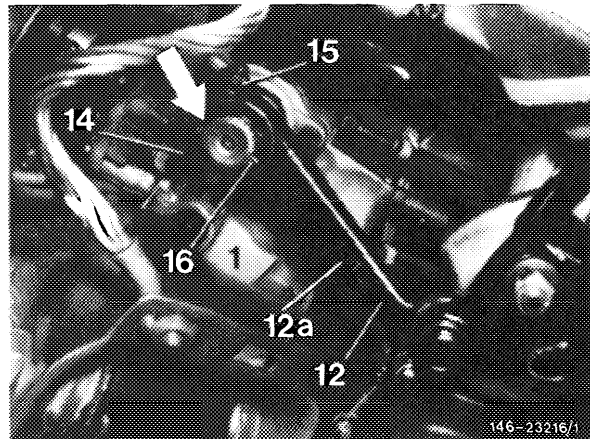
Note: a) On steering gear 1st version the two flats of the clamping sleeve (95) must be in parallel with contact surface of steering gear when in center position and the cutout on clamping sleeve (arrow) for clamping screw must be below.



b) Pay attention to code number (12a) of pitman arm (on both steering gear versions).

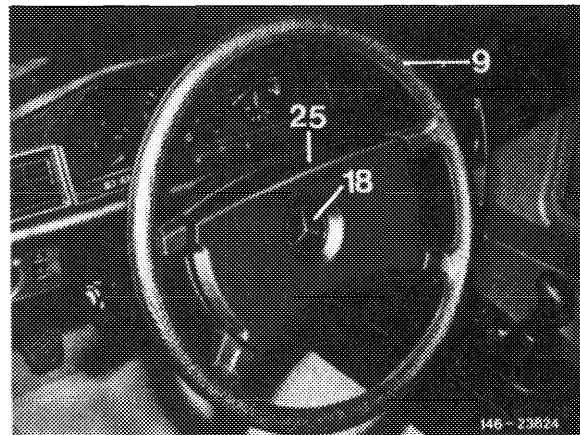
Lefthand steering = 0115  
Righthand steering = 0116

c) The marking on pitman shaft (arrow) should point to parting line of pitman arm (also on both steering gear versions).



14 Remove steering coupling from steering spindle, check for wear and renew, if required, then slip steering coupling completely on parallel flats of lower steering spindle.

15 Turn steering wheel together with steering shaft into correct position; the upper spoke of steering wheel should be in horizontal position.

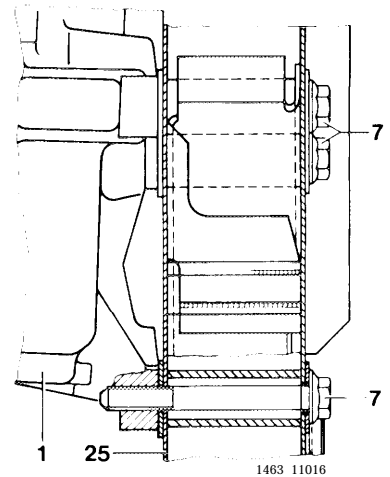


16 Insert steering gear 1 st version into steering spindle. Do not use force.

Fasten both steering gear versions with three new locking screws (7) to side member of frame floor. Tightening torque 70-80 Nm.

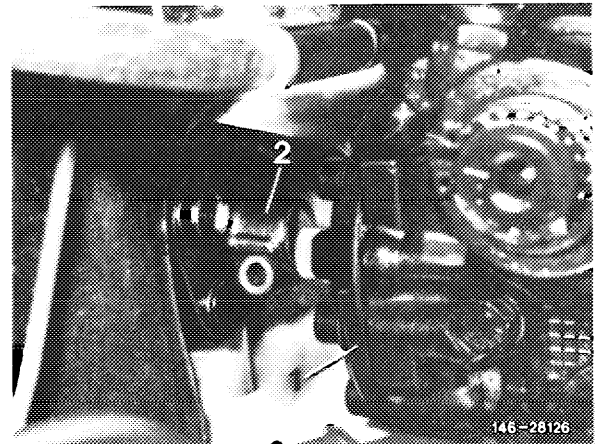
Attention!

Be sure to use new locking screws on principle.



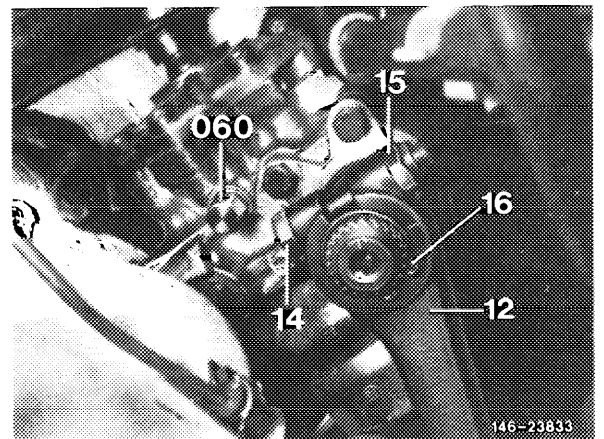
17 Slip steering coupling on splining of steering worm.

Note: Do not use force. Owing to structural design the corrugated tube of the lower steering spindle is relatively sensitive to lateral forces.

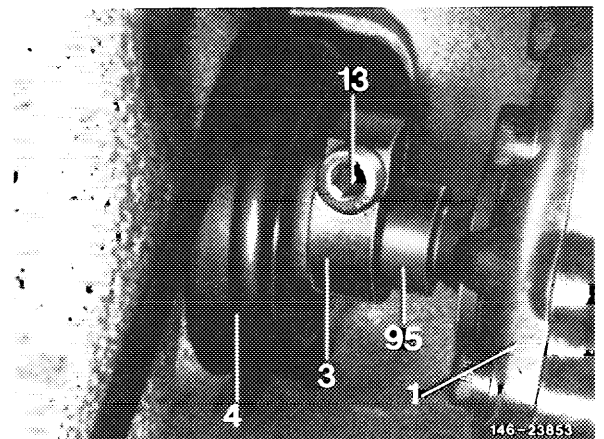


18 Screw out center control screw (060).

19 Screw in locking screw with new copper sealing ring into steering gear.

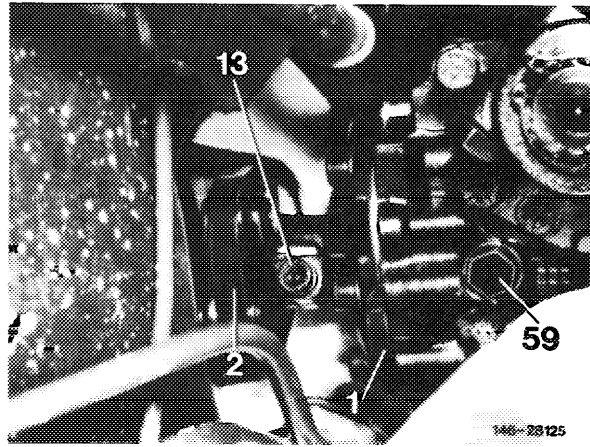


20 On steering gear 1st version screw hex. socket screw (13) into steering spindle (3) and tighten to 25 Nm.

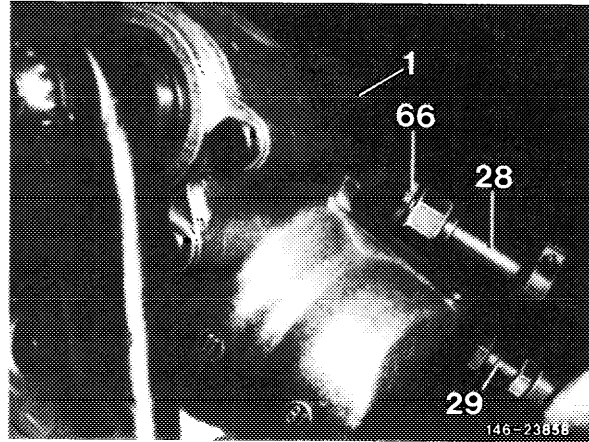




21 On steering gear 2nd version screw both hex. socket screws (13) into steering coupling and tighten to 25 Nm.



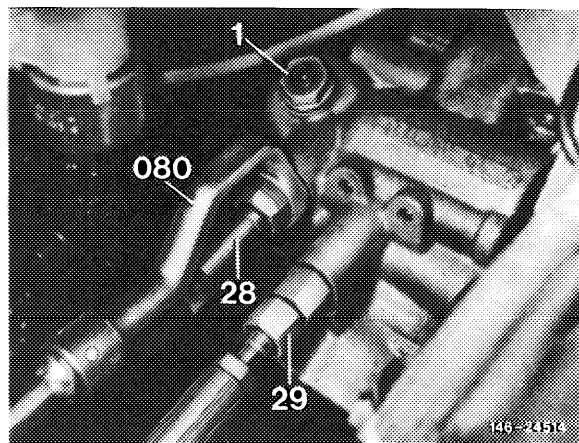
16 Remove blind plug, connect high-pressure expanding hose (29) and connecting tube (28) for return flow hose.



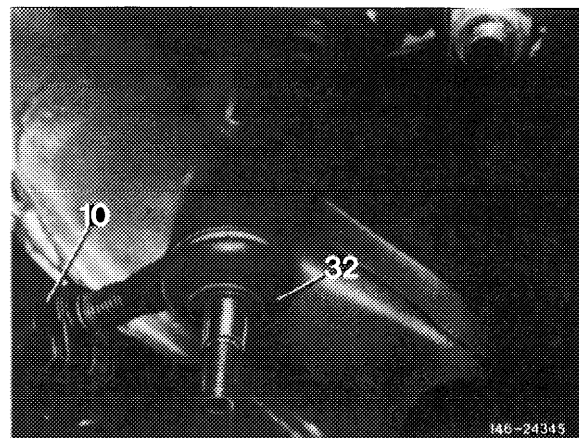
**Note:** For connecting return flow hose (28), use open socket wrench insert (080).

Attention!

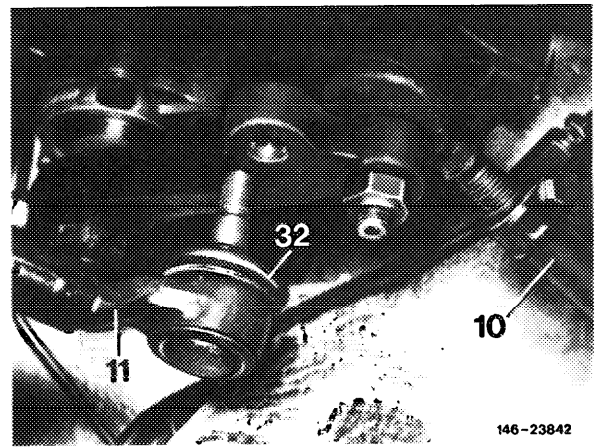
Pay attention to perfect laying of hose. Even minor chafe marks may result in loss of oil and, as a consequence, in a breakdown of the hydraulic support.



17 Check rubber sleeve (32) on joint of track rod. When on a used joint a damaged rubber sleeve is detected, the relevant joint must be completely replaced. If the rubber sleeve was damaged during removal of track rod, replacement of the rubber sleeve will be sufficient (46-540 and 560).

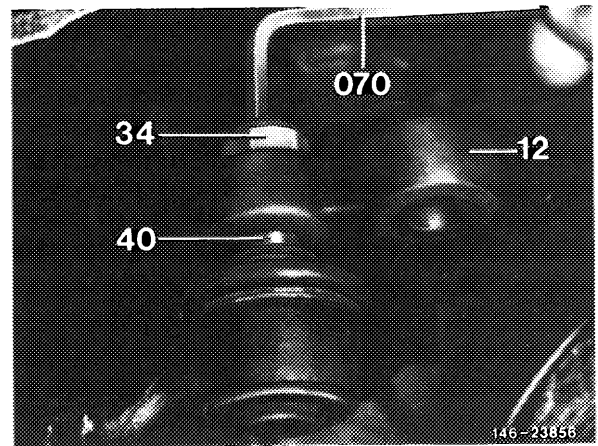


24 Check rubber sleeve (32) on joint of drag link.  
**If on a used joint a damaged rubber sleeve is detected, the drag link must be replaced.** If the rubber sleeve was damaged during removal of drag link, replacement of the rubber sleeve will be sufficient (46-550 and 560).



25 Perfectly remove any grease from ball pins as well as tapered seats in pitman arm. Then firmly press ball pins of drag link and track rod into taper of pitman arm, screw-on self-locking hex. nuts, while applying counterhold to ball pins with hex. socket wrench (070). Tighten self-locking hex. nuts to 35 Nm.

**Note:** Make sure to renew self-locking hex. nuts on principle.



26 Top up supply tank of power steering pump with specified oil type.

27 Run engine and turn steering several times to the left and the right until it is locked, top up oil simultaneously.

**Note:** The steering is self-venting.

28 Check ball point position and toe-in (40-320).

## 46-510 Removal and installation of pitman arm


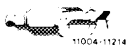
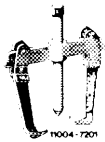
### Data

| Part No.     | Version             | Code No. | Remarks                       |
|--------------|---------------------|----------|-------------------------------|
| 201 463 1501 | left-hand steering  | 0115     | For manual and power steering |
| 201 463 1601 | right-hand steering | 0116     |                               |

### Tightening torques

|   | Nm |
|---|----|
| Self-locking hex. nut of clamping screw on pitman arm | 50 |
| Self-locking hex. nut on track rod and drag link      | 35 |

### Special tools

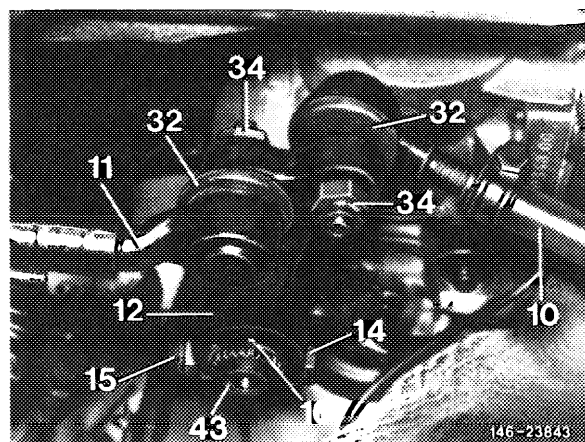
|                                    |   |                  |
|------------------------------------|---|------------------|
| Puller for ball joint of track rod |  | 201 589 08 33 00 |
| Puller for ball joint of drag link |  | 201 589 07 33 00 |
| Double-arm puller                  |  | 000 589 883 300  |

### Adhesive agent

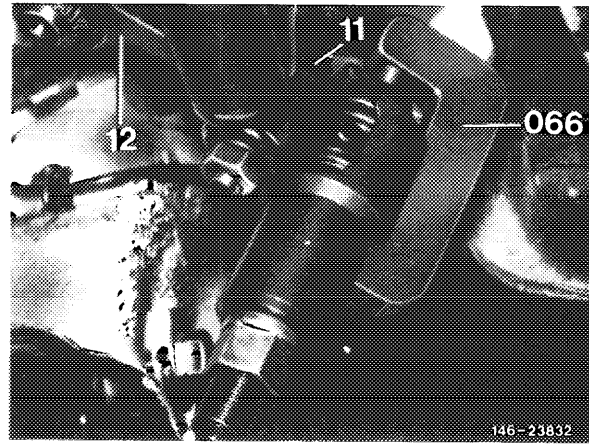
|   |            |
|---|------------|
| for pitman arm on pitman shaft<br>Loctite 270 | 0029899371 |
|---|------------|

### Removal

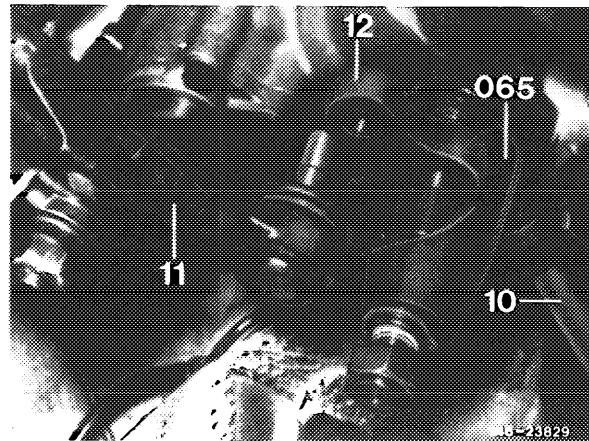
- 1 Screw off self-locking hex. nut (34) of drag link and track rod on pitman arm (12).



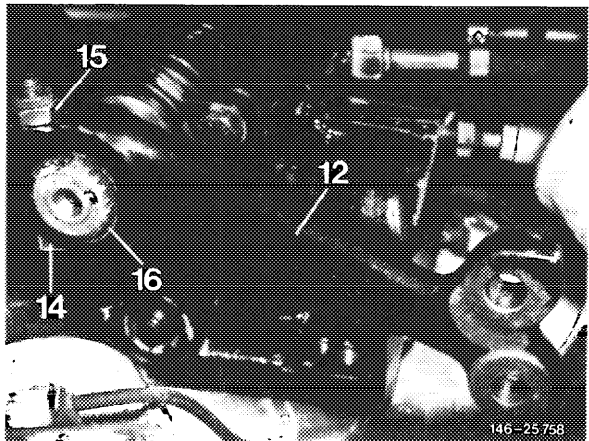
2 Force off ball joint of drag link (11) from pitman arm by means of puller (066).



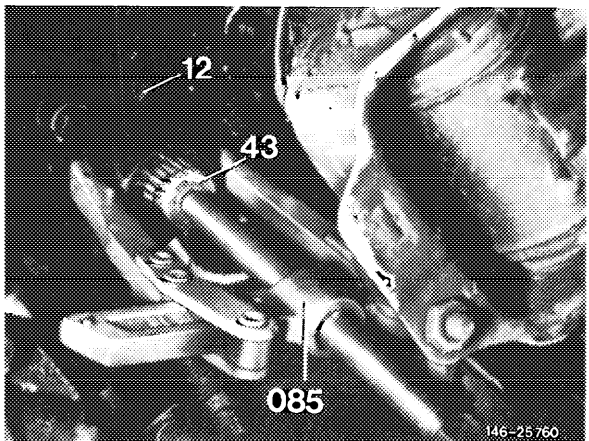
3 Force off ball joint of track rod (10) by means of puller (065).



4 Remove safety ring (16). Loosen hex, nut (15) and take off clamping screw (14).



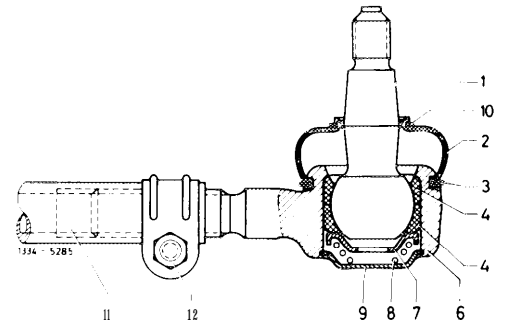
5 Take off pitman arm (12) from pitman shaft (43). If pitman arm is stuck, use double-arm puller (085).



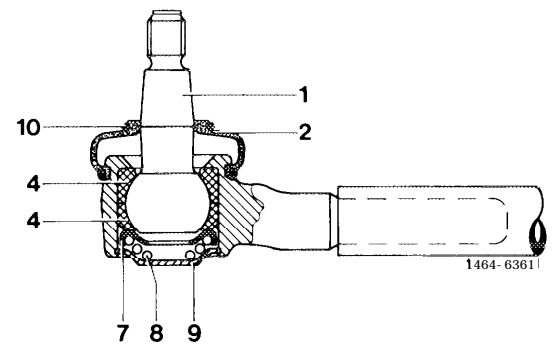
## Installation

6 The **pitman** arm cannot be checked with workshop tools. **When in doubt**, in particular following an accident, renew steering gear including the **pitman** arm. For fitting reasons in relation to **pitman** shaft the **pitman** arm is not available as a spare part.

7 Check rubber sleeve (2) on the joints of track rod. If rubber sleeves are damaged, test ball joints for wear and replace, if required (46-540).

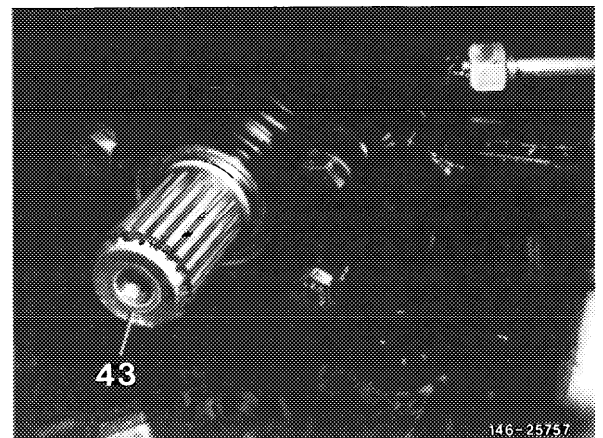


8 Check rubber sleeve (2) on the joints of drag link. If the sleeves are damaged, check joints for wear and replace drag link, if required (46-550).

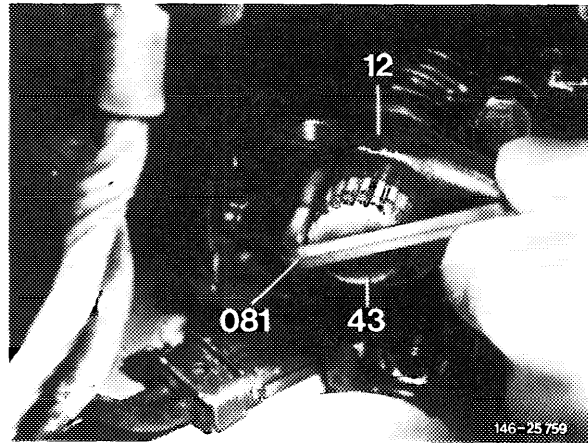


9 Clean serrated shaft section on **pitman** shaft and on **pitman** arm. Both parts must be oil and grease-free.

10 Cover serrated shaft section of **pitman** arm with Loctite 270.



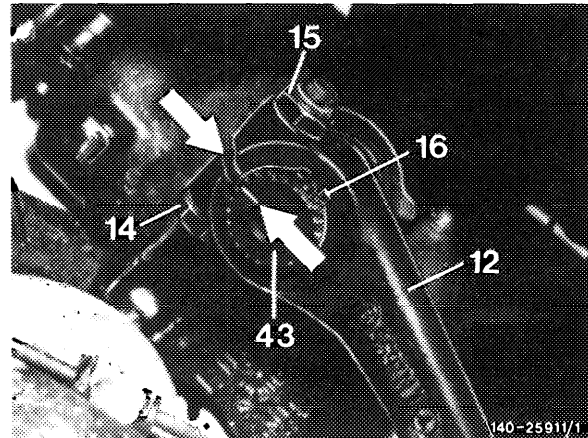
11 Spread pitman arm (12) at parting line with a 6 mm hex. socket wrench.



12 Slide pitman arm in accordance with marking on pitman shaft, i.e. the notch in pitman shaft (43) must be in center of parting line.

13 Insert clamping screw (14), using a new self-locking hex. nut (15), into pitman arm (12).

14 Measure ball point position (40-320). After adjustment to the prescribed dimension, tighten hex. nut (15) to 50 Nm.



**Attention!**

Make sure to renew self-locking hex. nut on principle.

15 Insert safety ring (16).

**Attention!**

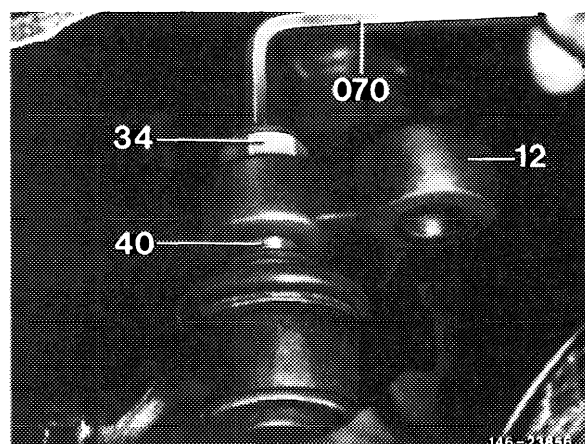
The combination pitman shaft — pitman arm should harden at least 1 hour,

12 Perfectly clean from any grease the ball pins as well as the tapered seats in pitman arm. Then firmly press ball pins of drag link and track rod into taper of pitman arm, screw-on self-locking hex. nuts, while applying counterhold to ball pins by means of hex. socket wrench (070). Tighten self-locking hex. nuts to 35 Nm.

**Attention!**

Make sure to renew self-locking hex. nuts on principle.

17 Check ball point position and toe-in (40-320).



## 46–520 Removal and installation of intermediate steering arm

### Data

| Part No.     | Version            | Code No. | Remarks                                    |
|--------------|--------------------|----------|--|
| 201 463 1210 | Lefthand steering  | 0112     | 1st version valid for models 201.02, 201.1 |
| 201 463 1310 | Righthand steering | 0113     | Not valid for model 201.03                 |
| 201 463 1710 | Lefthand steering  | 0117     | 2nd version valid for all models 201       |

### Adjusting value

|  |       |
|--|-------|
| Permissible difference in height of ball point position between pitman arm and intermediate steering arm | 3 m m |
|--|-------|

### Tightening torques

|   |        |
|---|--------|
|   | N m    |
| Self-locking hex. nut for attaching intermediate steering arm | 90-100 |
| Self-locking hex. nut on track rod and drag link              | 35     |

### Special tools

|   |  |                  |
|---|--|------------------|
| Puller for ball joint of track rod to intermediate steering arm | <br>11004-7226 | 201 589 08 33 00 |
|---|--|------------------|

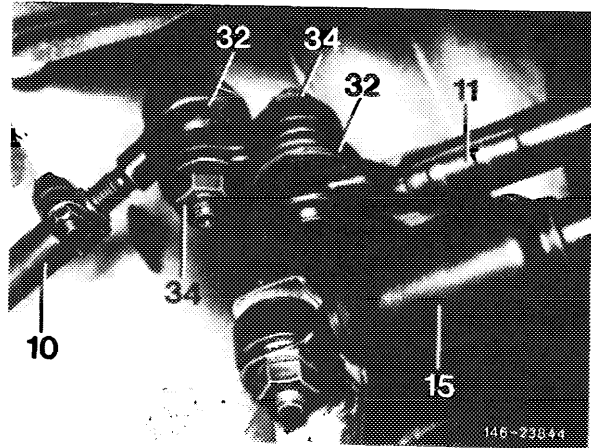
|  |   |                  |
|--|---|------------------|
| Puller for ball joint of track link to intermediate steering arm | <br>11004-11214 | 201 589 07 33 00 |
|--|---|------------------|

|                                 |  |                  |
|---------------------------------|--|------------------|
| Puller for rubber slide bearing | <br>11004-7238 | 201 589 09 33 00 |
|---------------------------------|--|------------------|

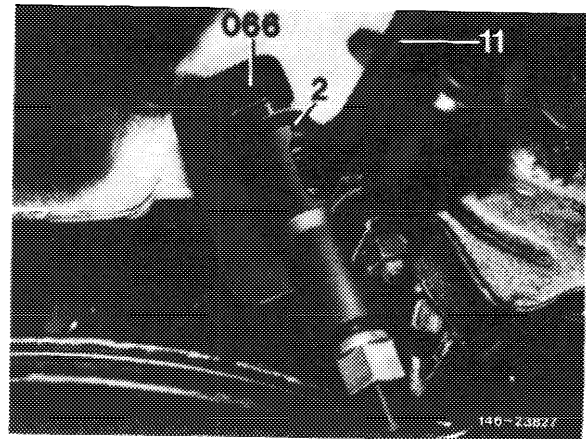
|  |   |                  |
|--|---|------------------|
| Installation tool for rubber slide bearing | <br>11004-11375 | 201 589 08 43 00 |
|--|---|------------------|

|  |   |                  |
|--|---|------------------|
| Measuring tool for control arm and ball point position | <br>11004-11217 | 201 589 00 21 00 |
|--|---|------------------|

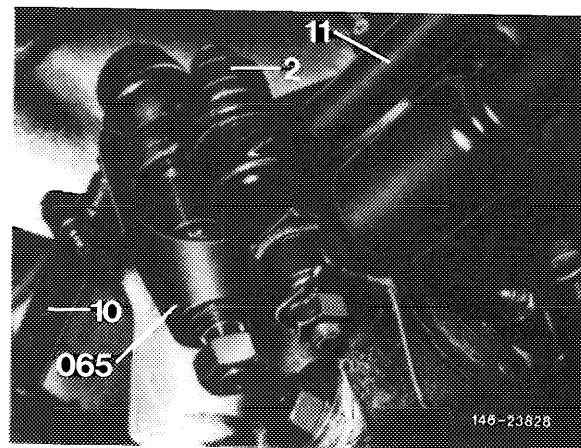
1 Unscrew self-locking hex. nut (34) from ball joint of drag link and track rod.



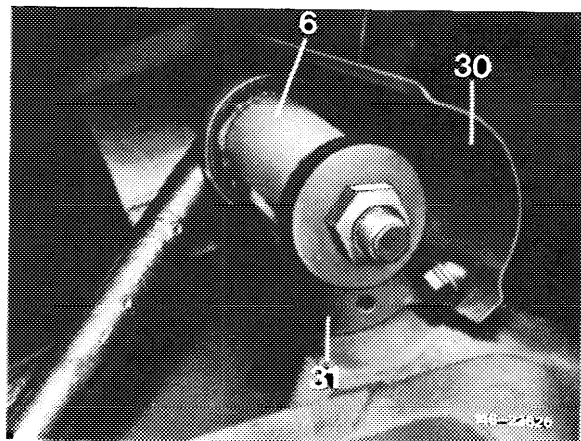
2 Force ball joint of drag link (11) from intermediate steering arm with puller (066).



3 Force ball joint of track rod (10) from intermediate steering arm with puller (065).



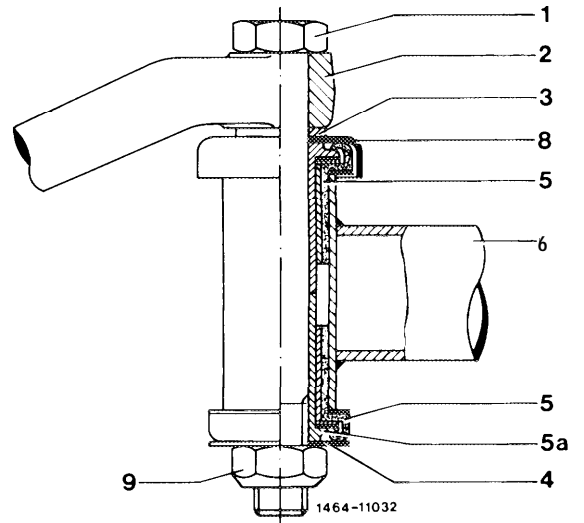
4 Loosen heat screen (30) on journal bearing.





5 Unscrew self-locking hex. nut (9) from hex. screw (1), remove sealing washer (4).

6 Remove hex, screw (1) together with intermediate steering arm (2) and dust cap (8). Watch out for washer (3), if any, inserted between intermediate steering arm and dust cap.



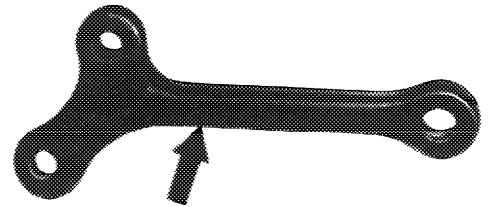
### Checking and reconditioning

7 The intermediate steering arm cannot be checked with conventional workshop equipment. **When in doubt**, particularly following an accident, **replace intermediate steering arm**.

Pay attention to correct code number (arrow) of intermediate steering arm.

#### Attention!

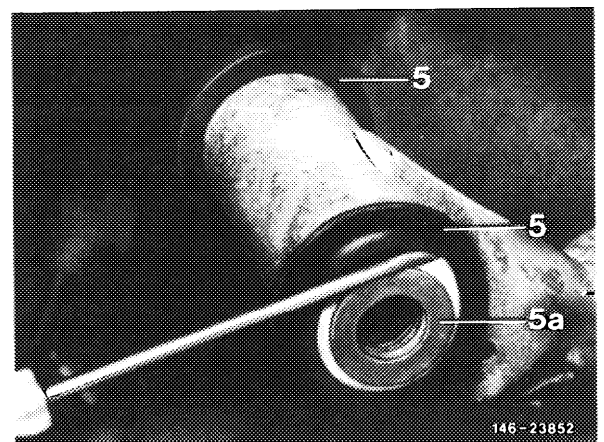
In model 201.034 install intermediate steering arm with part No. 201 463 17 10 (code number 0117) only.



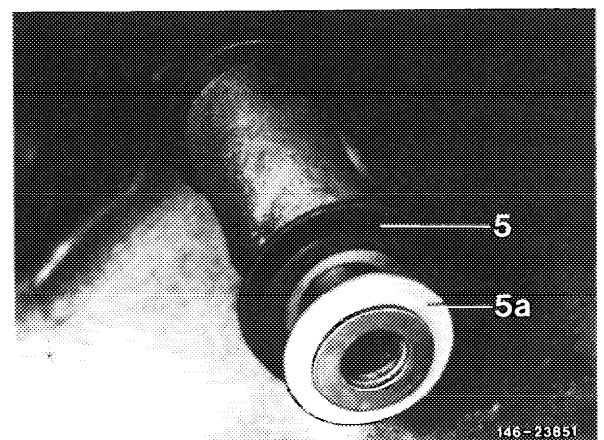
146-11420/3

8 Check rubber slide bearing (5) in journal bearing for wear and renew, if required.

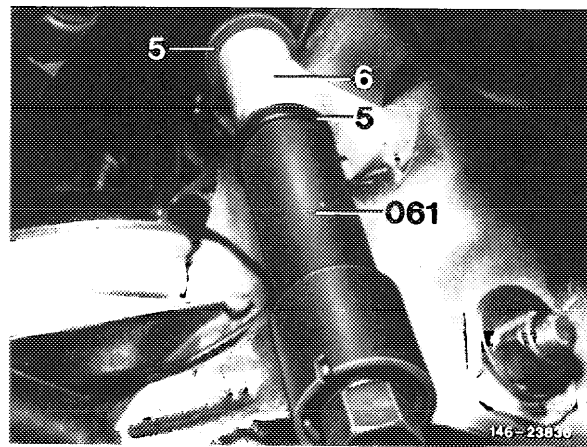
For this purpose, lift sealing lip of rubber slide bearing (5) by means of a screw driver.



9 Remove slide bushing (5a) from rubber slide bearing.

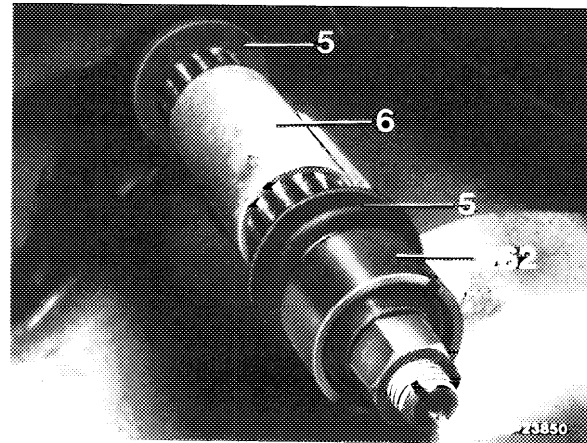


10 Remove both rubber slide bearings (5) from journal bearing by means of puller (061).

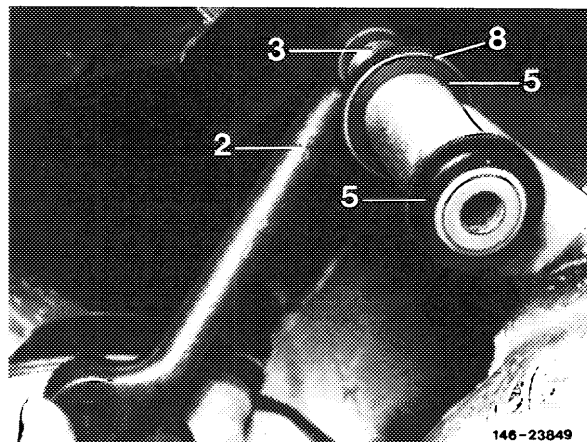


### Installation

11 Coat rubber slide bearing (5) outside with slide fluid, e.g. with oil, and press into journal bearing (6) with installation tool (062).



12 Place dust cap (8) on upper rubber slide bearing.

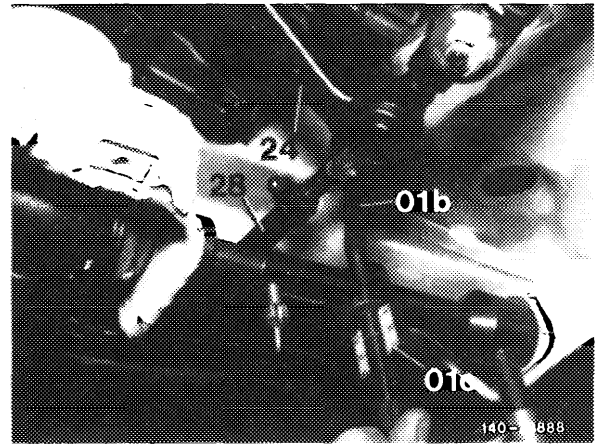


13 Insert hex. screw together with intermediate steering arm (2) and possibly available washer (3) into rubber slide sleeve (5).

**Note:** Make sure to mount hex. screw with screw head facing intermediate steering arm.

14 Mount sealing washer (4), screw-on normal hex. nut (not self-locking) M 12 x 1.5 and tighten to approx. 70 Nm.

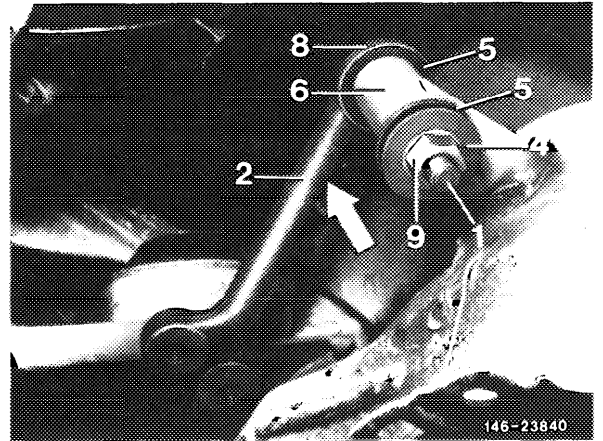
15 Measure permissible deviation in height of ball point location between pitman arm and intermediate steering arm. Max. permissible difference 3 mm. If the difference is larger, complete remedies (40-320).



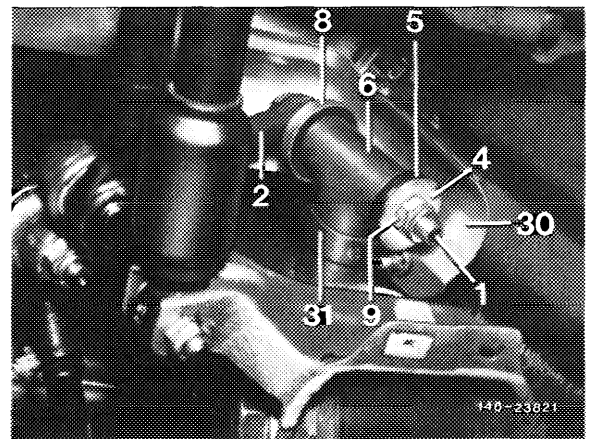
16 Unscrew hex. nut, then screw-on new self-locking hex. nut (9) and tighten to 90 Nm.

Note: Upon tightening of self-locking hex. nut, one thread of hex. screw should project beyond hex. nut.

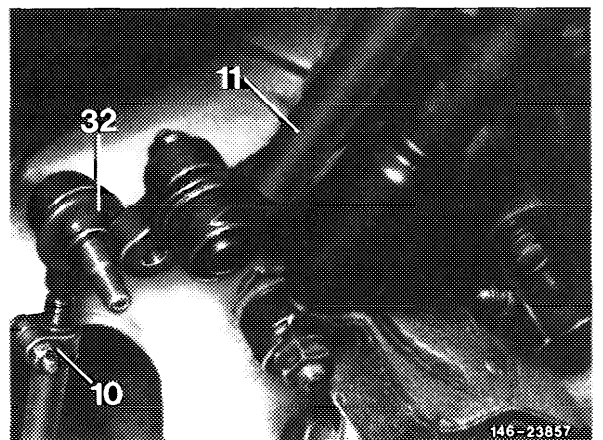
**Attention!**  
Replace self-locking hex. nut on principle.



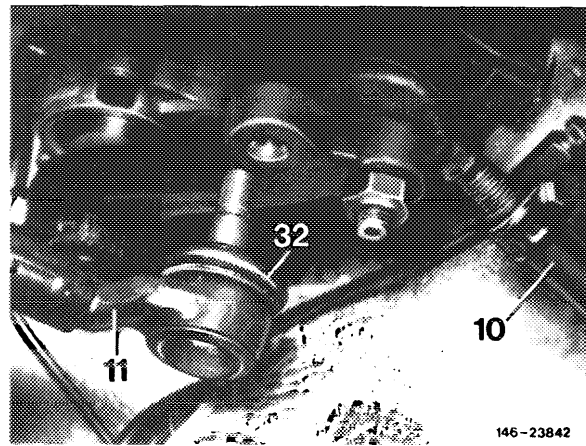
17 Attach heat screen (30) on journal bearing.



18 Check rubber sleeve (32) on joint of track rod. **If on a used joint a damaged rubber sleeve is detected, replace the relevant joint completely.** If the rubber sleeve was damaged during removal, replacement of rubber sleeve will be sufficient (46-540 and 560).

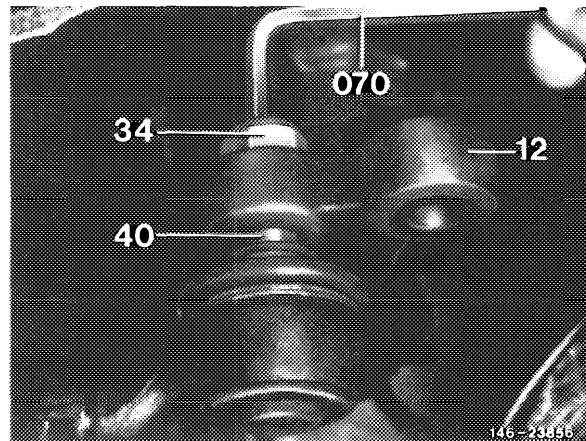


19 Check rubber sleeve (32) on joint of drag link. When on a used joint a damaged rubber sleeve is detected, replace drag link. If the rubber sleeve was damaged during removal, replacement of rubber sleeve will be sufficient (46-550 and 560).



20 Perfectly clean ball pins as well as tapered seats in pitman arms from any grease. Then firmly press ball pins into taper of pitman arm, unscrew self-locking hex. nut while applying counterhold to ball pins with hex. socket wrench (070). Tighten self-locking hex. nut to 35 Nm.

**Note:** Replace self-locking hex. nuts on principle.

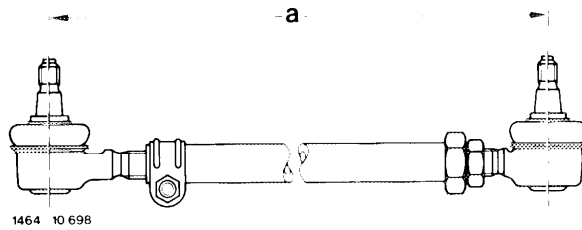


21 Check ball point position and toe-in (40-320).

## 46-540 Removal and installation of track rod

### Data

| Part No.      | Length "a" adjusting dimension | Installation end              | Remark   |
|---------------|--------------------------------|-------------------------------|--|
| 201 3300703   | 335 ± 2                        | Pitman arm end                | Ball housing pin mounted with tapered clamping ring to steering knuckle arm (steering knuckle end) |
| 201 330 12 03 |                                | Intermediate steering arm end |  |



### Approved grease types for ball joints

Multi-purpose grease

refer to Specifications for service products page 267

### Tightening torques

Nm

Self-locking hex. nut for attaching track rod to steering arms

35

Hex. screw to clamp of track rod

10

Tapered clamping ring to track rod

30

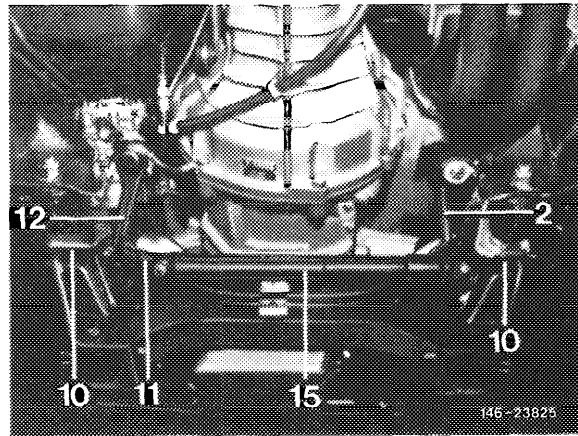
### Special tool

Puller for ball joints of track rod



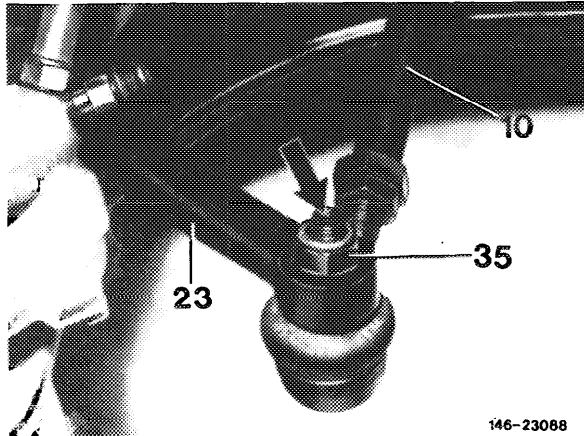
201 589 08 33 00

- 2 Intermediate steering arm
- 10 Track rod
- 11 Drag link
- 12 Pitman arm
- 15 Steering shock absorber

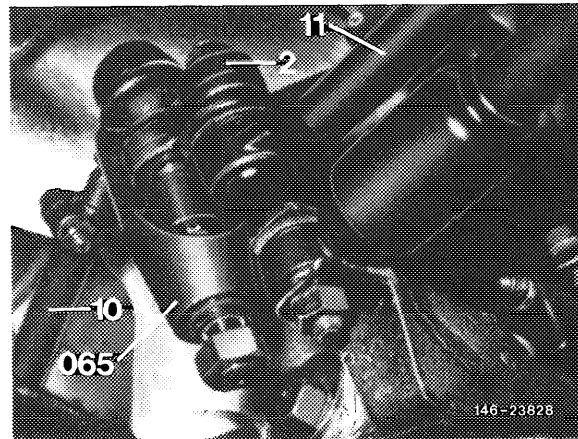


**Removal**

1 Unscrew self-locking hex. nuts (35) on joints of track rod.



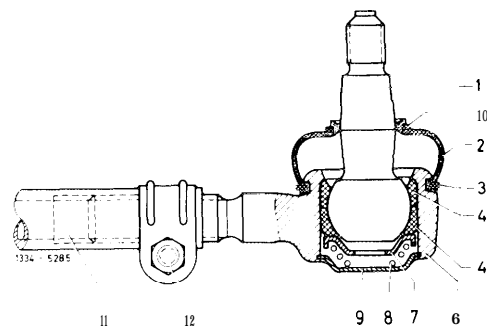
2 Force ball joints of track rod from steering arms with puller (065).



**Checkup**

3 Check joints of track rod. If track rod is moving too easily or if subject to play, replace respective track rod head.

4 Check rubber sleeves (2) for joints, **If on a used joint a damaged rubber sleeve is detected, completely replace respective joint.**

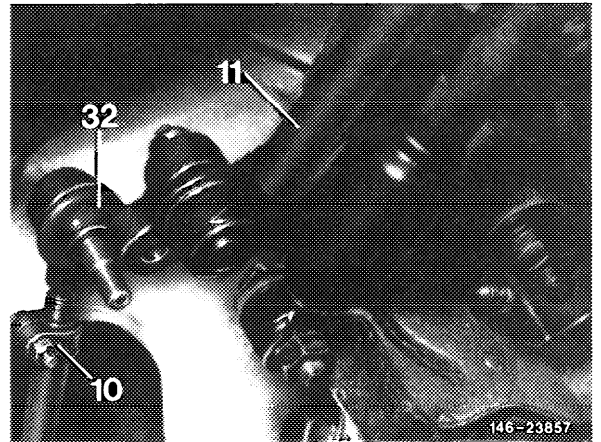


5 If rubber sleeve (2) was damaged during removal, replacement of rubber sleeve will be sufficient.

### Installation

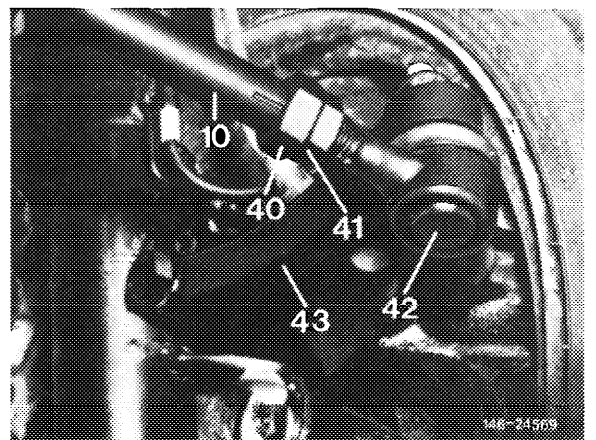
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6 Perfectly clean ball pins as well as tapered seats in steering arms from any grease. Then firmly press ball pins into taper of steering arm.



**Note:** When installing track rod, absolutely make sure that the ball joint secured by tapered clamping ring (40) is attached to steering knuckle arm (steering knuckle end).

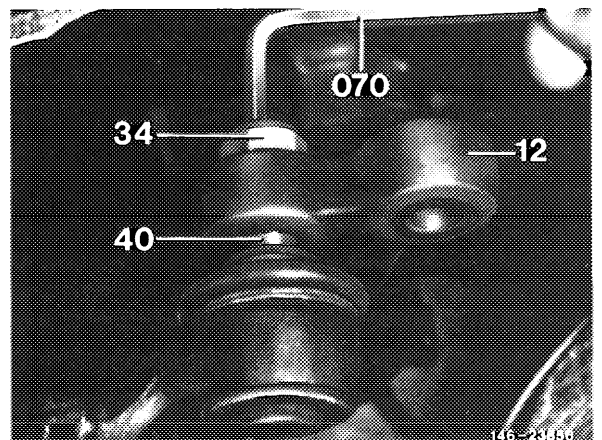
b) Make sure that different track rods are installed for left-hand and right-hand front wheel, respectively.



7 Screw-on new self-locking hex. nut (34) while applying counterhold to ball pins with hex. socket wrench (070). Tighten self-locking hex. nut to 35 Nm.

**Note:** The self-locking hex. nut must be renewed on principle.

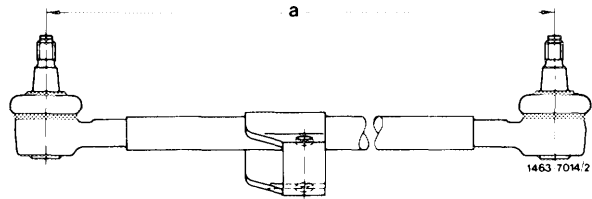
8 Check toe-in (40-320).



## 46–550 Removal and installation of drag link

### Data

| Part No.   | Version                           | Length "a" |
|------------|-----------------------------------|------------|
| 2014601405 | left-hand and right-hand steering | 487 ± 0.5  |



### Approved grease types for ball joints

Multi-purpose grease refer to Specifications for service products page 267

### Tightening torques

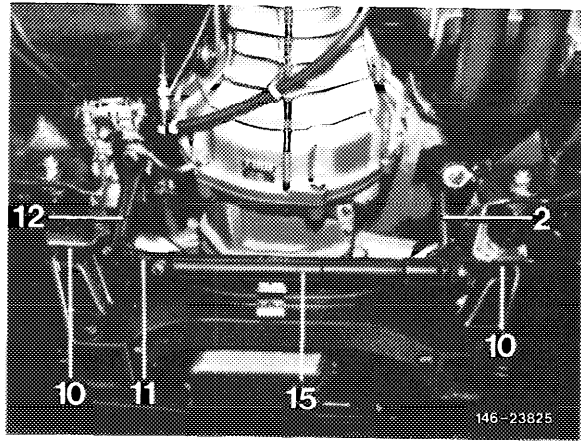
|   | Nm |
|---|----|
| Self-locking hex. nut for attaching drag link to steering arms      | 35 |
| Self-locking nut for attaching steering shock absorber to drag link | 50 |

### Special tool

Puller for ball joints on drag link  201 589 07 33 00

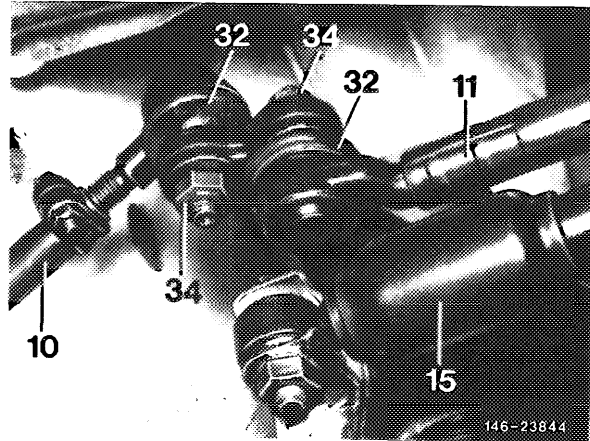


- 2 Pitman arm
- 10 Track rod
- 11 Drag link
- 12 Intermediate steering arm
- 15 Steering shock absorber

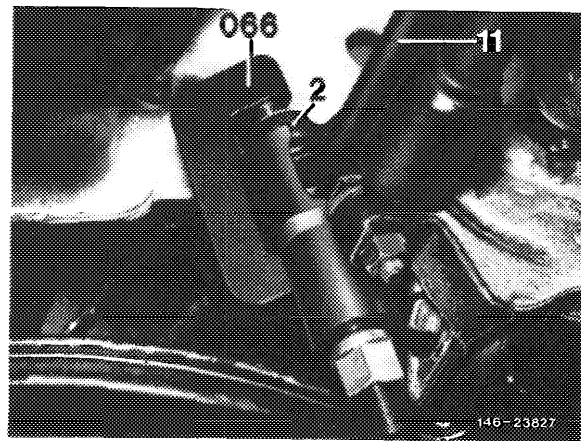


**Removal**

- 1 Screw off self-locking hex. nut (34) on joints of drag link.
- 2 Screw out hex. nut for attaching of steering shock absorber and take off steering shock absorber from drag link.

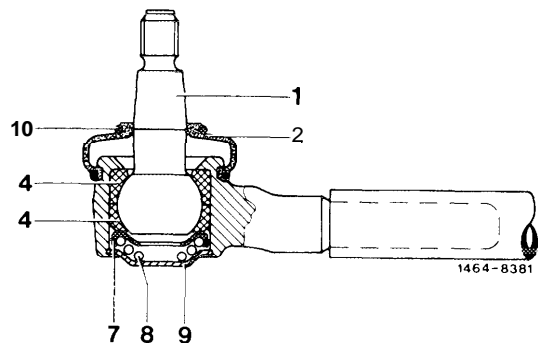


- 3 Force off ball joints of drag link (1 1) with puller (066).



**Checkup**

- 4 Check joints of drag link. If joints are moving too easily or in the event of play, be sure to replace drag link.
- 5 Check rubber sleeve (2) for joints. **If on a used joint a damaged rubber sleeve is detected, drag link must be renewed.**

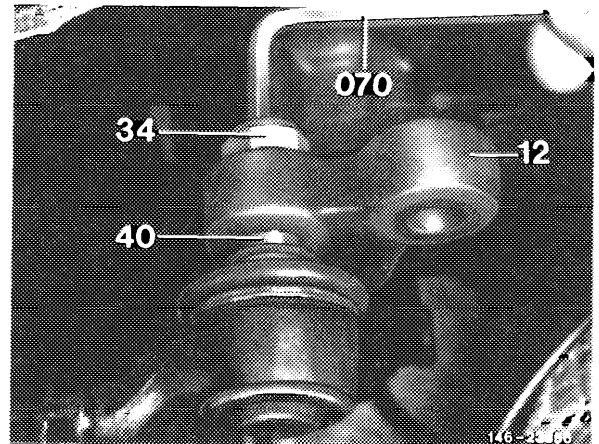


6 If rubber sleeve (2) was damaged during removal, it will be sufficient to replace rubber sleeve.

### Installation

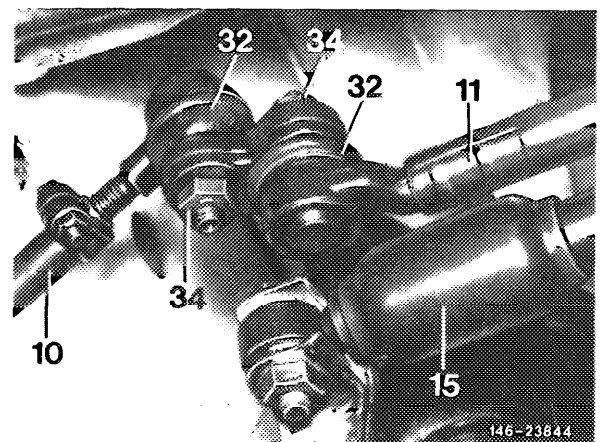
7 Perfectly clean ball pins as well as tapered seats in steering arms from any grease. Then tightly push ball pins into taper of steering arm, screw-on self-locking hex. nuts while applying counterhold to ball pins with hex. socket wrench (070). Tighten self-locking hex. nuts to 35 Nm.

**Note:** Make sure to replace self-locking hex. nuts or principle.



8 Attach steering shock absorber to drag link. Tighten self-locking hex. nut to 50 Nm.

**Note:** Make sure to renew self-locking hex. nut on principle.



9 Check toe-in (40-320).

**Approved grease types for ball joints**

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Multi-purpose grease

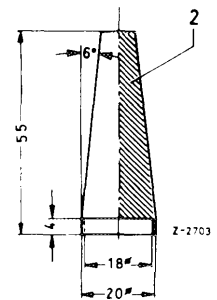
refer to Specifications for service products page 267

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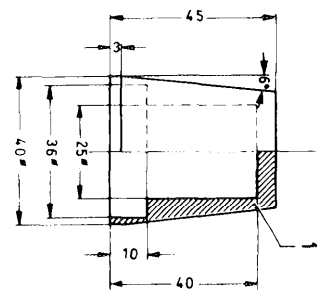
**Self-made tools**

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Assembly sleeve for plastic ring



Assembly bushing for flat wire clamping ring



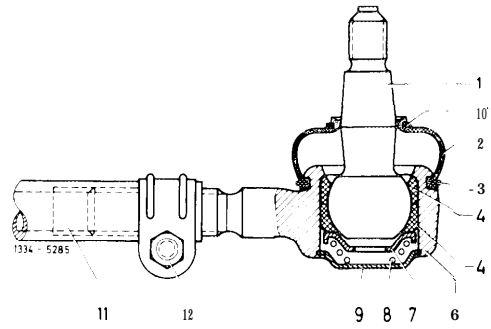
**Note**

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The maintenance-free joints are provided with grease for life. On these joints, the **seal** which prevents the entry of dirt **is of decisive importance for the life of the joint. A rubber sleeve damaged during assembly should therefore be immediately replaced**, since otherwise the penetrating dirt may result in wear of joints. For this reason, make sure **that the joints are carefully checked at regular intervals**, When on a used joint a damaged sleeve is detected, the pertinent joint must be renewed completely,

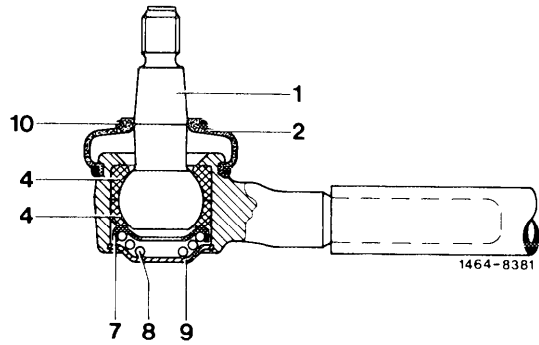
Replacing

1 Remove flat wire clamping ring (3) and sleeve (2) together with plastic locking ring (10).



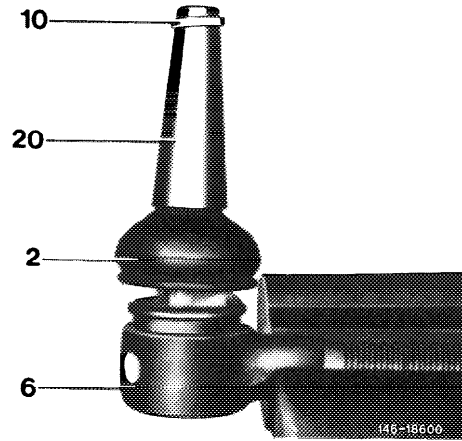
Track rod joint

2 Fill space between sleeve and joint with the specified grease.

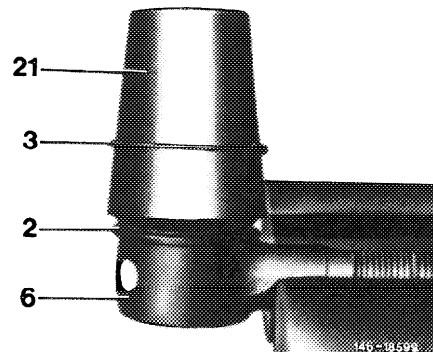


Drag link joint

3 Place rubber sleeve (2) and subsequently assembly sleeve (20) on ball pin. Insert plastic locking ring (10) over assembly sleeve into rubber sleeve.



4 Place assembly sleeve (21) on ball joint and over rubber sleeve (2), and insert flat wire clamping ring (3).

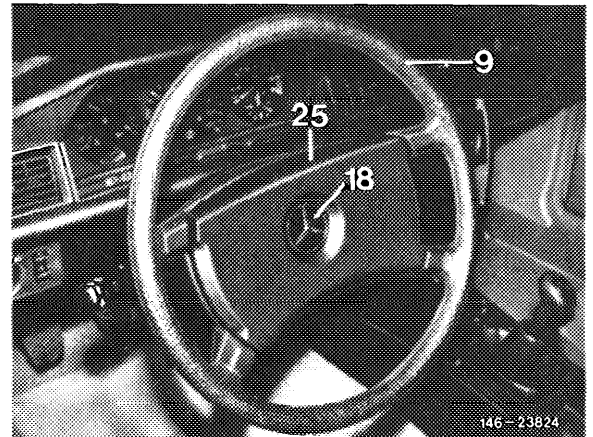


| Tightening torque   | Nm |
|---|----|
| Countersunk screw with hex. socket for attaching steering wheel to steering shaft | 80 |

### A. Steering wheel without Airbag unit

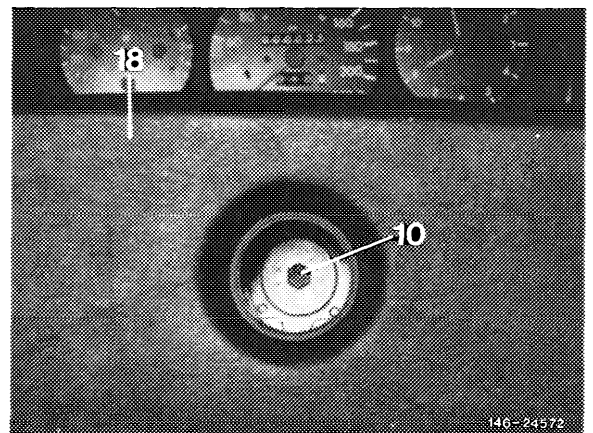
1 Remove company symbol (18) with a small screw driver from steering wheel pad (25).

**Note:** In order to avoid damage the pad must not be pulled off the horn carrier.



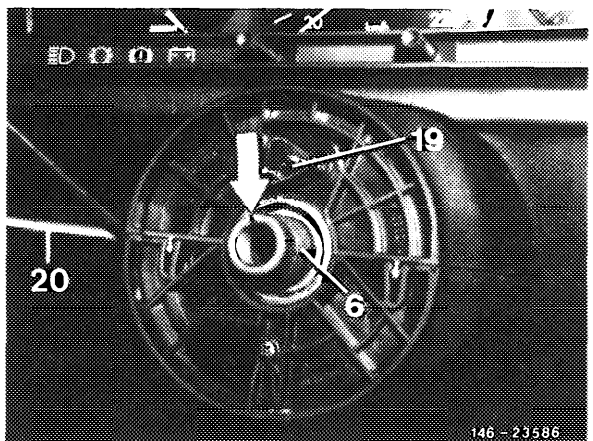
2 Screw-out countersunk screw (10) from steering shaft with the steering lock engaged.

3 Remove steering wheel from steering shaft.

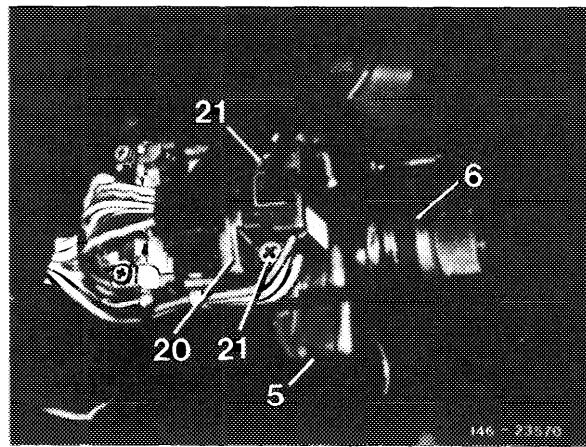


### Installation

4 Turn steering shaft (6) in such a manner, that marking line (arrow) is pointing accurately upwards.



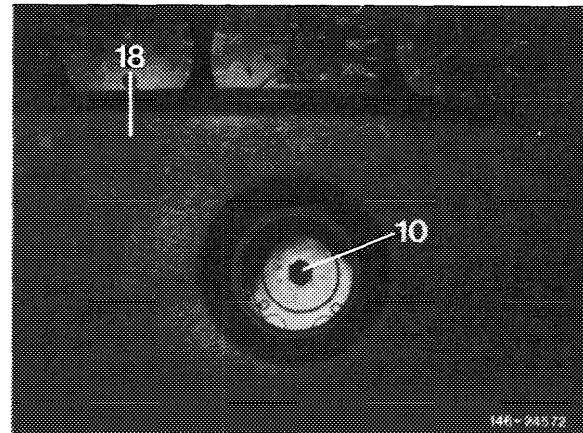
5 Check carbon brush for wear and renew, if required. For this purpose, loosen the two cables on instrument cluster (jacket tube represented without protective cover).



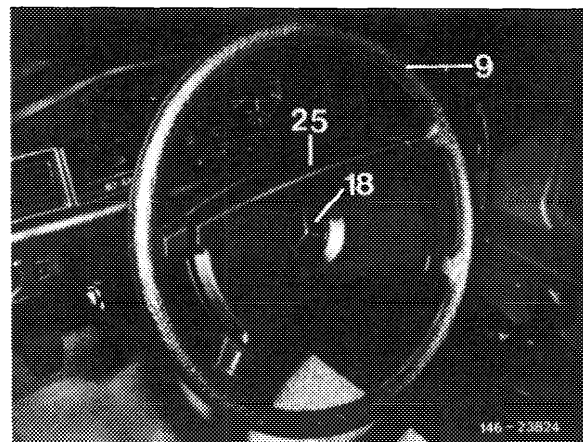
6 Place steering wheel on splining of steering shaft while making sure of horizontal position of spokes on steering wheel; the slightly curved spoke should be below.

7 Screw-in countersunk screw (10) into steering shaft with the steering lock engaged, and tighten to 80 Nm.

**Note:** Make sure to renew self-locking countersunk screw on principle.



8 Insert company symbol into steering wheel pad,



9 During trial run, check position of steering wheel in straight-ahead position of road wheels. If the steering wheel position when driving straight-ahead is not in agreement with front wheels, the steering wheel can be displaced in splining by max. 2 teeth to the left or right.

**Note:** If, thereafter, the position of the steering wheel and the straight-ahead position of wheels are not even now correct, check and adjust toe-in distribution, starting from the center position of steering gear (40-320).

10 Check horns for function and automatic return of combination switch.

Note: Dirty or sticky steering wheels can be cleaned with a neutral type of household cleaner by washing the steering wheel with a lukewarm solution of the cleaner.

Do not use scouring compounds, since they will attack the plastic foaming.

## B. Steering wheel with Airbag unit

| Tightening torque           | Nm |
|-----------------------------|----|
| Oval head screw with Intorx | 7  |

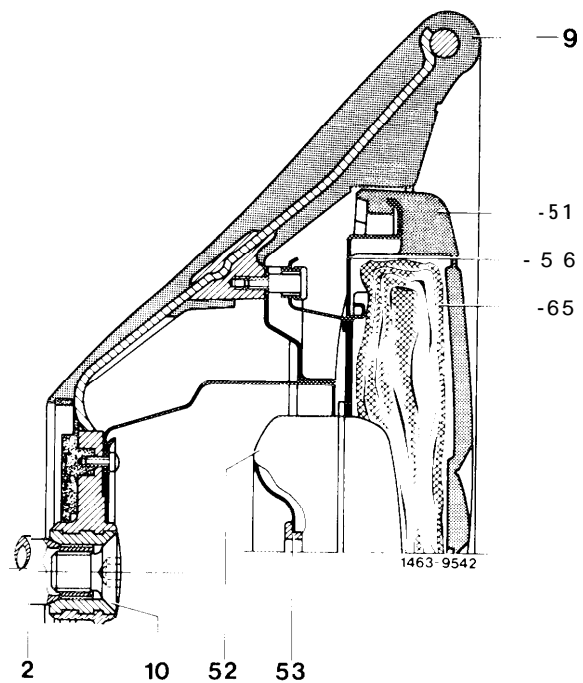
### Special tool

Screw driver insert TX 30  
1/4" hex., 60 mm long



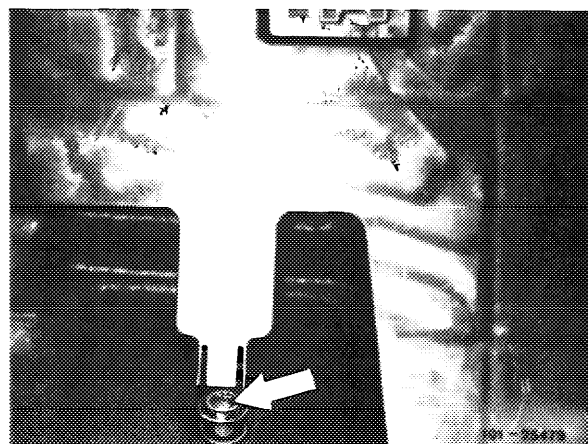
126 589 00 10 00

- 2 Steering shaft
- 9 Steering wheel
- 10 Countersunk screw
- 51 Airbag unit
- 52 Gas generator
- 53 Gas generator plug connection
- 56 Generator carrier
- 65 Airbag



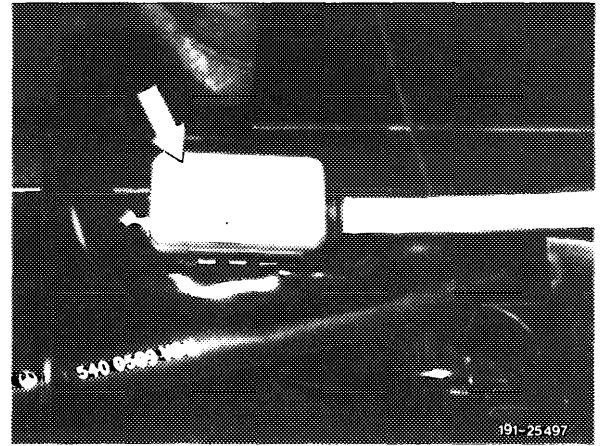
### Removal

- 1 Turn ignition key to zero position, disconnect and cover negative pole of battery.
- 2 Remove floor mat in co-driver's foot well.
- 3 Loosen screw on foot support and remove foot support.

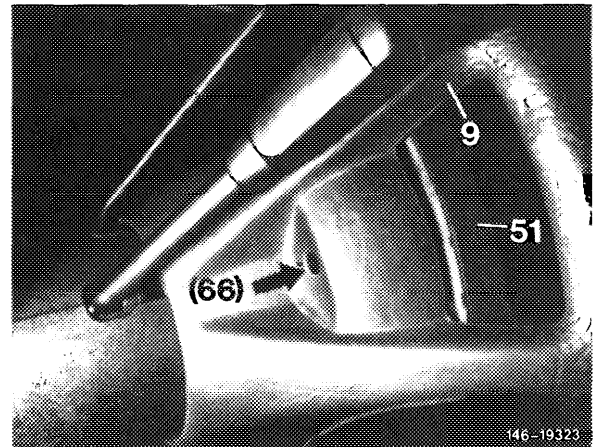




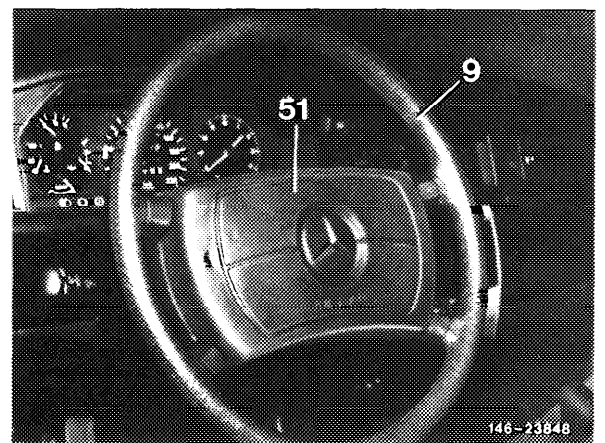
4 Pull off red 10-line plug connection of release unit at foot support.



5 Screw out both fillister-head screws (66) with Intorx (arrow) from generator carrier by means of screw driver insert. This will release the generator carrier from contact bridges.

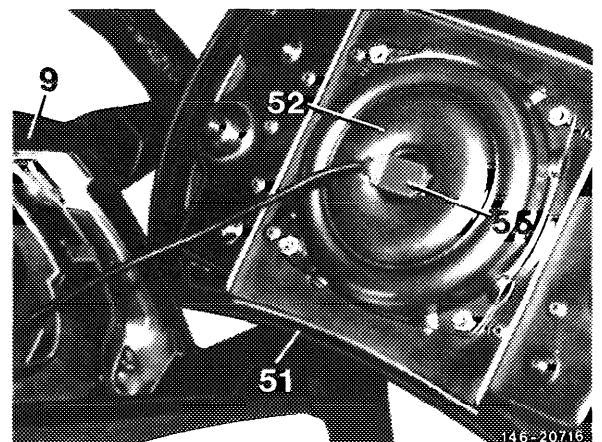


6 Remove complete airbag unit (51) from steering wheel.



7 Pull-out plug connection (55) from gas generator.

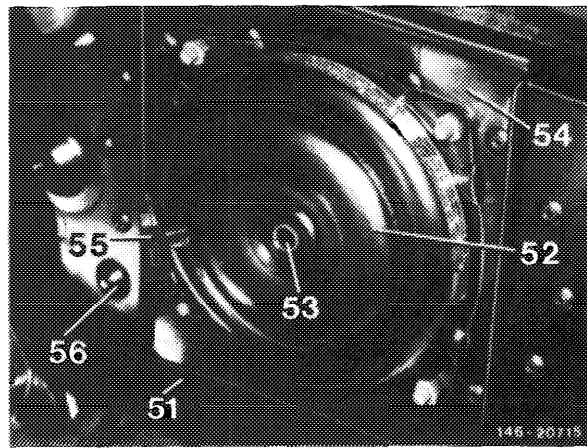
Note: By pulling-off the plug connection, a short circuit bridge will automatically become effective in gas generator.



8 Remove **airbag** unit from steering wheel.

**Note:** No additional job may be performed on the complete **airbag** unit. The **airbag** unit must be stored under personal supervision or, when it is removed for an extended period, under lock and key.

b) As a spare part, only the complete **airbag** unit is available.



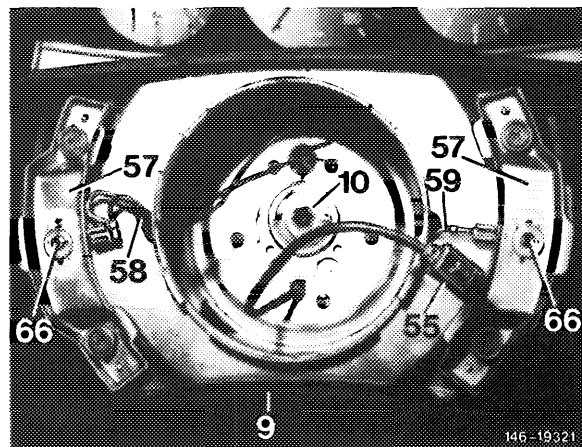
**Attention!**

Always store the **airbag** unit after removal in such a manner that the padded face is showing **upwards**.



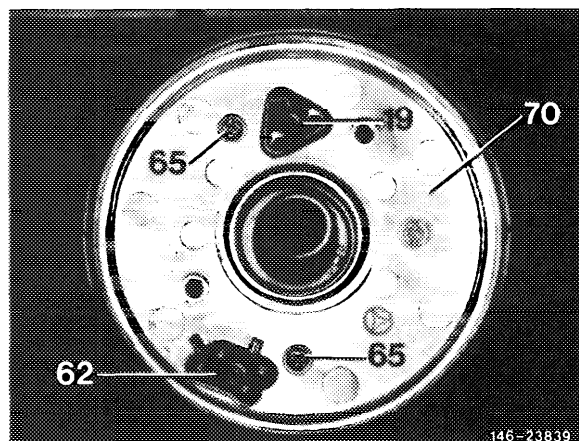
9 Unscrew countersunk screw (10) from steering shaft.

- 9 Steering wheel
- 10 Countersunk screw
- 55 Plug connection
- 57 Horn push buttons
- 58 Cable to horn
- 59 Ground cable on steering wheel
- 66 Fillister-head screw with Intorx

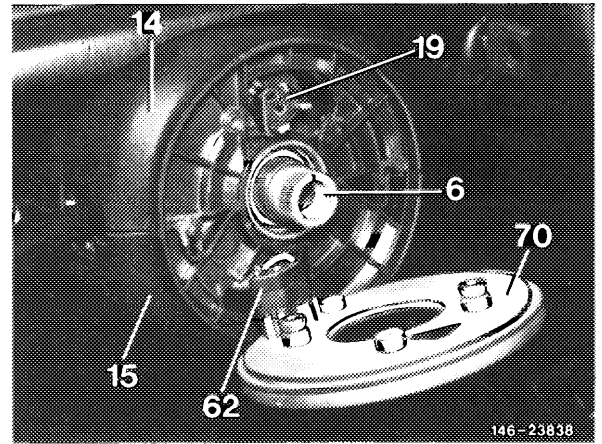


10 Remove steering wheel from steering shaft (2).

11 Check carbon brushes (19) for horn as well as (62) for airbag unit.

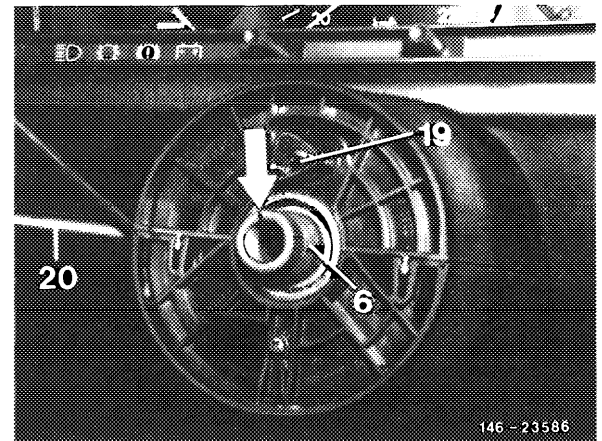


12 Remove cover plate (70) and replace carbon brushes, if necessary.



### Installation

13 Turn steering shaft (6) in such a manner that marking (arrow) is pointing accurately upwards.

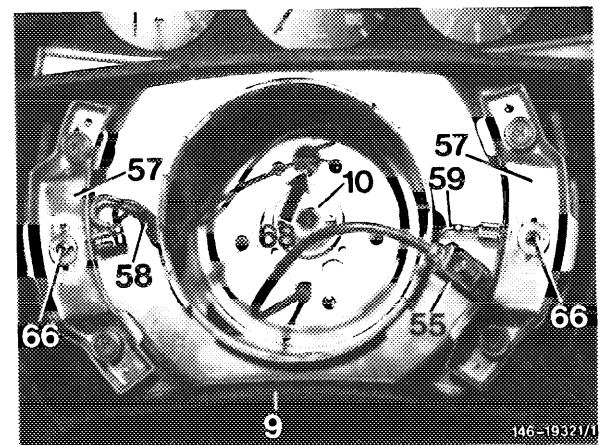


14 Place steering wheel on splining of steering shaft while making sure of horizontal position of spokes on steering wheel; the slightly curved spoke should be below.

15 Screw-in countersunk screw (10) into steering shaft and tighten to 80 Nm.

**Note:** Make sure to renew the self-locking countersunk screw on principle,

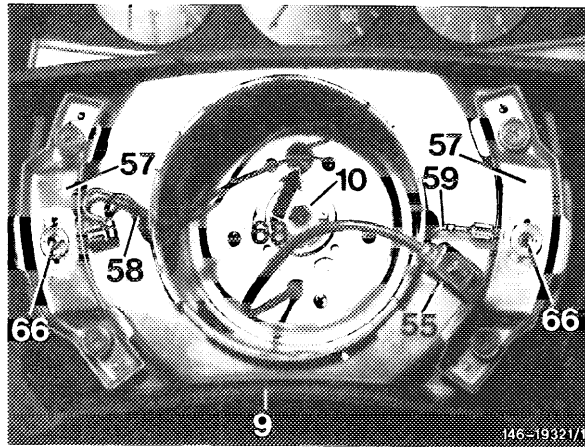
16 Pull-off cable (68) on plug connection of contact ring.



17 During trial run, check position of steering wheel in straight-ahead position of wheels.

18 If any correction should be necessary, the steering wheel can be displaced by max. 2 notches in steering shaft.

19 Connect cable (68) at plug connection of contact ring.

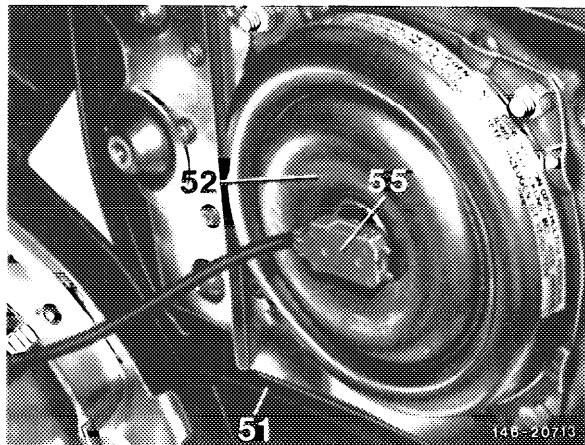
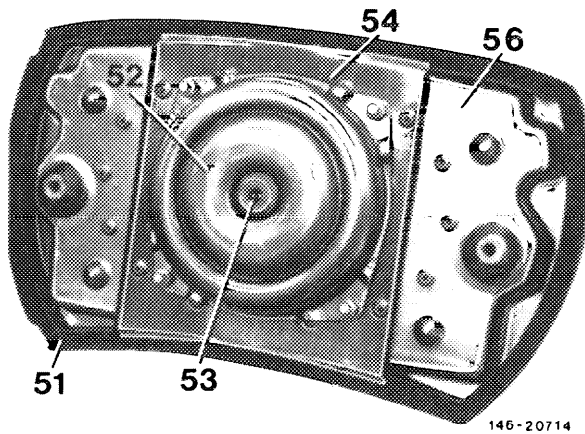


### Installation of airbag unit

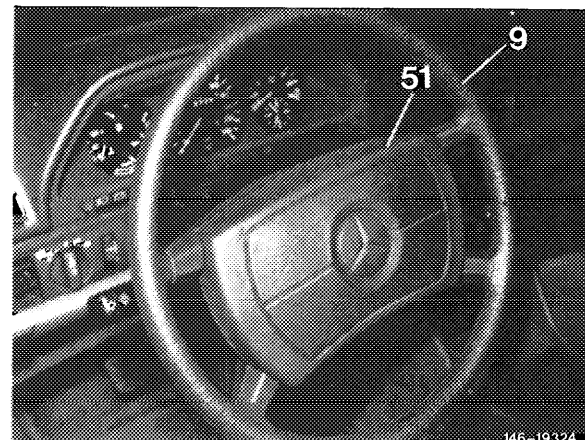
#### Attention!

- a) The airbag unit must not be treated with grease, cleaning agents or similar compounds.
- b) The airbag unit must not be exposed to temperatures over 100 °C, not even for a short period,
- c) The airbag unit is sensitive to percussion. Should it fall from a height exceeding 50 cm to a hard underground, the airbag unit must no longer be installed, but returned to the Sindelfingen plant enclosed in a special packing (transportation means).
- d) Prior to installation, check airbag unit for disconnection of ground cable on battery, pole covering and ignition key position to zero,

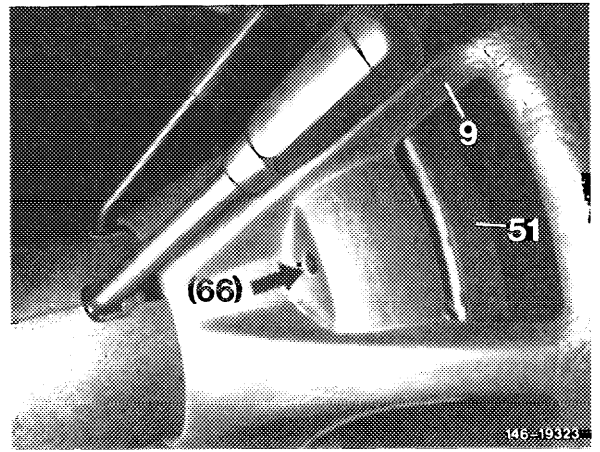
20 Connect plug connection (55) to gas generator (plug connection should audibly engage).



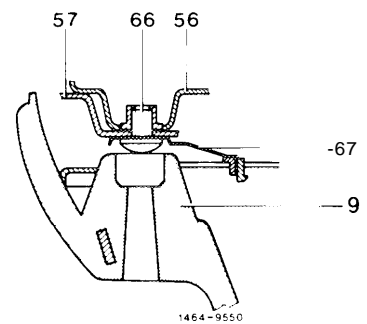
21 Place airbag unit (51) on steering wheel.



22 Screw-in fillister head screws (66) with Intorx (arrow) into generator carrier with insert. Tightening torque 7 Nm.



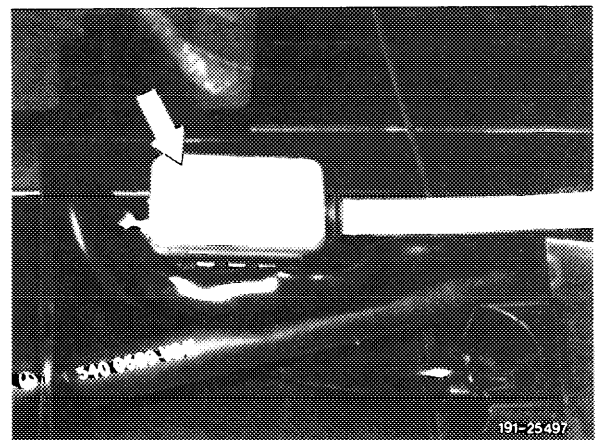
- 9 Steering wheel
- 56 Generator carrier
- 57 Contact bridges
- 66 Fillister-head screw with Intorx
- 67 Spring



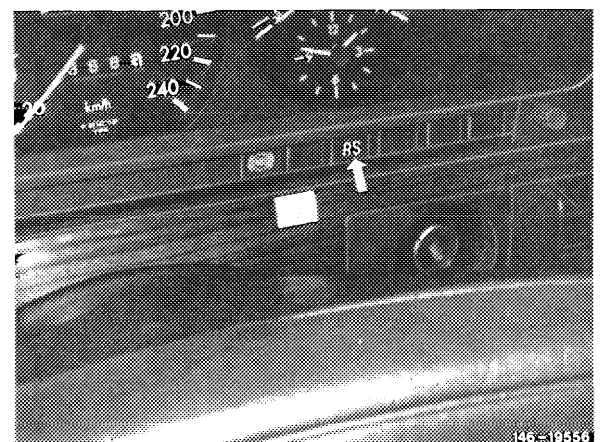
23 Check device by means of tester (91-700).

24 Following the testing operation, disconnect ground cable on battery and, with the ignition switched off, connect plug connection to releasing device. insert foot support into front wall and place foot mat into co-driver's foot well.

25 Connect ground cable to battery.



26 Observe control light while turning steering wheel completely into both directions with the engine running. Control light should then neither flash nor flare.



27 Check horns for function and automatic return of instrument cluster.

28 By knocking on the steering wheel rim, check whether a rattling noise is heard.

Note: Dirty or sticky steering wheels can be cleaned with neutral household cleaner, by washing the steering wheel with a lukewarm solution of the cleaner.

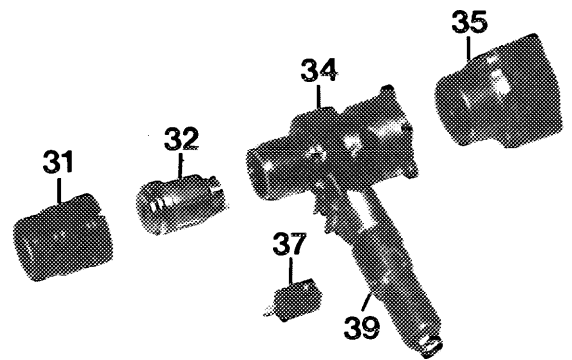
Do not use scouring compounds, since they will attack the plastic foaming.

## 46-640 Removal and installation of steering lock

The steering lock comprises three main components:

- A. Ignition starting switch electrical section (35)
- B. Locking cylinder (32)
- C. Steering lock mechanical section (34)

- 31 Cover
- 32 Locking cylinder
- 34 Steering lock
- 35 Ignition starting switch
- 37 Contact switch
- 39 Locking pin

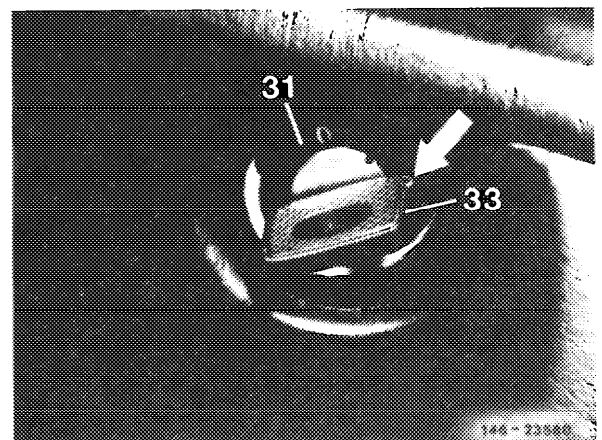
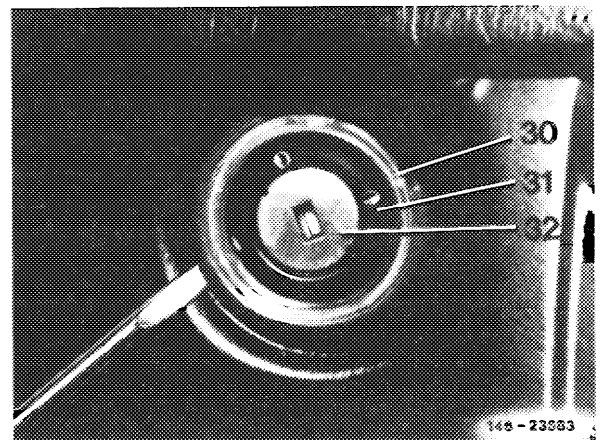


146 - 24094

### A. Removal and installation of ignition starting switch

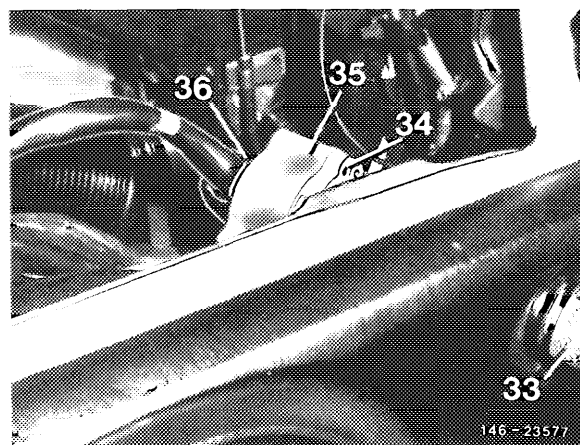
#### Removal

- 1 Remove cover on the left in driver's foot well.
- 2 Remove steering wheel 46-610.
- 3 Remove instrument cluster. For this purpose, pull out instrument cluster as far as possible, release speedometer shaft, electrical plug connections and oil pressure line.
- 4 Remove rosette (30) by means of a small screw driver from instrument panel.
- 5 Turn locking cylinder to position "1" by means of ignition key.

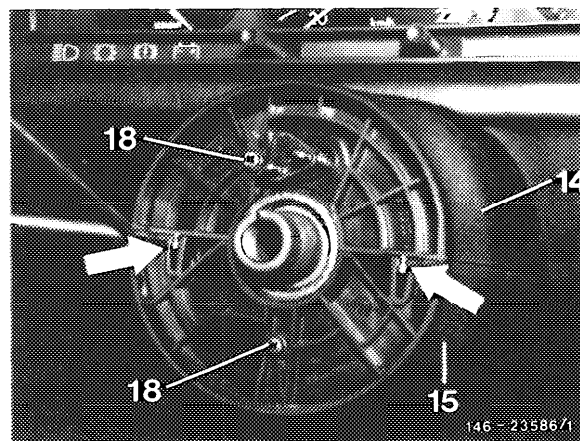


6 Remove plug connection (36) from starter switch (35).

**Note:** Plug connection can be released in position "1" only.

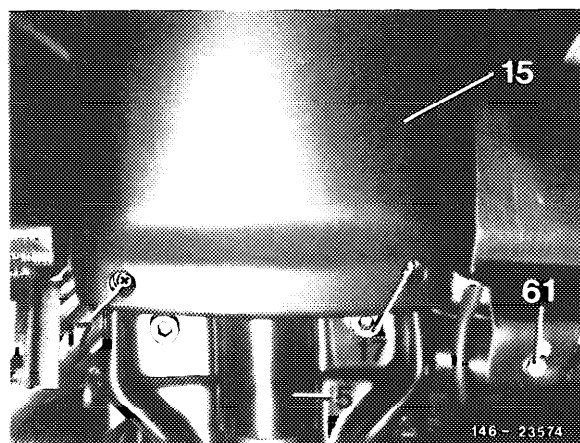


7 Remove jacket tube covering (14) and (15). For this purpose, unscrew both Phillips screws (18).

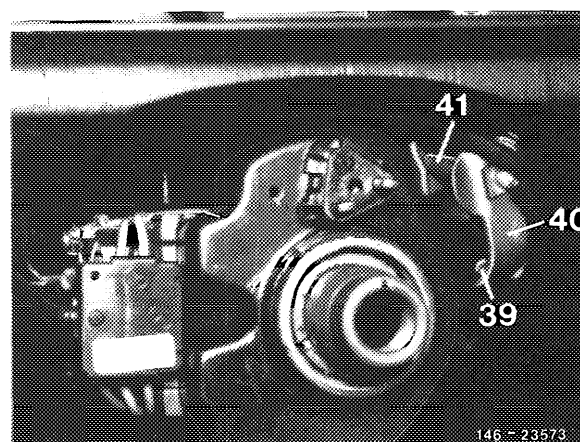


8 Unscrew both Phillips screws (17). Unclip lower part of jacket tube covering (15) from upper part and remove the two parts.

9 Unscrew locking screw (61) for instrument panel right of the jacket tube.



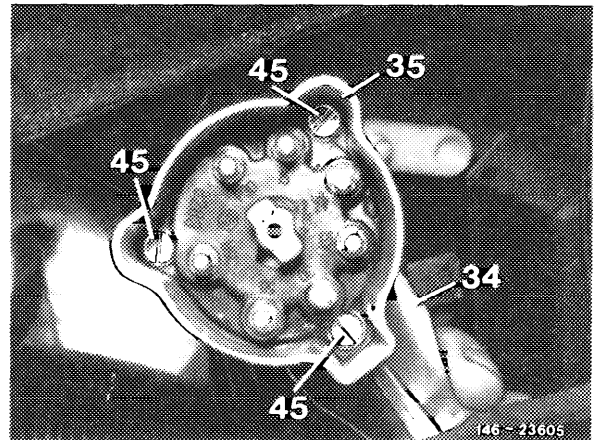
10 Release clamp (40) on jacket tube. Press-in locking pin (39) in position "1", and pull-out steering lock slightly from holder of jacket tube.





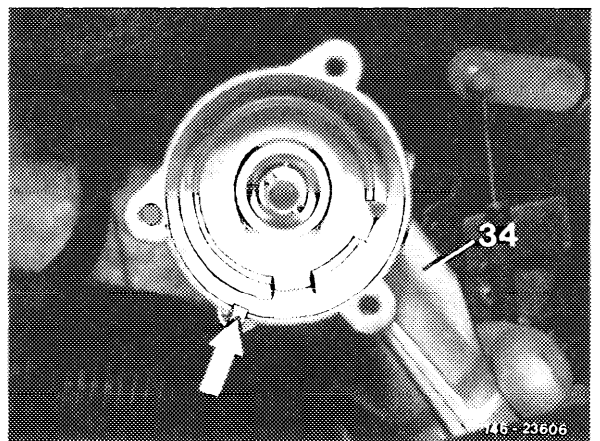
11 Pull-off ignition key at the right bottom section slightly to the rear. Swivel steering lock in such a manner that locking cylinder no longer reaches into detent of instrument panel. Take out steering lock from holder of jacket tube.

12 Unscrew locking screws for starter switch by means of a short screw driver from steering lock and remove starter switch.



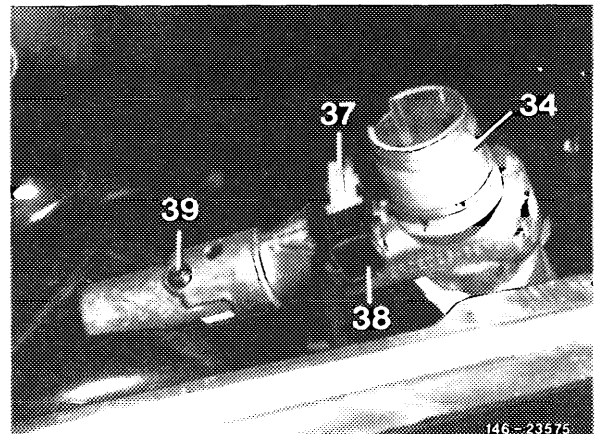
### Installation

13 Attach starter switch to steering lock and plug-in plug connection. While doing this, make sure that the switch is inserted with its fixing nose into detent of steering lock (arrow),

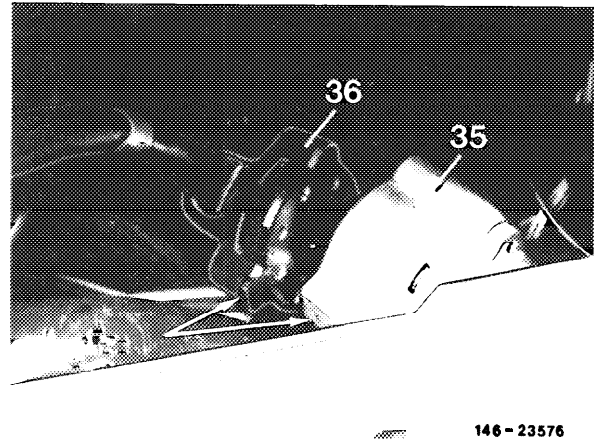


14 First press-in locking pin of steering lock into steering lock, and then locking pin (39).

15 Insert steering lock into holder of jacket tube while making sure that locking pin engages into bore of holder.



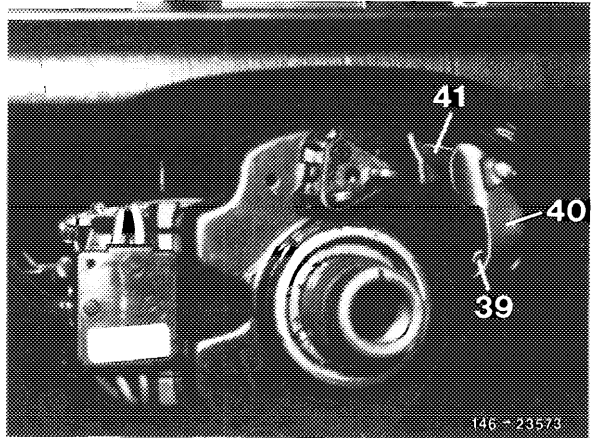
16 In position "1" of locking cylinder, plug-on plug connection (36) on to starter switch (35). Watch out for correct position of plug connection.



146 - 23576

17 Insert rosette into instrument panel.

18 Tighten clamp on holder of jacket tube.

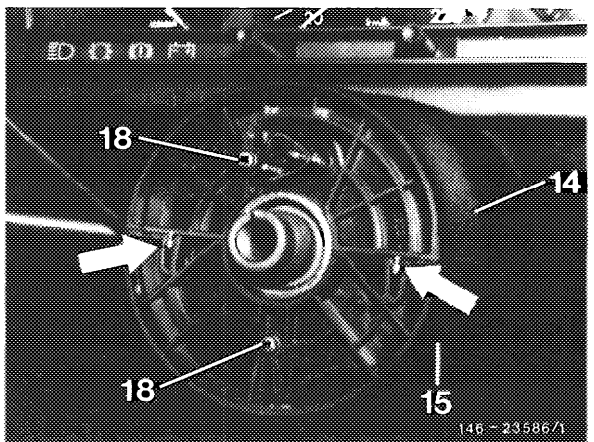


146 - 23573

19 Install jacket tube covering.

20 Attach instrument panel right of jacket tube.

21 Install covering in driver's foot well.

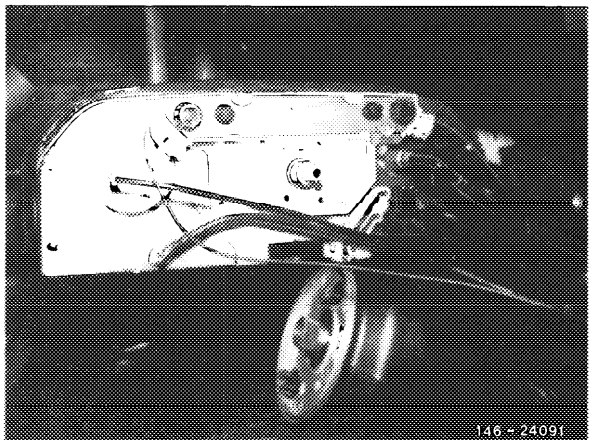


146 - 23586/1

22 Install instrument cluster. For this purpose, connect plug connections, oil pressure line and speedometer shaft.

23 Install steering wheel.

24 Check starter switch for function.



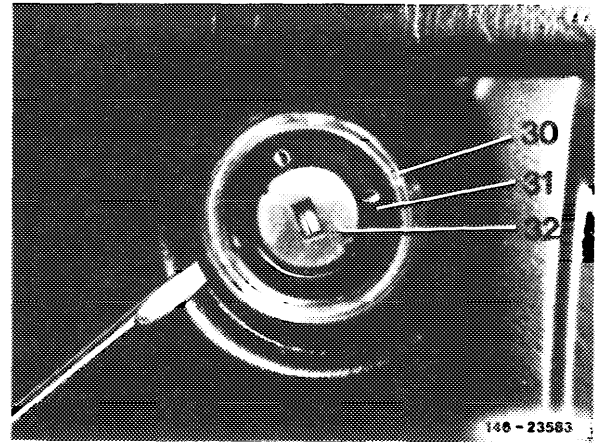
146 - 24091

## B. Removal and installation of locking cylinder

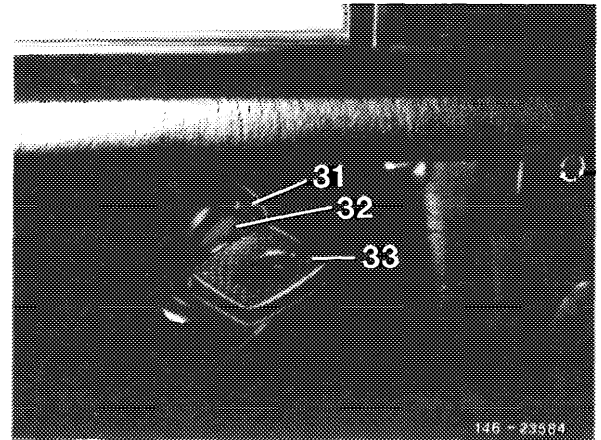
### Removal

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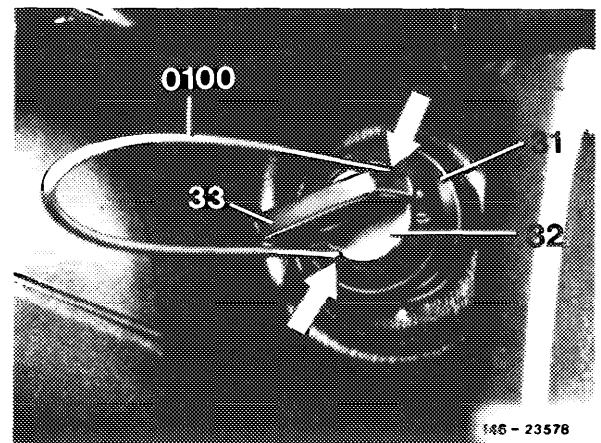
1 Take rosette (30) out of instrument panel by means of a small screw driver.



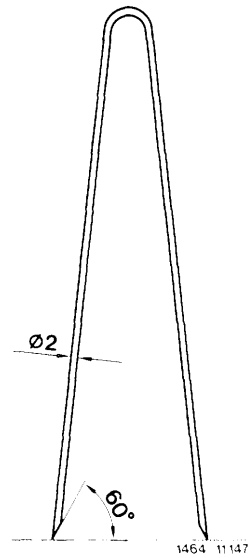
2 Turn locking cylinder with ignition key to position "1".



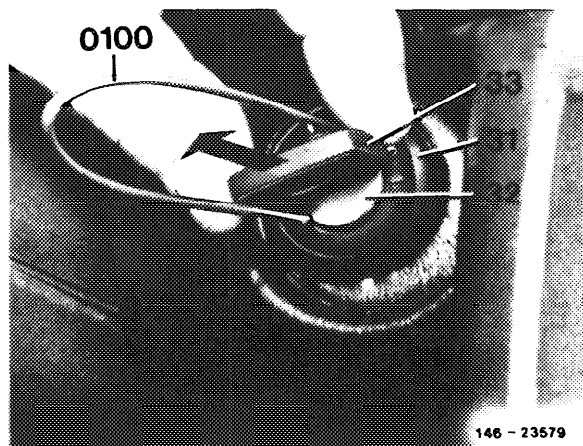
3 Insert releasing wire (0100) via bores (arrow) in locking cylinder. Then press-in releasing wire and, by overcoming the elastic resistance, unlock the safety detents.



Note: The releasing wire is self-made from a 2-mm thick steel wire according to the specified dimensions. Length of wire straightened-out = 400 mm.

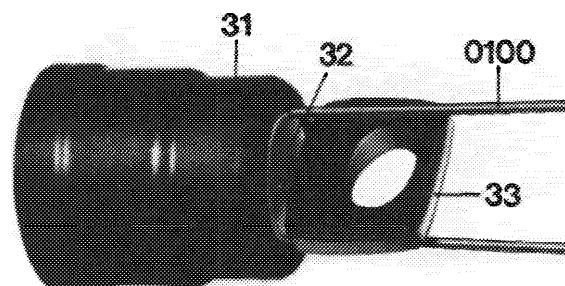


4 Remove locking cylinder (32) together with cover (31) from steering lock by means of ignition key (33).



5 Take-out releasing wire (0100) from locking cylinder. Turn ignition key to "0" and pull off.

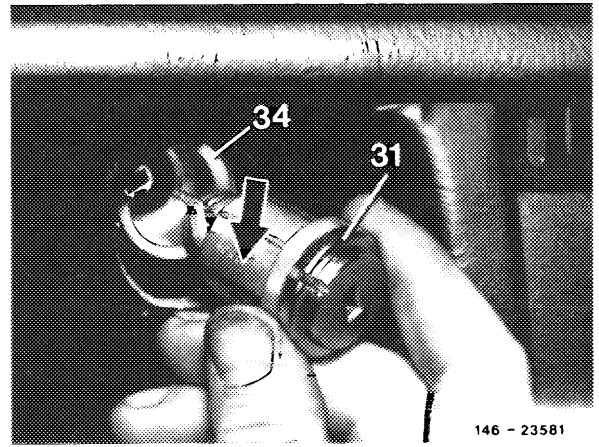
6 Take-out locking cylinder from cover.



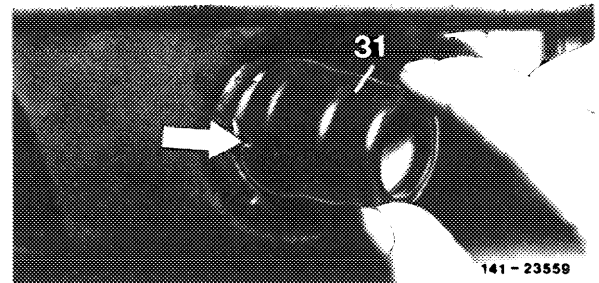
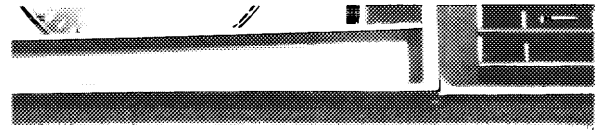
## Installation

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7 Insert locking cylinder (31) into steering lock (34) while making sure that the raised section on locking cylinder engages into groove of steering lock.

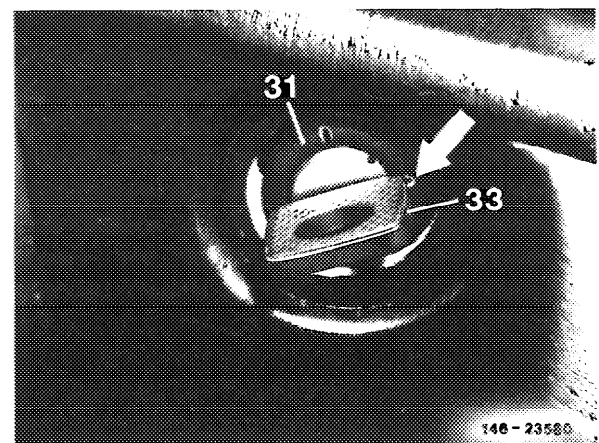


8 Position cover on steering lock in such a manner that the detent is directed to the left.



9 Turn locking cylinder by means of ignition key into position "1"; then press-in cover and locking cylinder into steering lock while making sure that both parts are engaging into steering lock.

Note: When the ignition key in position "1" is pointing to the mark on cover, then the detent on cover coincides with the raised section on steering lock. In this position only, locking cylinder together with cover can be installed into steering lock.



10 Check locking cylinder for function.

11 Insert rosette into instrument panel.

### C. Complete removal and installation of steering lock

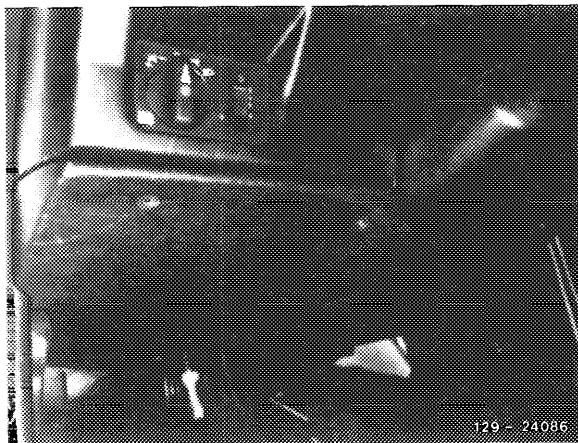
#### Removal

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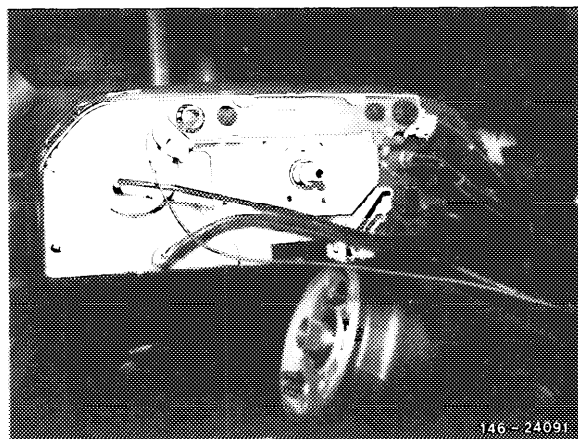
1 Remove cover at the left of driver's foot well.

2 Remove steering wheel (46-610).

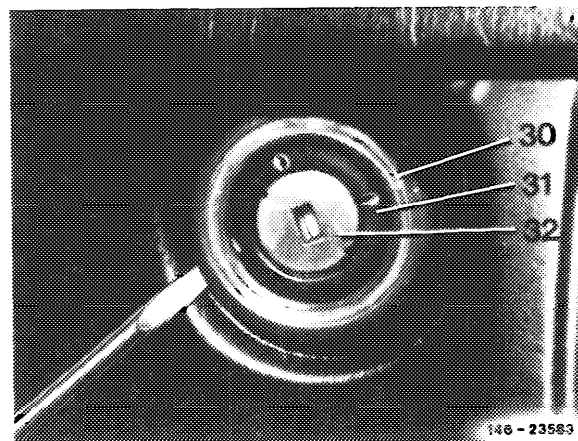
Note: On vehicles equipped with a restraining system (airbag and belt straightener), make sure to observe the Safety Instructions (91-610).



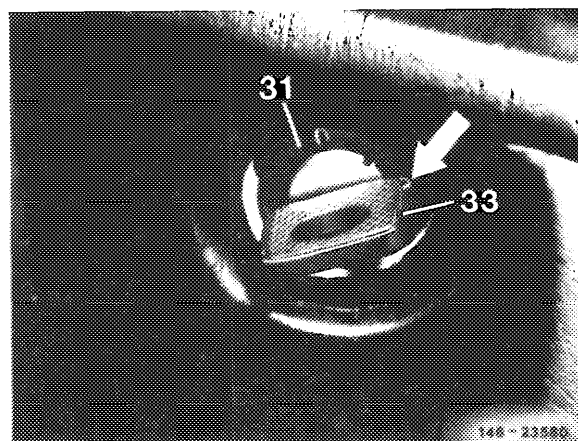
3 Remove instrument cluster. For this purpose pull out instrument cluster as far as possible, release speedometer shaft, electrical plug connections and oil pressure line.



4 Take out rosette (30) from instrument panel by means of a small screw driver.

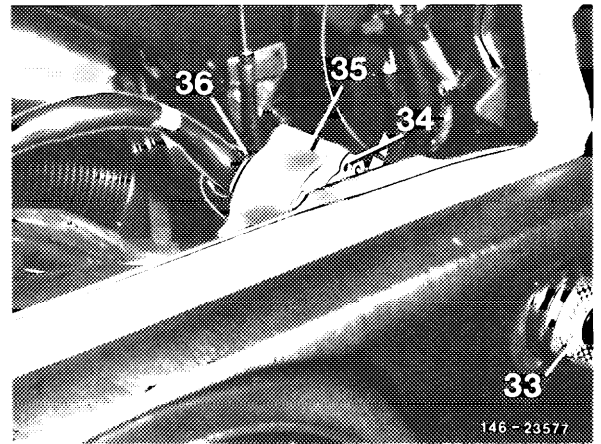


5 Turn locking cylinder by means of ignition key into position "1".

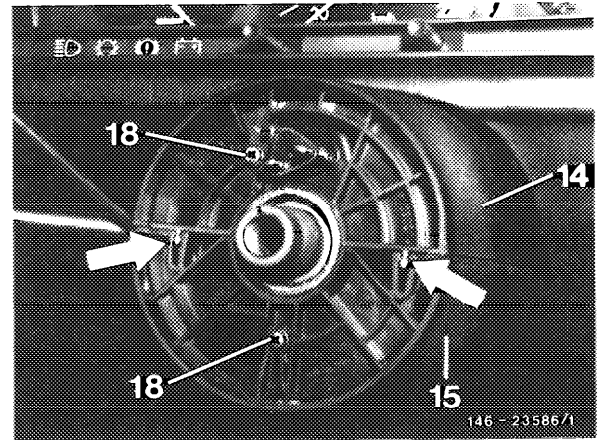


6 Take-off plug connection (36) from starter switch (35).

**Note:** The plug connection can be released in position "1" only.

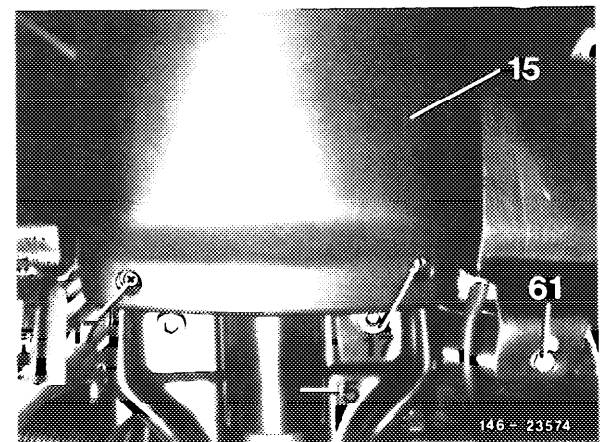


7 Remove jacket tube covering (14). For this purpose unscrew the two Phillips screws (15).

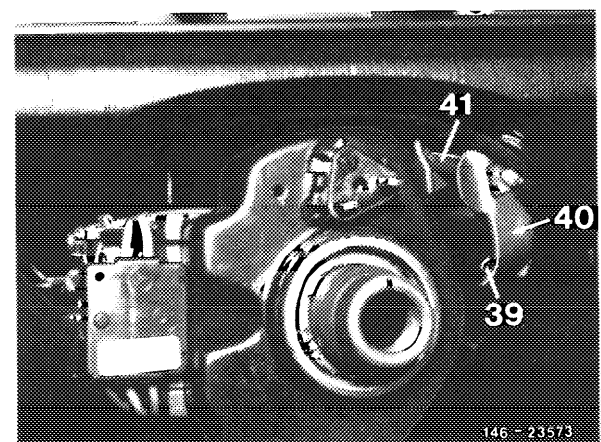


8 Unscrew both Phillips screws (17). Unclip lower part of jacket tube covering from upper part and remove both parts.

9 Unscrew locking screw (61) for instrument panel right of jacket tube.



10 Release clamp (40) on jacket tube. In position "1", press-in locking pin (39) and slightly pull-out steering lock from holder of jacket tube.

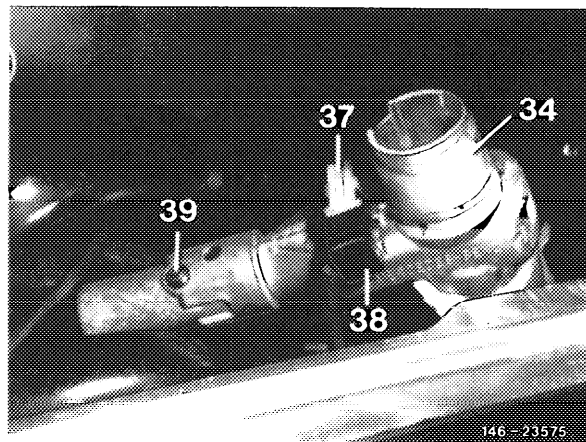


11 Pull-off ignition key, carefully pull instrument panel at the bottom right slightly to the rear, swivel steering lock in such a manner that locking cylinder no longer extends into detents of instrument panel. Take-out steering lock from holder of jacket tube,

12 Pull-off plug connection (38) from contact switch (37) and remove steering lock.

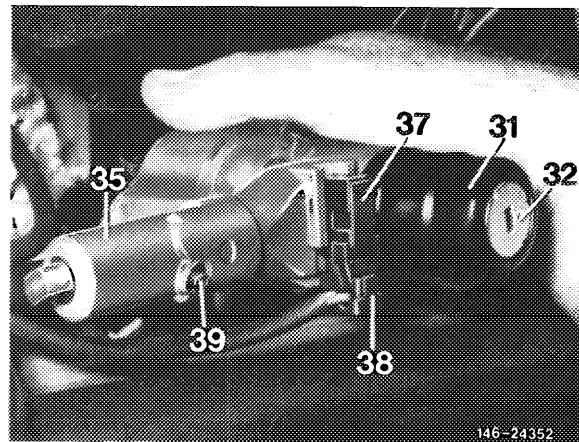
13 Remove contact switch (37) from steering lock.

**Note:** Contact switch can be removed in position "1" only.



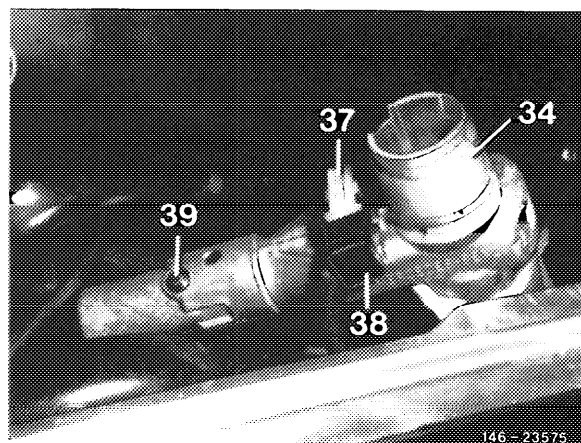
### Installation

14 First press-in closing pins of steering lock, then the locking pin (39) itself.



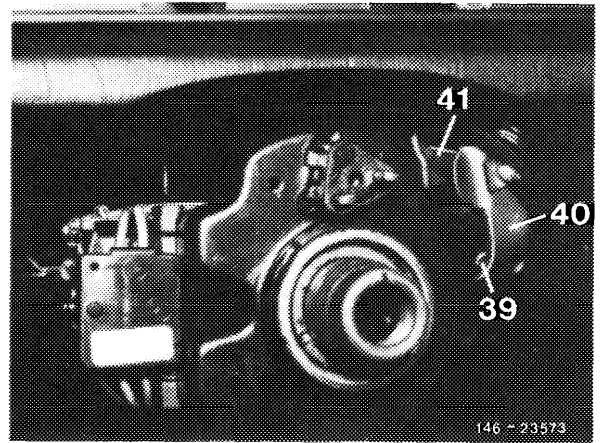
15 Install contact switch.

16 Connect plug connection to contact switch.

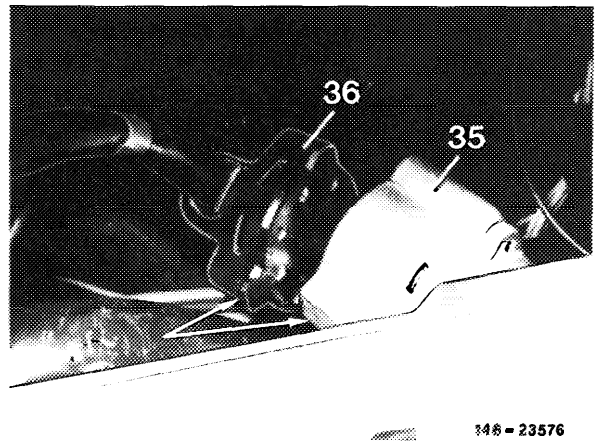




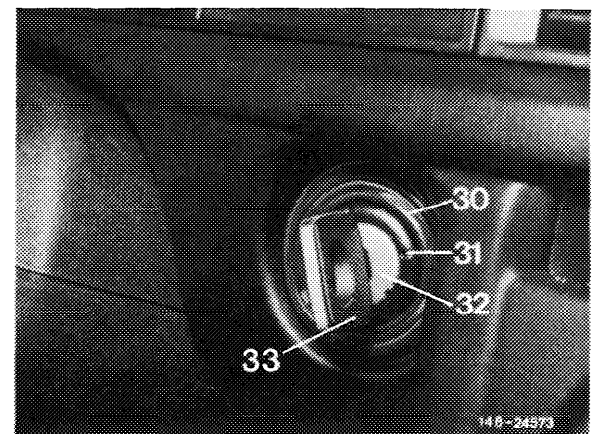
17 insert steering lock into holder of jacket tube, while making sure that locking pin (39) engages in bore of holder.



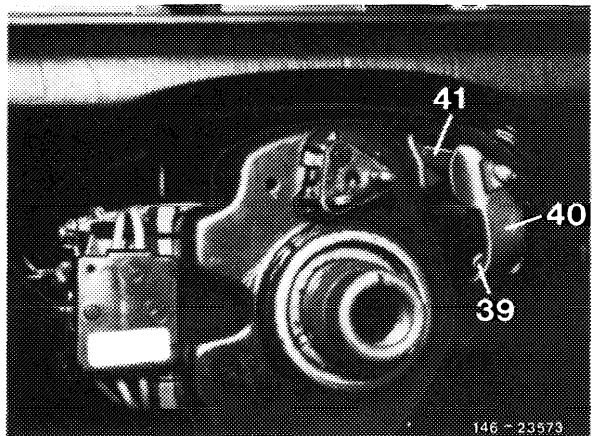
18 In position "1" of locking cylinder, plug-on plug connection (36) on to starter switch (35). Watch out for correct position of plug connection.



19 Insert rosette into instrument panel.

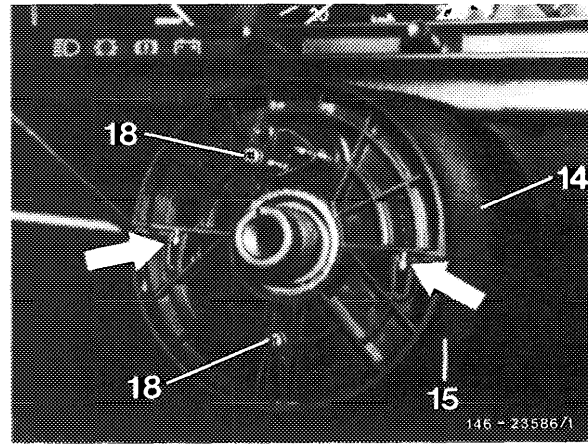


20 Tighten clamp on holder of jacket tube.



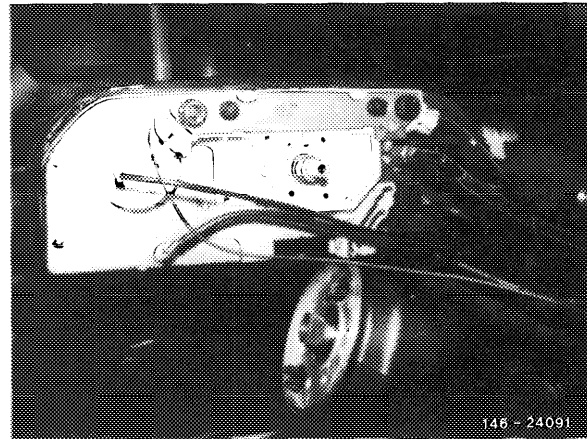
21 Install jacket tube covering.

22 Attach instrument panel right of jacket tube.



23 Install instrument cluster. For this purpose connect electrical plug connections, oil pressure line and speedometer shaft.

24 Install steering wheel.



25 Check steering lock for function.

26 Install lower covering.

## 46--710 Removal and installation of power steering pump

### Data

| Power steering pump | Model   | Opening pressure of pressure relief valve bar gauge pressure | Color code of type rating plate |
|---------------------|---|--|---------------------------------|
| VT 60               | 201.022<br>201.024 (up to August 84)                        | 65   | black                           |
| ZF 60               | 201.122 (up to November 84)<br>201.034 (up to September 84) | 85   | blue                            |
| VT61                | 201.023<br>201.024 (from September 84)                      | 65   | black                           |
| ZF 61               | 201.022 (from October 84)                                   | 85   | green                           |

### Oil types/Filling capacity and oil level checkup

Automatic transmission fluid (ATF) refer to Specifications for service products page 236.2  
or transmission oil refer to Specifications for service products page 237

Filling capacity approx. 0.6 litre

Oil level checkup With the oil at operating temperature (approx. 80 °C), the oil level in supply tank should reach up to cast-in mark (approx. 20 mm below rim of tank). With the oil cold and at ambient temperature, oil level 6-8 mm below mark. For filling-up, use only perfectly clean oil, since even minor particles of dirt may cause trouble in the hydraulic system.

### Tightening torques

|   | Nm    |
|---|-------|
| Hex. screws on pulley                     | 30    |
| Cap screw of high-pressure expanding hose | 25-30 |
| Cap screw connection pipe (return flow)   | 35-45 |
| Hex. screws for attaching pump in carrier | 25    |

### Special tool

Box wrench insert open  
17 mm 1/2" square



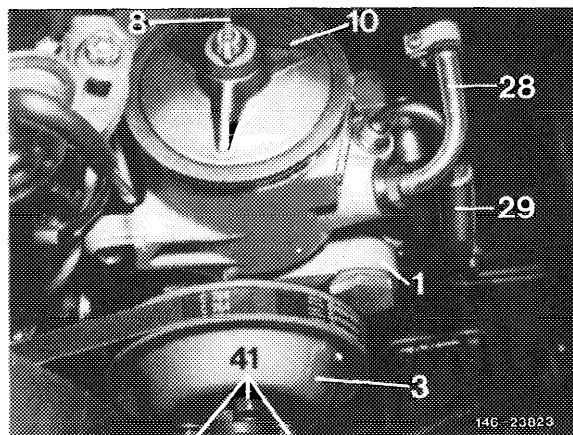
000 589 68 03 00

A. 1st version

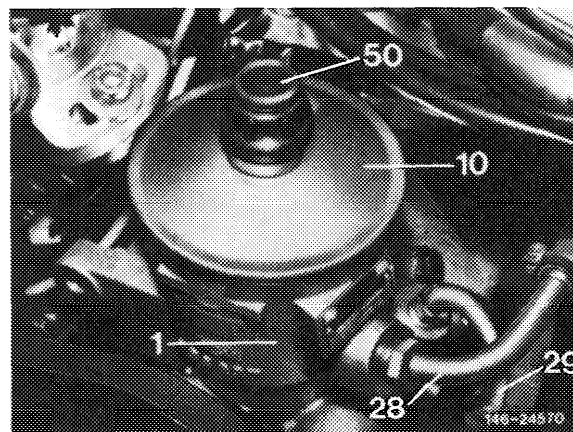
Removal

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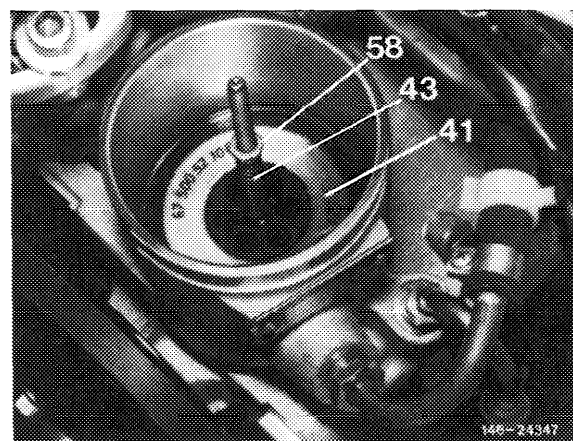
1 On the 1st version of power steering pump, unscrew wing nut (8) from pump housing and remove closing cover.



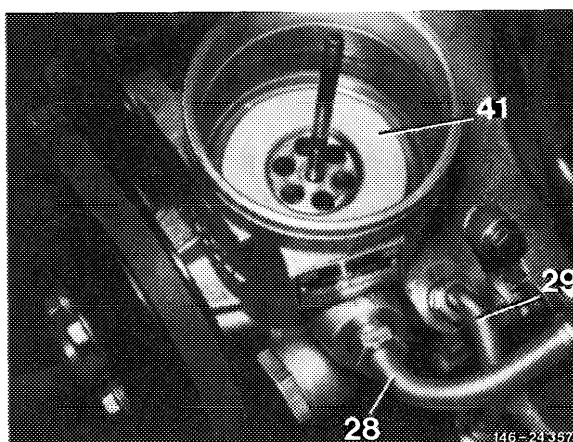
2 On the 2nd version, unscrew locking screw (50) together with blower from pump housing.



3 Unscrew hex. nut (58) and remove pressure spring from stud bolt.

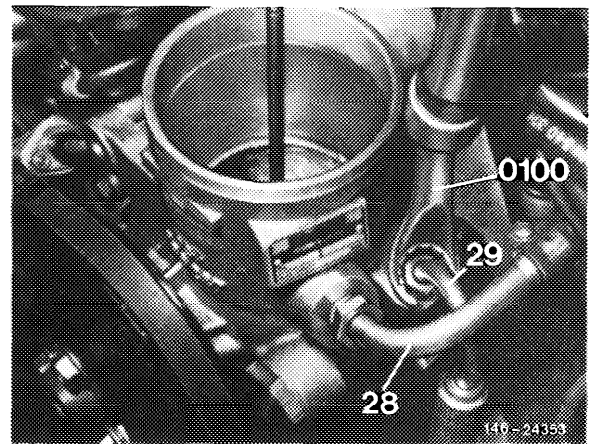


4 Take-out filter cartridge (41) from supply tank and drain oil by means of a syringe.

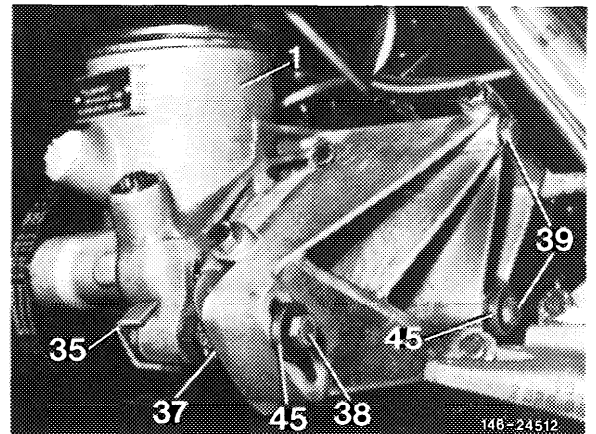


5 Release high-pressure expanding hose (29) on pump housing by means of box wrench insert (0100).

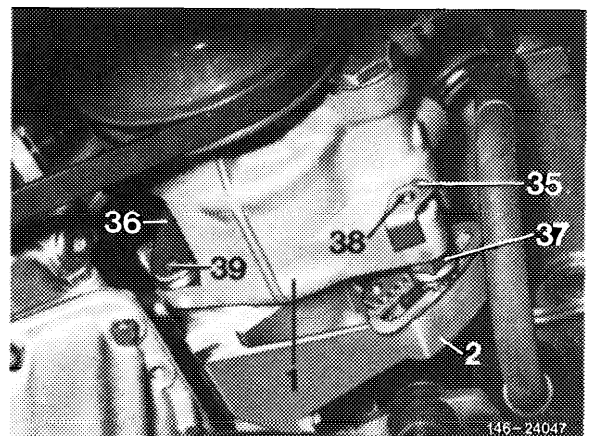
6 Release return flow hose (28).



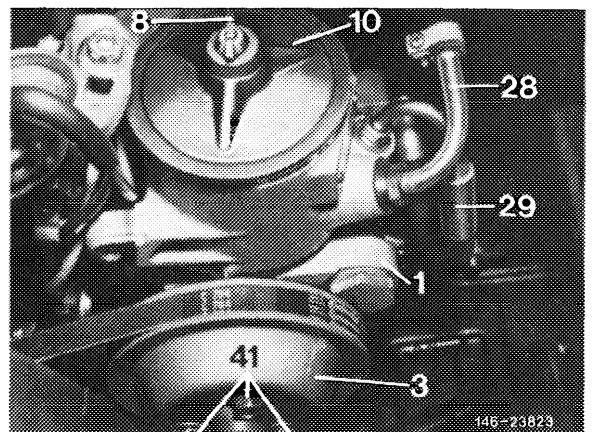
7 Release hex. screw (38) as well as the two screws (39).



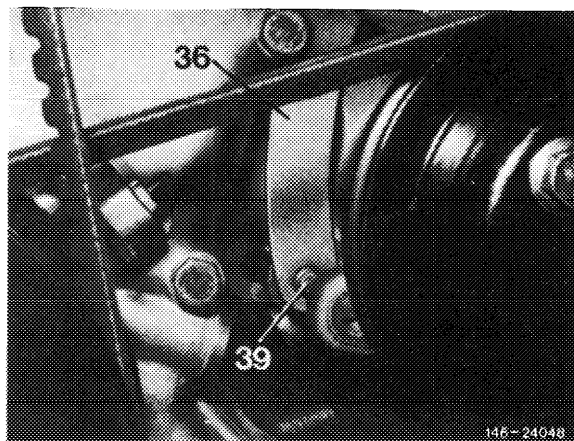
8 Swivel power steering pump toward engine by means of regulator wheel (37) and remove V-belt.



9 Unscrew hex. screws (41) for attaching V-belt, and remove driving shaft.

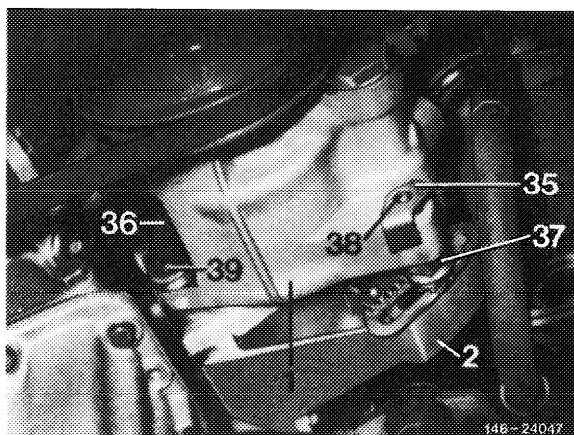


10 Unscrew both hex. screws (39) and remove threaded plate (36).



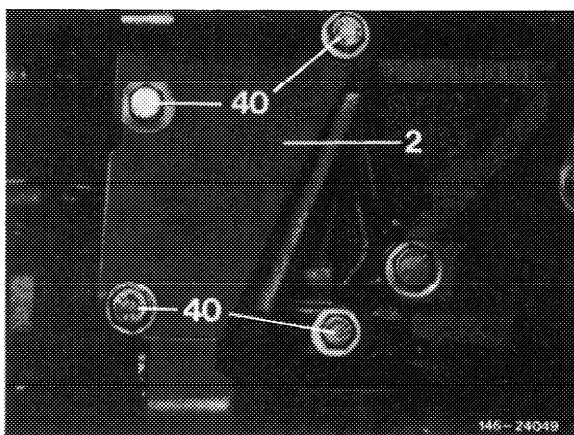
11 Unscrew hex. screw (38), remove locking nut (35) and regulator wheel (37).

12 Remove power steering pump.

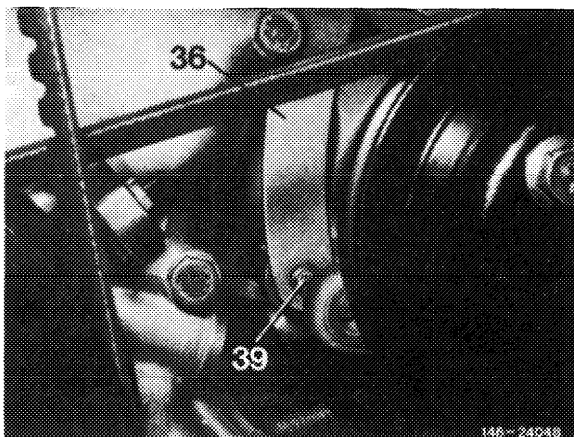


### Installation

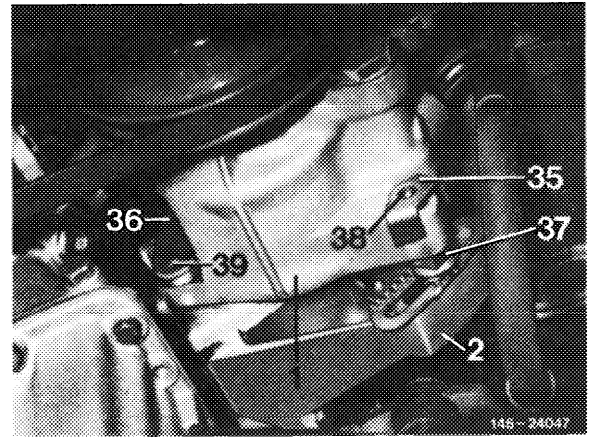
13 Check hex. screws (40) for attaching carrier (2) to cylinder crankcase for tight seat.



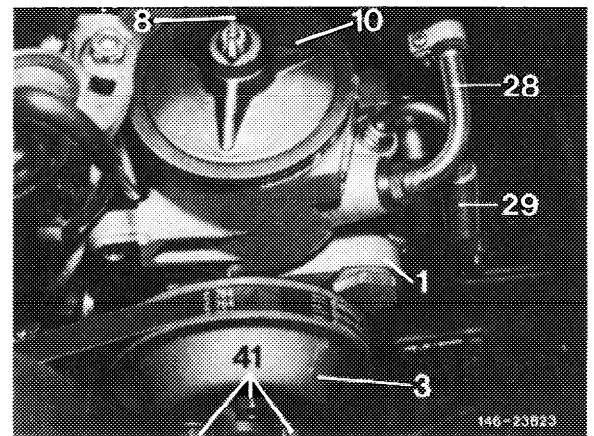
14 Insert power steering pump into carrier and attach to carrier by means of hex. screws (39) and the threaded plate (36); do not tighten hex. screws, however



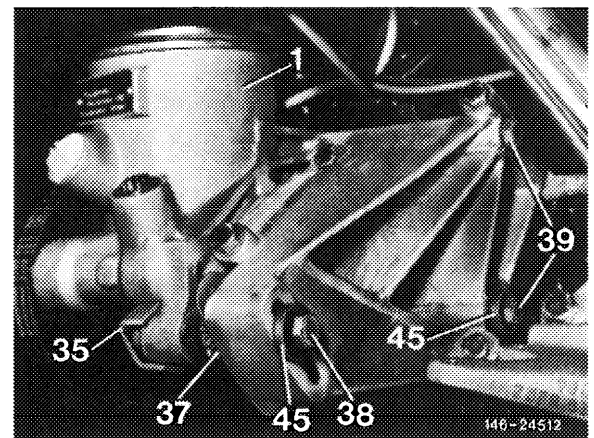
15 Insert regulator wheel (37) between power steering pump and carrier, and screw-in hex. screw (38) into fastening plate (35); do not tighten hex. screw, ho\Never.



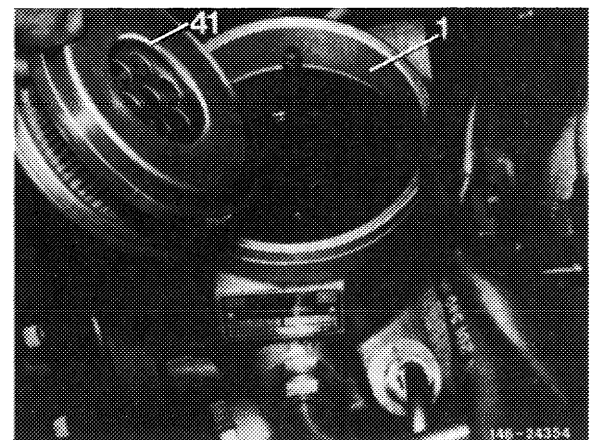
16 Attach pulley (3) on flange of driving shaft, position V-belt.



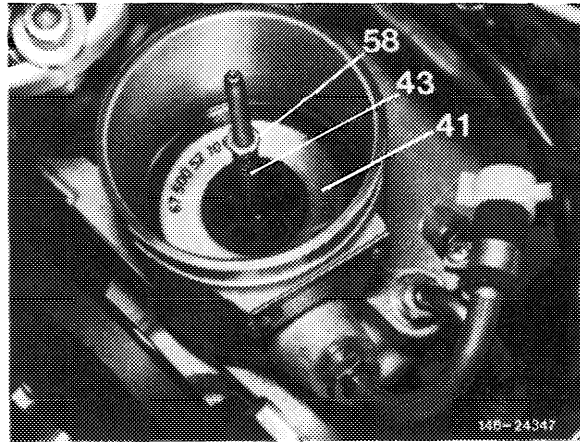
17 Tension V-belt by means of regulator wheel. Then tighten hex. screws.



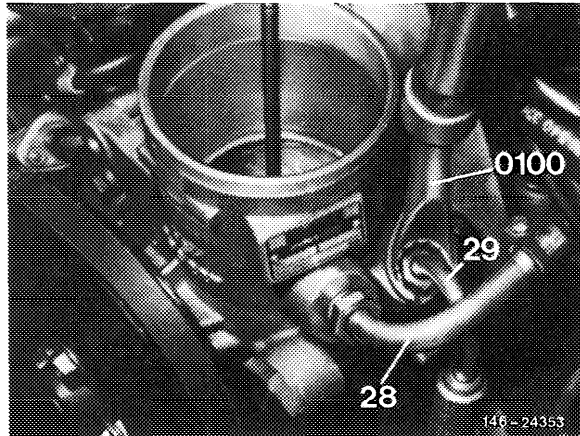
18 Insert filter cartridge (41) into pump.



19 Position pressure spring on stud bolt, screw-in hex.nut (58) up to the point when the spring is pre-tensioned.



20 Connect high-pressure expanding hose and return flow hose to pump housing. Pay attention to perfect arrangement of the hose.



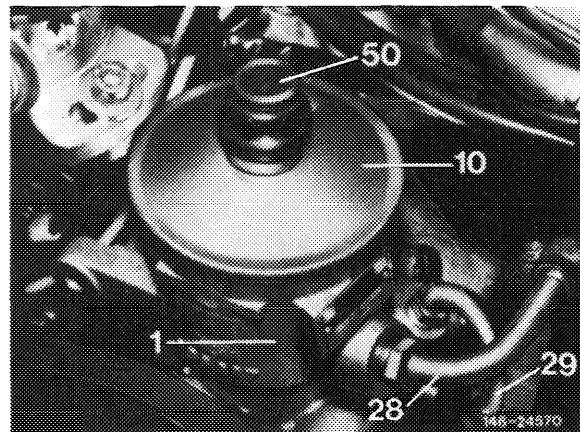
Note: Tighten high-pressure expanding hose by means of open box wrench insert.

21 Fill power system with the specified oil, top up oil with the engine running.

22 Completely turn steering several times to the left and the right for bleeding the system.

23 Check oil level and power system for leaks.

24 Attach closing cover for the 1st version on power steering pump by means of wing nuts and for the 2nd version by means of closing screw (50).





## B. 2nd version (single-belt drive) — diesel engines

Below is a description of removal and installation of power steering pump VT 60 and ZF 60. The assembly of the power steering pump VT 61 and ZF 61 is essentially the same, so that these instructions can be followed.

### Removal

---

1 unscrew vent cap (47), remove closing cap (45).

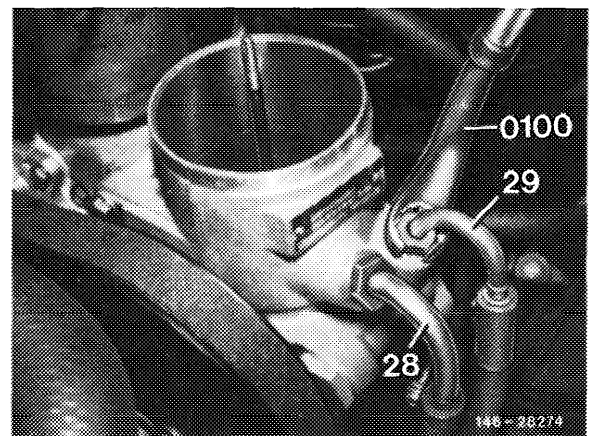
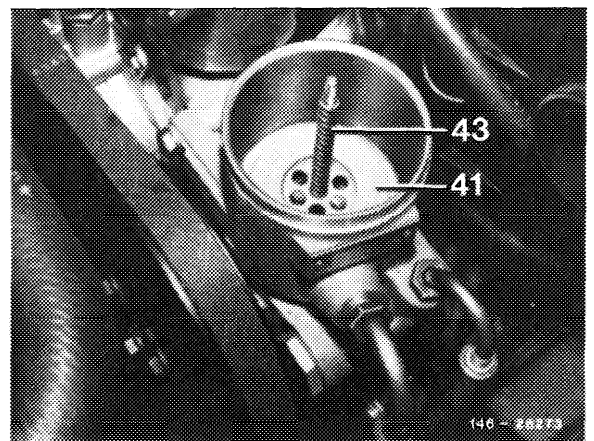
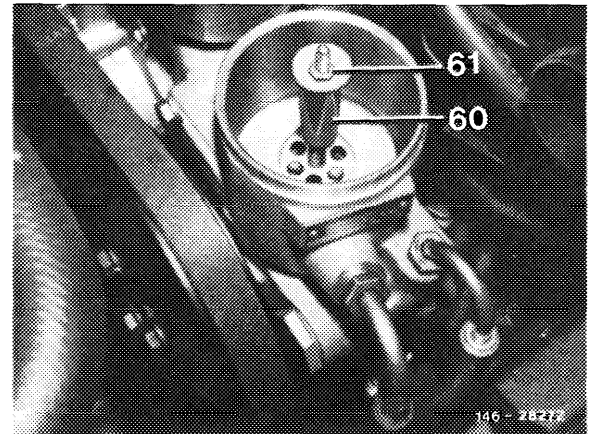
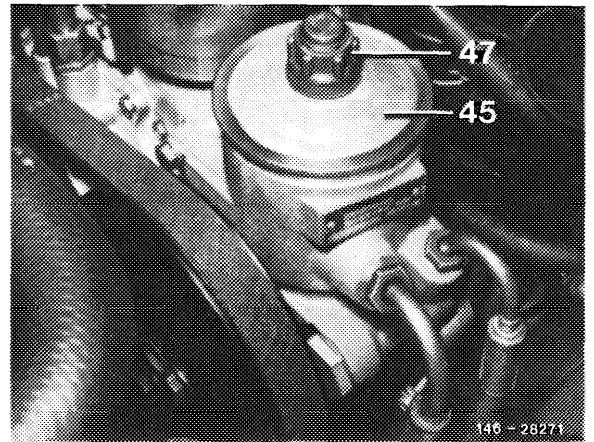
2 unscrew hex. nut (61). Remove plastic sleeve (60) from stud.

3 Take compression spring (43) and filter element (41) from reservoir and draw off oil by means of a syringe.

4 Loosen high-pressure expanding hose (29) on pump housing with box wrench element (0100).

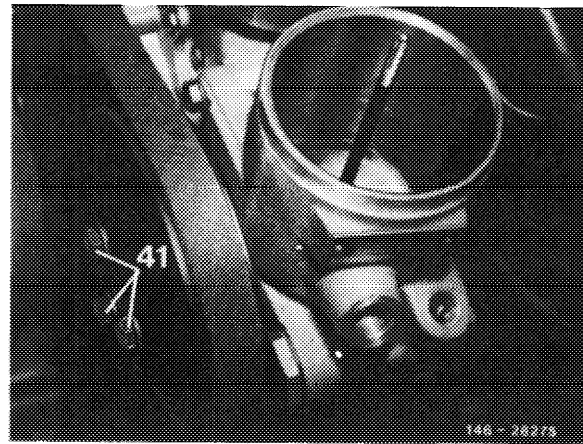
**Note:** On power steering pump VT 61 and ZF 61 the high-pressure expanding hose can be released by means of a conventional open-end wrench.

5 Release return flow hose (28).



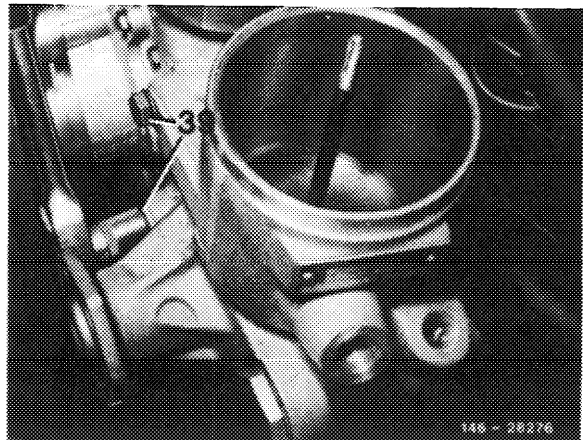
6 Slacken single-belt drive (13-340).

7 Unscrew hex. screws (41) for fastening pulley and remove pulley from drive shaft.



8 Unscrew hex. screws (39).

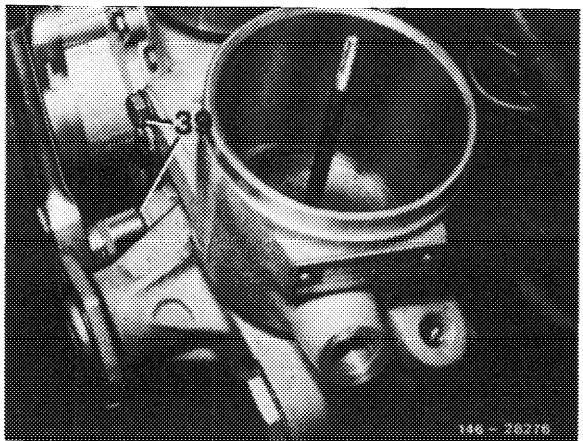
9 Remove power steering pump.



### Installation

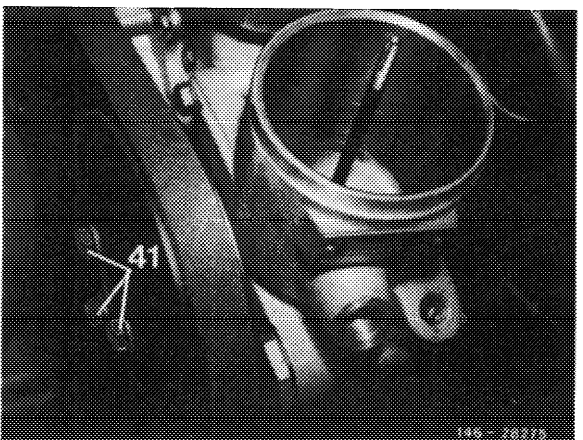
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10 Insert power steering pump and fasten with hex. head screws (39).



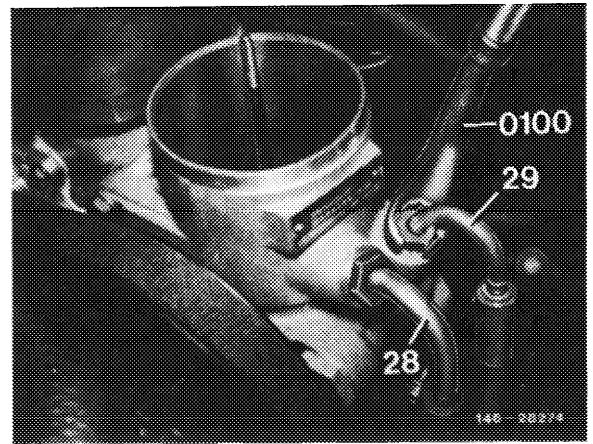
11 Fasten pulley (3) to flange of drive shaft, mount poly-V-belt.

12 Tension single-belt drive (13-340).



13 Connect high-pressure expanding hose and return flow hose to pump housing. Pay attention to perfect installation of hose.

Note: On power steering pump VT 60 and ZF 60 tighten high-pressure expanding hose with open box wrench element.



14 insert filter element (41) into pump.

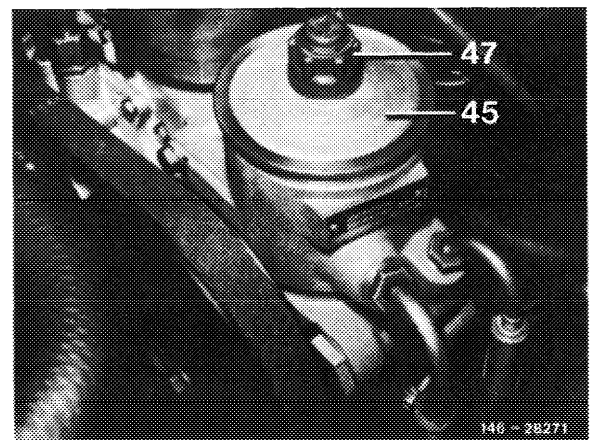
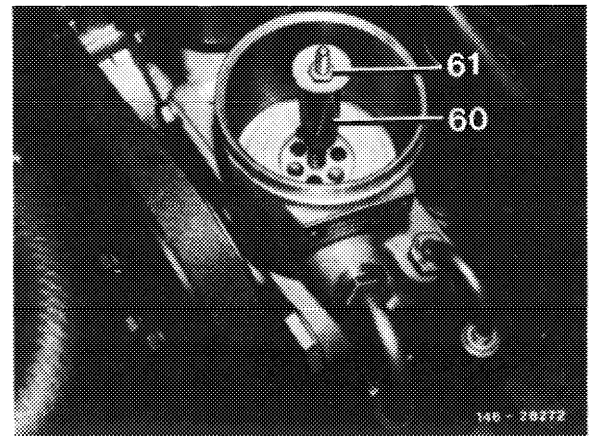
15 Place compression spring and plastic sleeve on stud, screw in hex. nut (61) until the spring is preloaded.

16 Fill servo system with specified oil, fill in oil up to mark with the engine running.

17 Turn steering wheel several times completely to the left and right up to lock, so that the system will be ventilated.

18 Correct oil level and check servo system for leaks.

19 Mount closing cap (45) and fasten with vent cap (47).



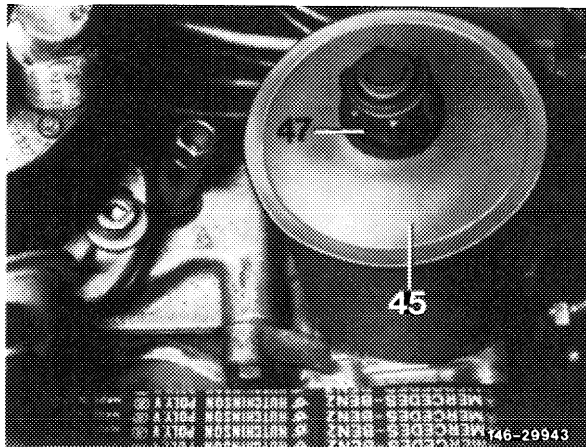
### C. 2nd version (single-belt drive) – gasoline engines

#### Removal

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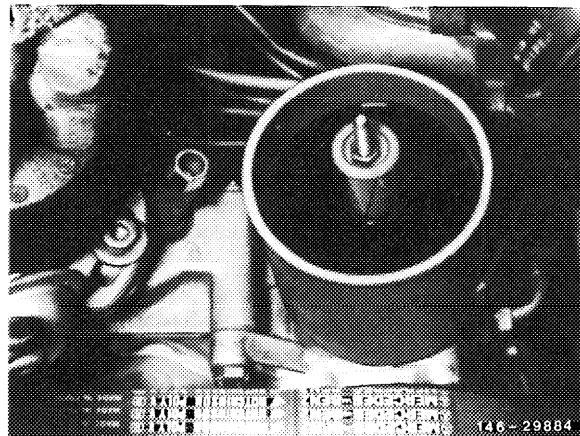
- 1 Unscrew vent cap (47), remove closing cap (45).

**Note:** Remove air cleaner housing prior to removing power steering pump.



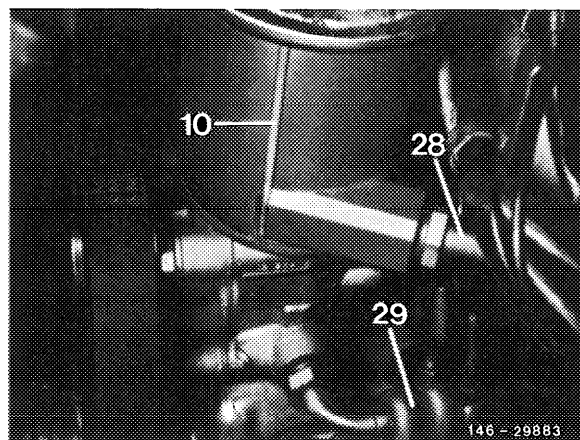
- 2 Unscrew hex. nut, remove plastic sleeve from stud.

- 3 Take compression spring and filter element out of reservoir and draw off oil with a syringe.



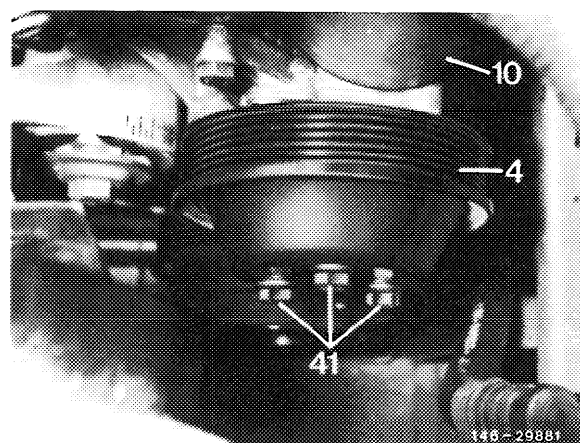
- 4 Loosen high-pressure expanding hose (29) on pump housing (10).

- 5 Loosen return flow hose (28).

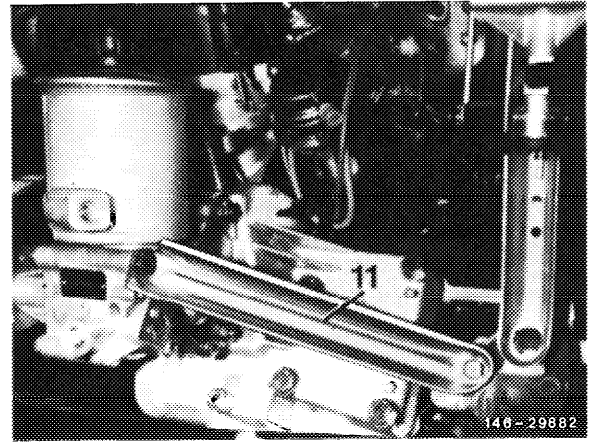


- 6 Slacken single-belt drive (13-340).

- 7 Unscrew hex. head screws (41) for fastening pulley and remove pulley (4) from drive shaft.

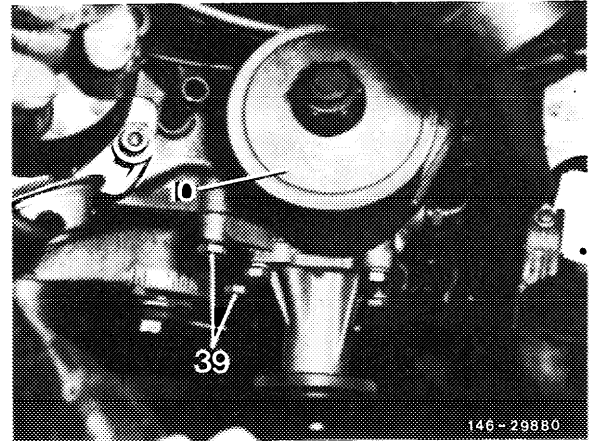


8 Unscrew strutting (11) on power steering pump and loosen on engine support.



9 Unscrew hex. head screws (39).

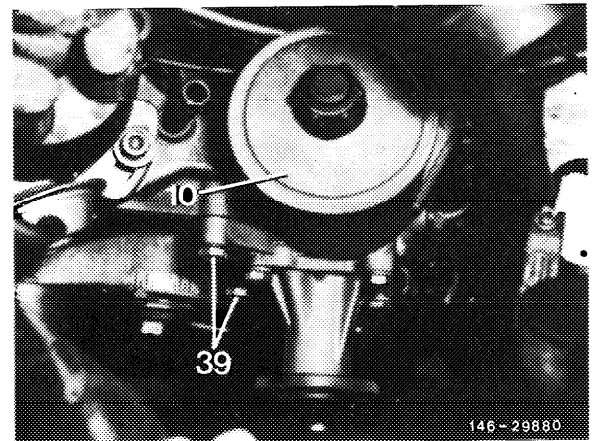
10 Remove power steering pump.



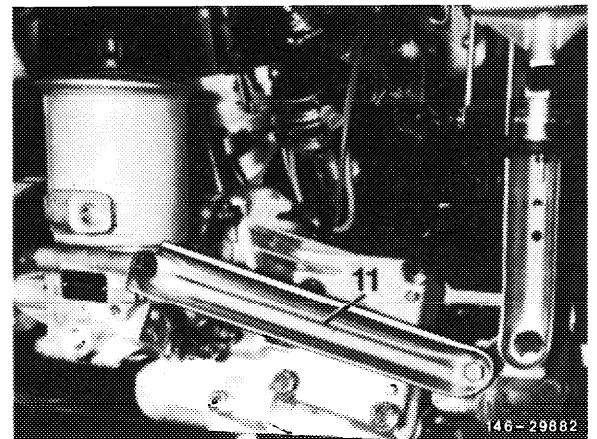
### Installation

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11 Insert power steering pump and fasten with hex. head screws (39).

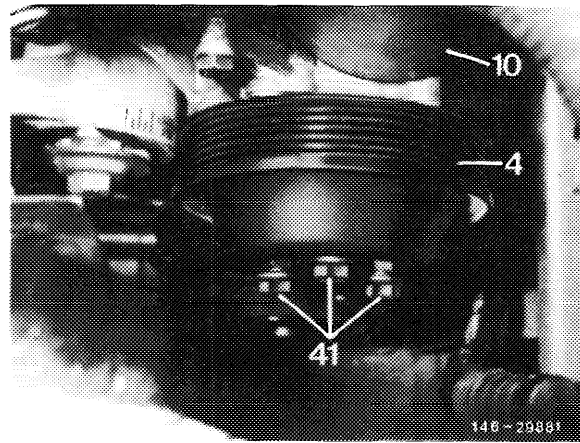


12 Fasten strutting (11) on power steering pump and fasten to engine support.

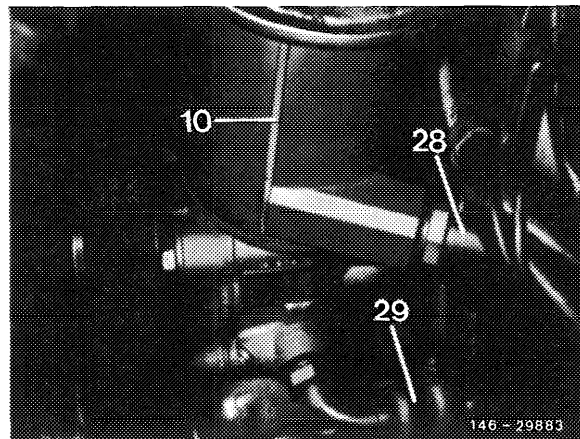


13 Fasten pulley (3) to flange of drive shaft, mount poly-V-belt.

14 Tension single-belt drive (13-340).



15 Connect high-pressure expanding hose (29) and return flow hose (28) on pump housing. Pay attention to perfect installation of hose.



16 Place filter element into pump.

17 Place compression spring and plastic sleeve on stud, screw in hex. nut until the spring is preloaded.

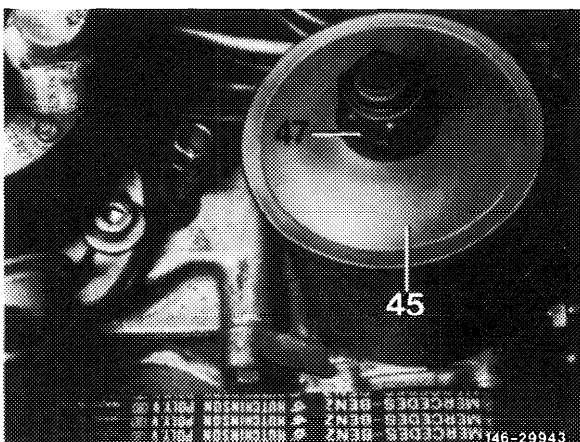
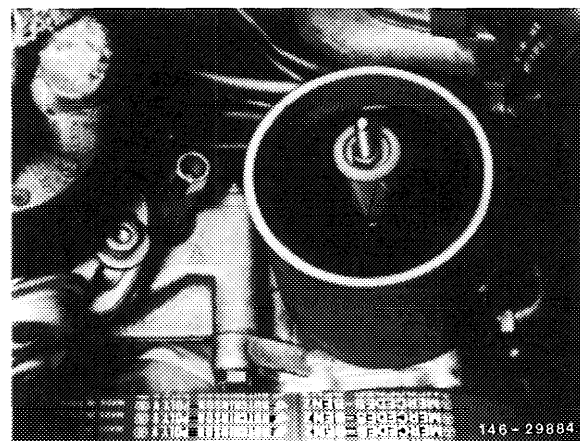
18 Fill servo system with specified oil up to mark with the engine running.

19 Turn steering several times completely to the left and right up to lock to bleed the system.

20 Correct oil level and check servo system for leaks.

21 Mount closing cap (45) and fasten with vent cap (47).

22 Mount air cleaner housing.



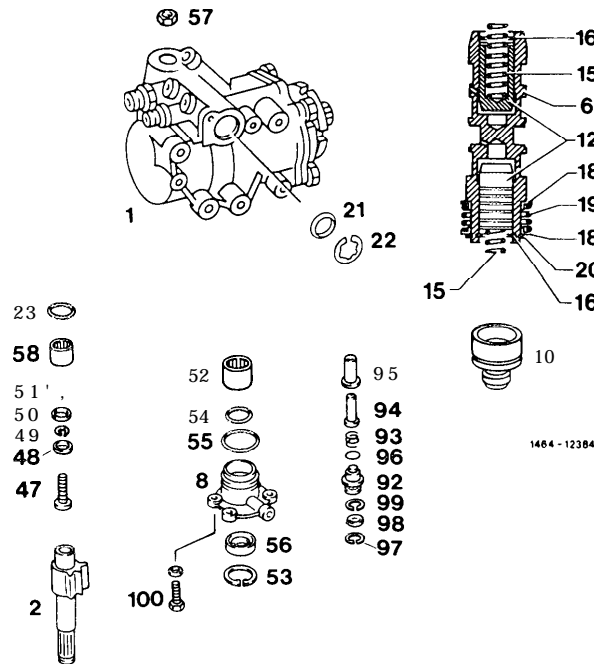
## 46-010 Differentiating characteristics of steering gears

|  |                                      |         |      |   |    |  |
|--|--------------------------------------|---------|------|---|----|--|
| 201.02<br>1 st version                         | 201 460 57 01 LL<br>201 460 58 01 RL | 765.901 | 11.5 | — | 10 | Automatic compensation for play, malleable iron housing, with dowel sleeve |
| 201.02<br>2nd version<br>201.1<br>1 st version | 201 460 43 01 LL<br>201 460 49 01 RL | 765.900 | 11.5 | — | 10 | Automatic compensation for play, light alloy housing, with dowel sleeve    |
| 201.02<br>3rd version<br>201.1<br>2nd version  | 201 460 66 01 LL<br>201 460 67 01 RL | 765.903 | 11.5 | — | 10 | Automatic compensation for play, light alloy housing, without dowel sleeve |
| 201.03   | 201 460 72 01 LL                     | 765.902 | 11.5 | — | 11 | Automatic compensation for play, light alloy housing, without dowel sleeve |

### B. Mechanical steering 760 (L 1 Z, L 075 Z)

| Installed in model      | Part No.<br>LL = lefthand steering<br>RL = righthand steering | Steering gear | Pitch<br>Ball<br>circulation | Remarks   |
|-------------------------|---|---------------|------------------------------|---|
| 114,115<br>1 st version | 115 460 1901 LL<br>115 460 2001 RL                            | 760.100       | 9                            | Respective pitman arm<br>115 463 07 01 LL<br>115 463 08 01 RL |
| 114,115<br>2nd version  | 115460 21 01 LL<br>115460 2201 RL                             | 766.100       | 10                           | Respective pitman arm<br>115463 1201 LL<br>115463 1301 RL     |
| 123<br>1 st version     | 123 460 38 01 LL<br>123 460 39 01 RL                          | 760.100       | 9                            | Pitman shaft dia. 30 mm                                       |
| 123<br>2nd version      | 123 460 62 01 LL<br>123 460 63 01 RL                          | 760.100       | 9                            | Pitman shaft dia. 32 mm                                       |
| 201<br>1 st version     | 201 460 52 01 LL<br>201 460 55 01 RL                          | 760.700       | 9                            | With dowel sleeve   |
| 201<br>2nd version      | 201 460 68 01 LL<br>201 460 69 01 RL                          | 760.700       | 9                            | Without dowel sleeve  |

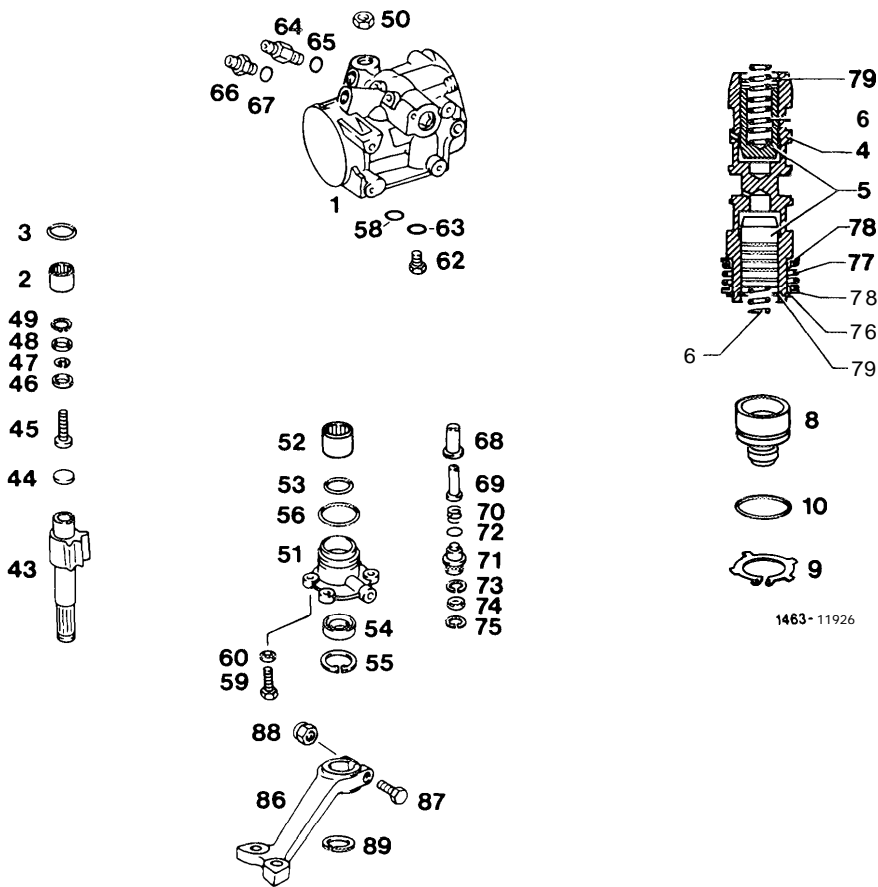
A. Steering gear 765.7 (LS 90)



|  |   |
|--|---|
| 1 Steering case                          | Clamp with special tool 123 589 03 59 00  |
| 2 Pitman shaft                           | Check for wear on bearing points and on tooth segment, as well as for distortion.                           |
| 6 Control valve                          | Attention! Pay attention to toothing.<br>Pay attention to different versions,<br><b>do not disassemble!</b> |
| 8 Steering case cover with needle sleeve | Check needle sleeve for damage and quiet running.<br>If needle sleeve is damaged, renew case cover.         |
| 10 Closing cap                           |   |
| 12 Reaction bolt.                        | Different diameters, according to steering gear model designation   |
| 15 Compression spring                    |   |
| 16 Locking ring                          |   |
| 18 Thrust washer                         |   |
| 19 Compression spring                    |   |
| 20 Locking ring                          |   |
| 21 O-ring (closing cap)                  | Renew   |
| 22 Locking ring                          | Renew   |
| 23 O-ring                                | Renew   |
| 47 Adjusting screw                       | Mount free of play  |
| 48 Thrust washer                         |   |
| 49 Locking ring                          | Renew   |
| 50 Thrust ring                           |   |
| 51 Locking ring                          | Renew   |
| 52 Needle sleeve                         | Check, renew case cover if required   |
| 53 Locking ring                          | Renew   |
| 54 O-ring                                | Renew   |
| 55 O-ring                                | Renew   |
| 56 Radial sealing ring                   | Renew, special tool 116 589 07 43 00  |



B. Steering gear 765.9 (LS68)



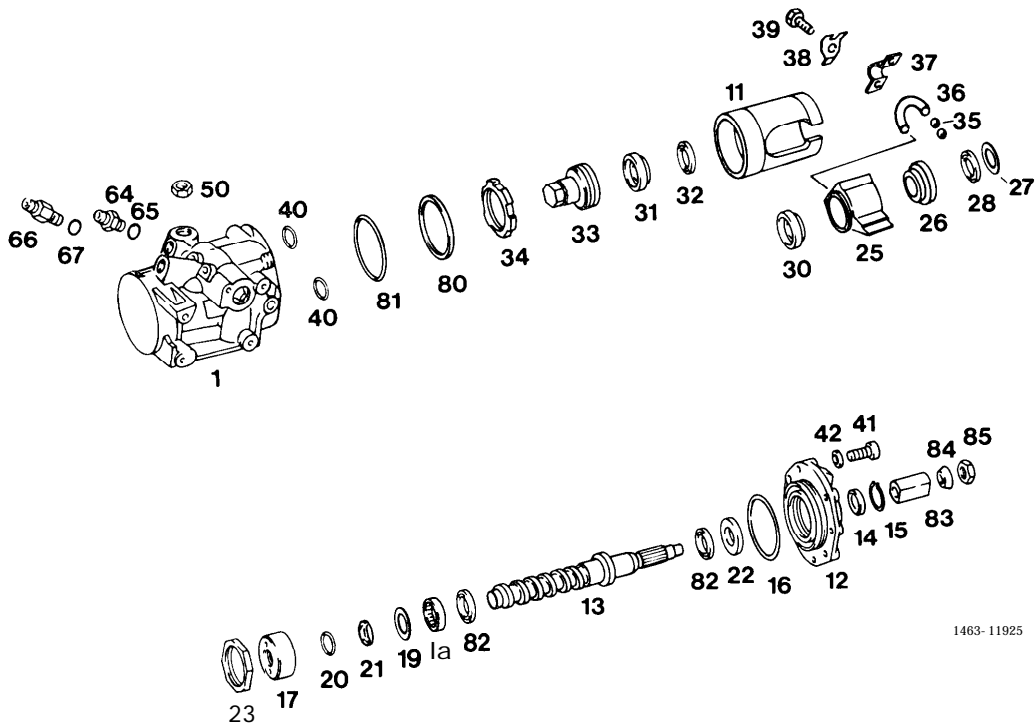
- 1 Steering case .....
- 2 Needle sleeve (pitman shaft) .....
- 3 O-ring (steering case — pitman shaft) .....
- 4 Control valve .....
- 5 Reaction piston .....
- 6 Compression spring reaction piston 2 each .....
- 8 Closing cap
- 9 Locking ring .....
- 10 O-ring (closing cap) .....
- 43 Pitman shaft .....
- 44 Thrust washer
- 45 Adjusting screw .....
- 46 Thrust washer
- 47 Locking ring .....
- 48 Thrust ring
- 49 Locking ring .....

Check needle sleeve in steering case for damage and quiet running. Replace steering gear, if required.  
Special tool 201 589 00 59 00.

| Light alloy | Malleable iron |
|-------------|----------------|
| 765.900 LL  | 765.900 R L    |
| 765.902 LL  | 765.901        |
| 765.903 LL  | 765.902 RL     |
|             | 765.903 R L    |
|             | 765.904        |
|             | 765.905        |

- Check for wear and quiet running
- Renew
- Attention!** Do not disassemble
- Check for easy operation
- Attention!** Do not mix up springs
- Renew
- Renew
- Check for wear on bearing points and on tooth segment, as well as for distortion.  
30 mm dia. = 765.900/90 1/902/903/905  
32 mm dia. = 765.904
- Mount free of play. Note: item 95
- Renew
- Renew

|   |   |
|---|---|
| 50 Polystop nut . . . . .                     | Renew, 60-65 Nm   |
| 51 Case cover with needle sleeve . . . . .    | Check needle sleeve for damage and quiet running.<br>If needle sleeve is damaged, renew case cover.<br>Special tool 201 589 06 15 00.<br>Light alloy   Malleable iron |
|   | <hr/>   |
|   | 765.900, 765.901   765.904  |
|   | 765.902, 765.903  |
|   | 765.905   |
| 52 Needle sleeve . . . . .                    | Check, renew case cover, if required  |
| 53 O-ring. . . . .                            | Renew   |
| 54 Radial sealing ring . . . . .              | Renew   |
| 55 Locking ring . . . . .                     | Renew   |
| 56 O-ring. . . . .                            | Renew   |
| 58 O-ring. . . . .                            | Renew   |
| 59 Hex. head screw . . . . .                  | Renew, 25-28 Nm   |
| 60 Washer                                     |   |
| 62 Closing plug. . . . .                      | 35-40 Nm  |
| 63 Sealing ring . . . . .                     | Renew   |
| 64 Screw connection (pressure side) . . . . . | 40-45 Nm  |
| 65 Sealing ring . . . . .                     | Renew   |
| 66 Screw connection (return) . . . . .        | 50-55 Nm  |
| 67 Sealing ring . . . . .                     | Renew   |
| 68 Bushing . . . . .                          | Check for easy operation  |
| 69 Spring bolt . . . . .                      | Check for easy operation  |
| 70 Compression spring                         |   |
| 71 Cap  |   |
| 72 O-ring. . . . .                            | Renew   |
| 73 Locking ring . . . . .                     | Renew   |
| 74 Thrust ring                                |   |
| 75 Locking ring . . . . .                     | Renew   |
| 76 Locking ring                               |   |
| 77 Compression spring                         |   |
| 78 Contact ring . . . . .                     | Single parts of control valve   |
| 79 Locking ring . . . . .                     | Do not disassemble control valve  |
| 86 Pitman arm . . . . .                       | Install pitman arm (46–510)   |
|   | Be sure to pay attention to locking compound, curing<br>time and ball point position.<br>Special tool 000 589 88 33 00  |
| 87 Hex. head screw                            |   |
| 88 Nut . . . . .                              | Renew   |
| 89 Locking ring . . . . .                     | Renew   |

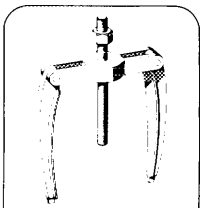


1463-11925

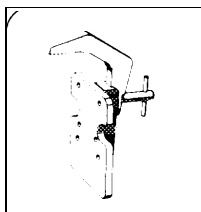
|  |     |  |
|--|-----|--|
| 1 Steering case . . . . .                      | ... | Check needle sleeve in steering case for damage and quiet running. If required, replace steering.<br>Special tool 201 589 00 59 00                                     |
| 11 Working piston . . . . .                    |     | Special tool 201 589 02 59 00<br>201 589 01 59 00  |
| 12 Bearing cap . . . . .                       |     | Special tool 201 589 05 31 00<br>Special tool 201 589 05 31 00<br>Light alloy Malleable iron   |
|  |     | 765.900, 765.90 1   765.904<br>765.902, 765.903<br>765.905   |
| 13 Steering worm . . . . .                     |     | Check ball circuit for score marks<br>Special tool 116 589 03 21 00<br>123 589 00 08 00<br>123 589 02 21 00  |
| 14 Radial sealing ring . . . . .               |     | Renew, special tool 201 589 05 31 00   |
| 15 Locking ring . . . . .                      |     | Renew  |
| 16 O-ring. . . . .                             |     | Renew  |
| 17 Bearing insert with needle sleeve . . . . . |     | Check needle sleeve in bearing insert for wear.<br>If damaged, renew complete bearing insert.<br>Special tool 201 589 00 07 00<br>123 589 01 16 00<br>201 589 02 09 00 |
| 18 Needle sleeve in bearing insert             |     |  |
| 19 Axial washer in bearing insert              |     |  |
| 20 O-ring. . . . .                             |     | Renew  |
| 21 Teflon ring . . . . .                       |     | Renew  |
| 22 Washer                                      |     |  |
| 23 Nut . . . . .                               |     | 220-240 Nm<br>Special tool 201 589 02 09 00<br>126589001600  |
| 25 Steering nut . . . . .                      |     | Check ball circuit for score marks<br>Special tool 116 589 02 21 00  |
| 26 Bearing ring                                |     |  |
| 27 Axial washer                                |     |  |
| 28 Axial needle cage . . . . .                 |     | Check for damage and quiet running   |

|    |   |  |
|----|---|--|
| 30 | Inner race  |  |
| 31 | Outer race  |  |
| 32 | Ball cage   | Check for damage and quiet running             |
|    |   | Special tool 123 589 01 16 00                  |
|    |   | 201 589 03 09 00                               |
| 33 | Screw cover   |  |
| 34 | Slot nut  | 220-240 Nm                                     |
|    |   | Special tool 126 589 00 16 00                  |
|    |   | 201 589 01 17 00                               |
| 35 | Steel ball  | 23 each  |
| 36 | Ball guide half   | Check for damage                               |
| 37 | Fastening clamp   |  |
| 38 | Locking plate   | Renew  |
| 39 | Hex. head screw   | 12-15 Nm                                       |
| 40 | O-ring (steering case bearing cap)                          | Renew  |
| 41 | Screw   | 25-28 Nm                                       |
| 42 | Washer  |  |
| 50 | Polystop nut  | Renew, 60-65 Nm                                |
| 64 | Screw connection (pressure side)                            | 40-45 Nm                                       |
| 65 | Sealing ring  | Renew  |
| 66 | Screw connection (return)                                   | 50-55 Nm                                       |
| 67 | Sealing ring  | Renew  |
| 80 | O-ring  | Renew  |
| 81 | Teflon ring   | Renew  |
| 82 | Axial bearing   | Check for quiet running and damage             |
| 83 | Dowel sleeve (steering gear 769.900 and<br>765.901 only)    | Pay attention to installation position item 14 |
| 84 | Supporting ring (steering gear 769.900 and<br>765.901 only) |  |
| 85 | Nut (steering gear 769.900 and 765.901 only)                | 50 Nm  |

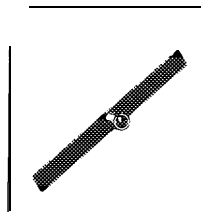
**Special tools**



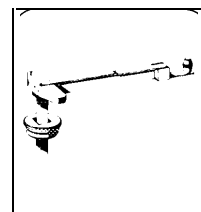
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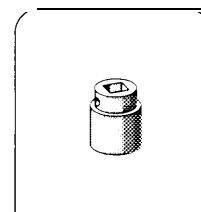
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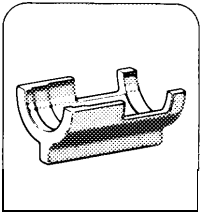
116 589 03 21 00



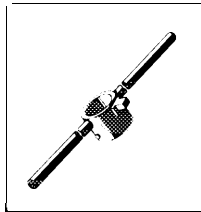
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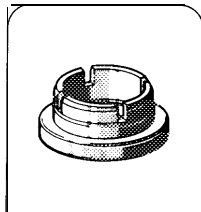
123 589 00 08 00



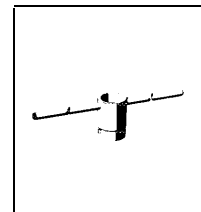
201 589 02 59 00



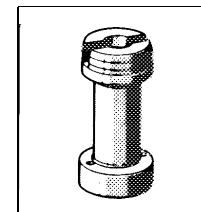
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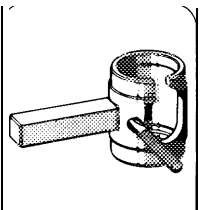
201 589 02 09 00



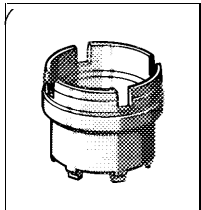
123 589 01 16 00



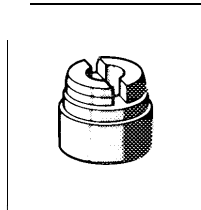
201 589 00 07 00



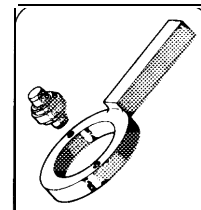
201 589 01 59 00



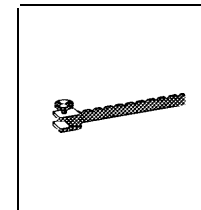
201 589 01 07 00



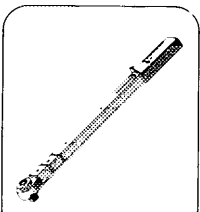
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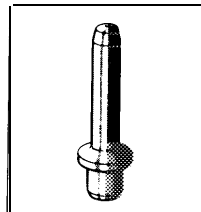
201 589 05 31 00



116589022100



001 589 67 21 00



201 589 06 15 00

**Conventional tools**

Locking pliers, outside

e.g. made by Knipex, D-5600 Wuppertal  
Order No. 46/A 1

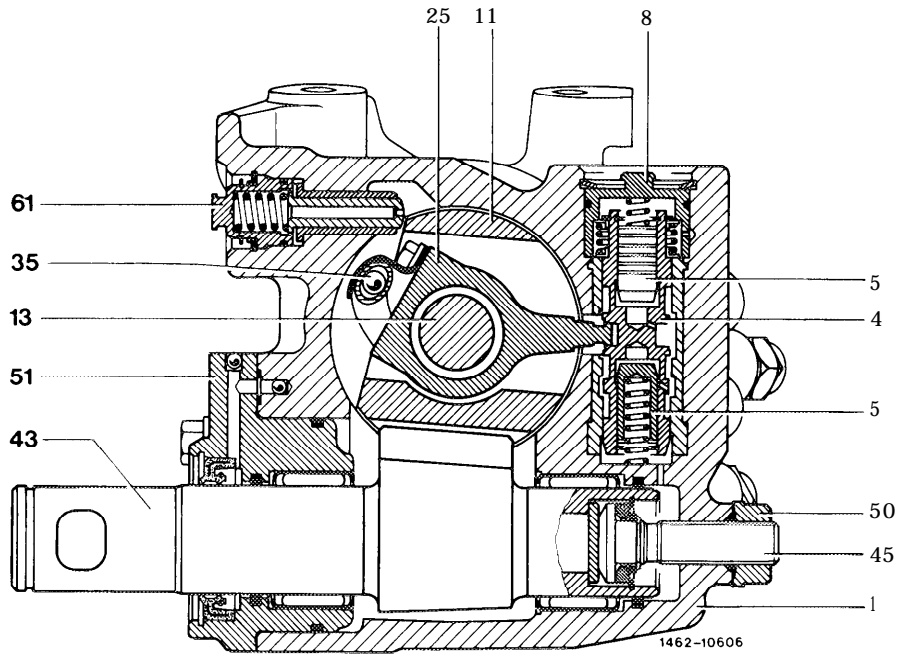
Locking pliers, inside

e.g. made by Knipex, D-5600 Wuppertal  
Order No. 44/J 1

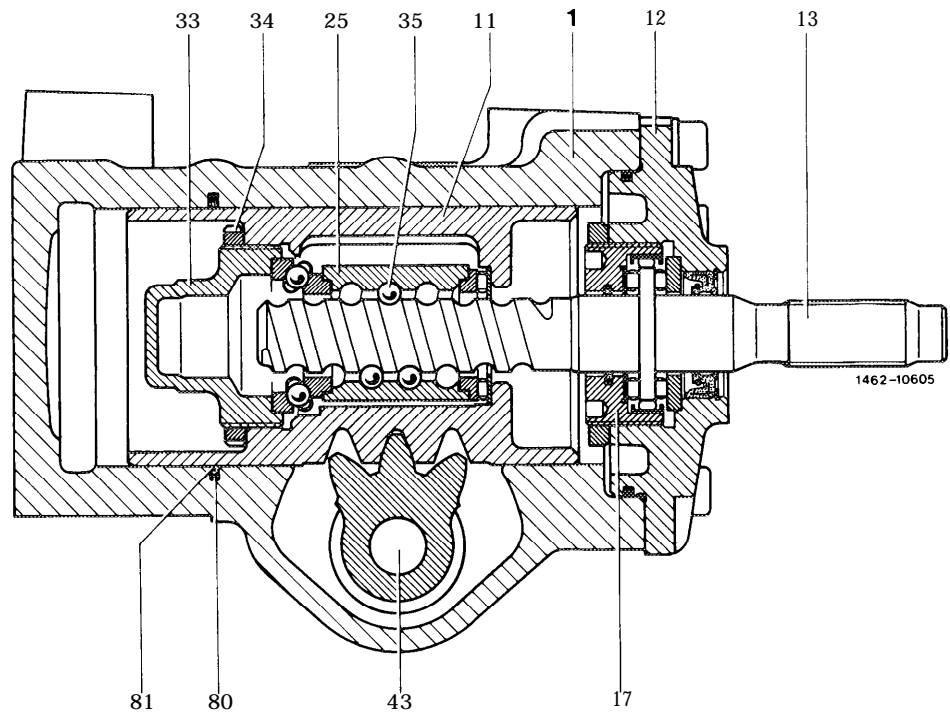
**Data**

|  |               |       |
|--|---------------|-------|
| Number of balls in circuit   | 23            |       |
| <b>Adjusting data</b>  | Ncm           |       |
| Friction torque of steering worm in bearing cap prior to preloading bearing insert | ≤ 12          |       |
| Additional friction torque of steering worm after preloading bearing cap           | 4-7           |       |
| Friction torque of steering nut in working piston                                  | 6-10          |       |
| Friction torque ball circuit steering worm → steering nut                          | new steering  | 30-50 |
|  | used steering | 5-50  |
| Total friction torque  | 110-160       |       |

- 1 Steering case
- 4 Control valve
- 5 Reaction bolt
- 8 Closing cover
- 11 Working piston
- 13 Steering worm
- 25 Steering nut
- 35 Ball
- 43 Pitman shaft
- 45 Adjusting screw
- 50 Collar nut
- 51 Housing cover
- 61 Closing cap



- Steering case
- 11 Working piston
- 12 Bearing cap
- 13 Steering worm
- 17 Bearing insert
- 25 Steering nut
- 33 Screw cap
- 34 Slot nut
- 35 Ball
- 43 Pitman shaft
- 80 O-ring
- 81 Teflon ring

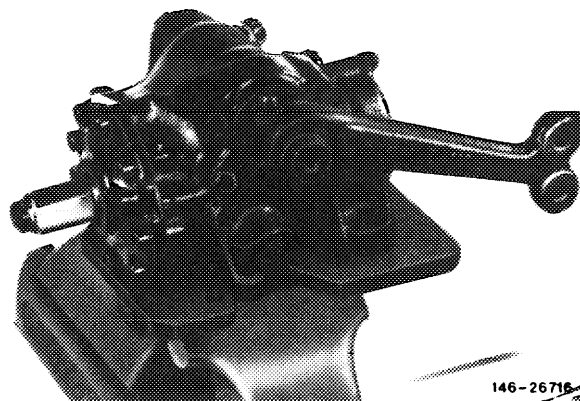


## Disassembly

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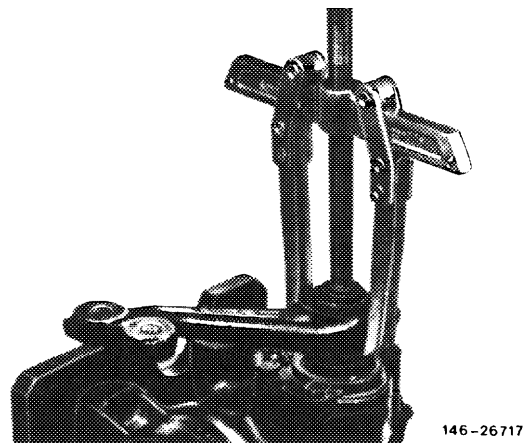
1 Fasten steering to assembly fixture.

Special tool 201 589 00 59 00

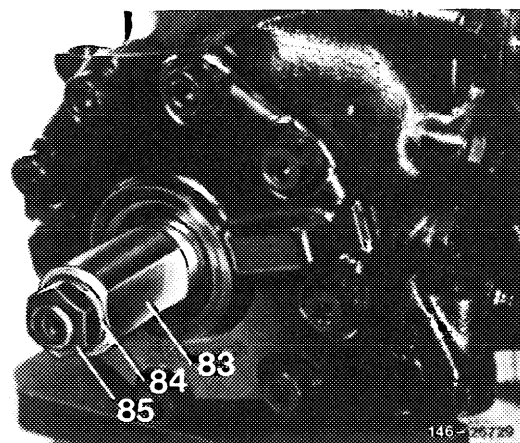


2 Remove locking ring, take off screw and pull pitman arm from pitman shaft.

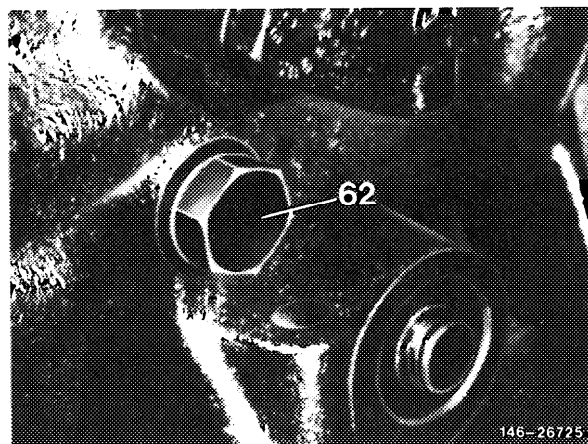
Special tool 000 589 88 33 00



3 On steering gear 1st version, remove hex. nut (85) as well as dowel sleeve (83).

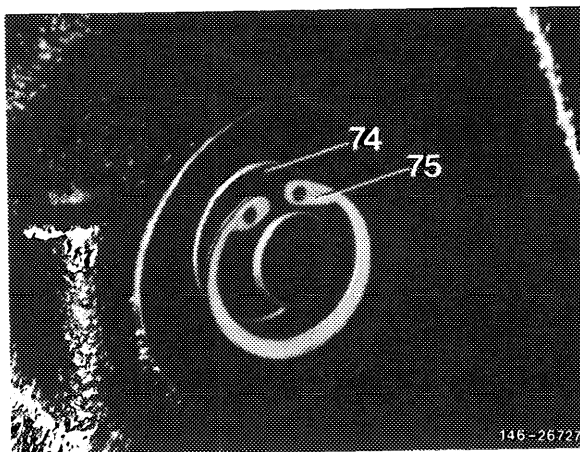


4 Unscrew closing screw (62) for center position and turn steering worm until working piston is approximately at lefthand or righthand lock.

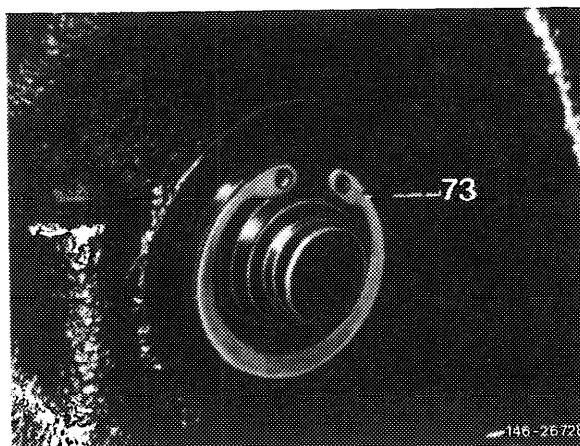




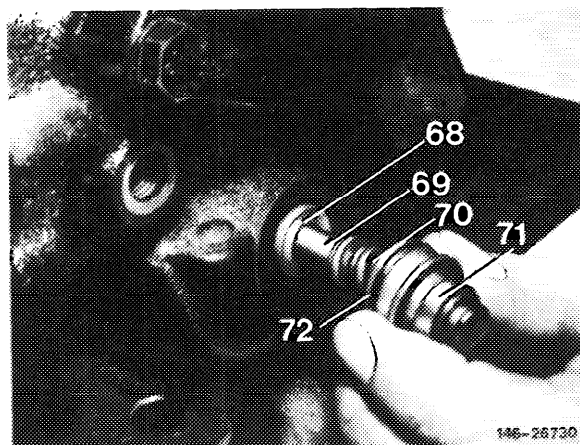
5 Take locking ring (75) and thrust ring (74) out of steering case.



6 Remove locking ring (73) from steering case.



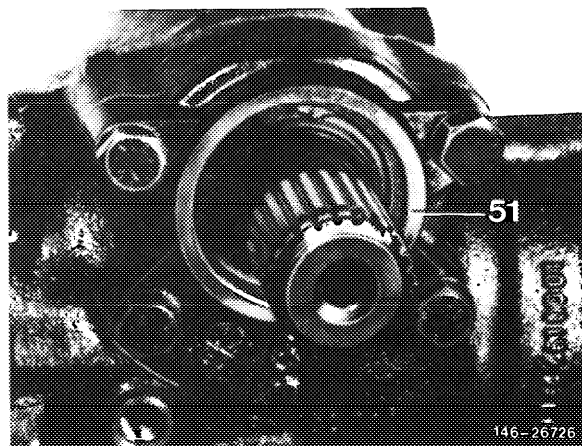
Remove cover (71), spring (70), spring bolt (69) and bushing (68).



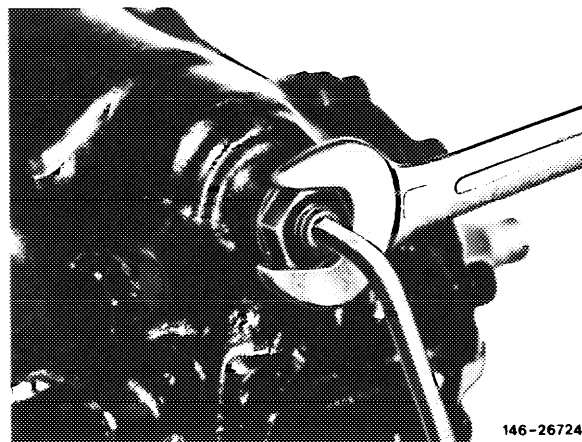
**Attention!**

Turn steering to center position. If steering is not in center position, the steering case will be damaged inside when the pitman shaft with case cover is forced out.

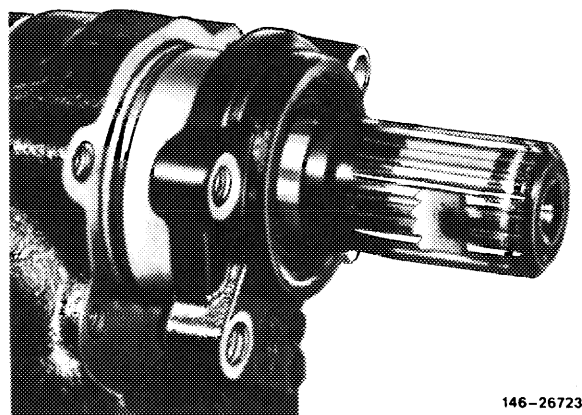
8 Unscrew self-locking hex. head screws for fastening steering case cover (51).



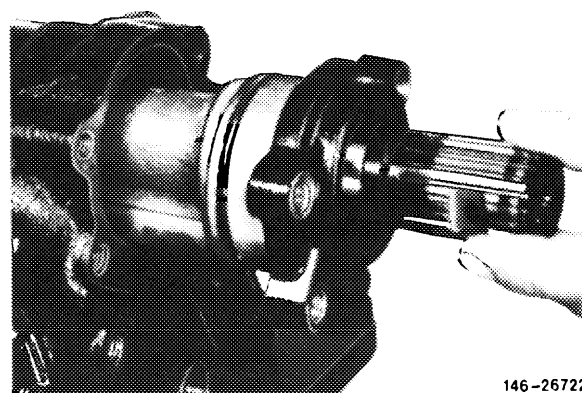
9 Unscrew self-locking hex. nut of adjusting screw while applying counterhold to adjusting screw.



10 Turn adjusting screw to the right in center position of steering, as a result the pitman shaft and case cover will be forced out of steering case.



11 Pull pitman shaft out of steering case cover.

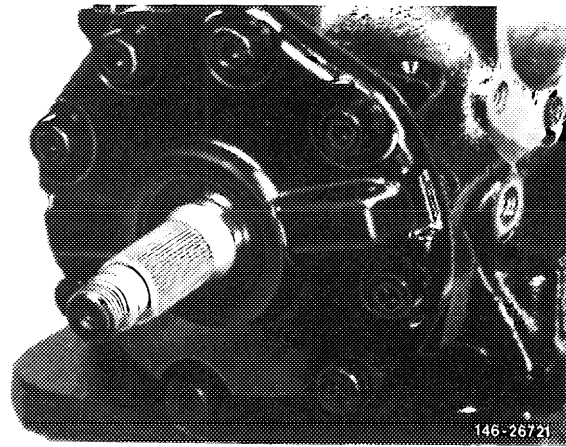


12 Unscrew hex. socket screws for fastening bearing cap.

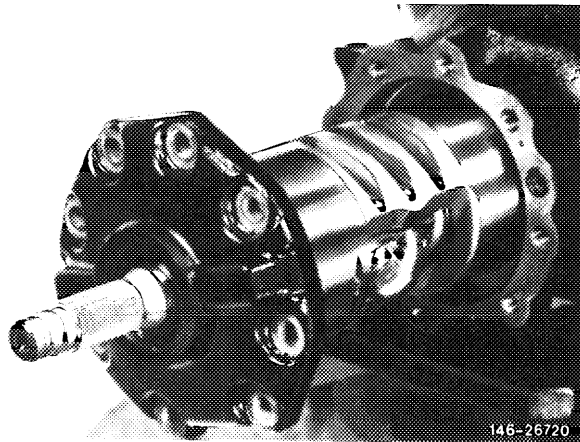
13 Turn steering worm to the left until the bearing cap is pushed slightly out of steering case.

**Attention!**

Do not turn steering worm too much, since otherwise the bails will fall out of ball circuit.



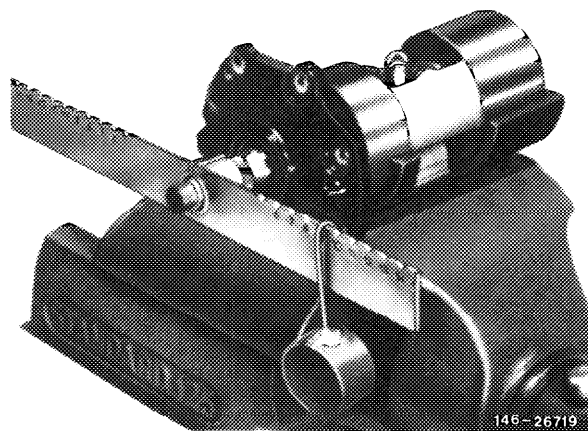
14 Remove bearing cap with steering worm and working piston out of steering case.



15 Place measuring device on splining of steering worm and measure friction torque of ball circuit. The friction torque steering nut  $\leftrightarrow$  steering worm should amount to 5-50 Ncm (i.e. 50 g in notch "10" as lowest or 500 g in notch "6" to "12" as highest friction torque).

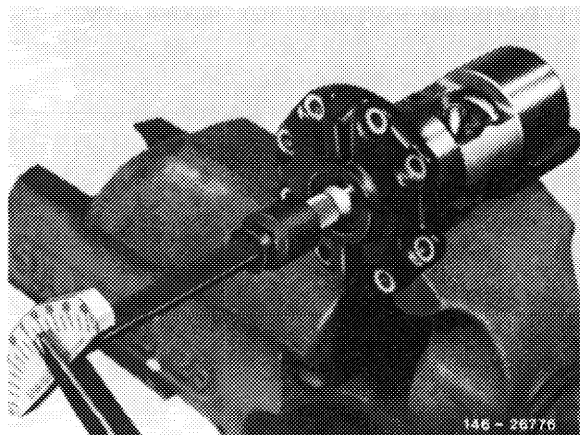
Special tool 116 589 03 21 00  
201 589 02 59 00

If the friction torque is lower, the ball circuit has play, if it is higher, the ball circuit is damaged. In both cases, renew steering.

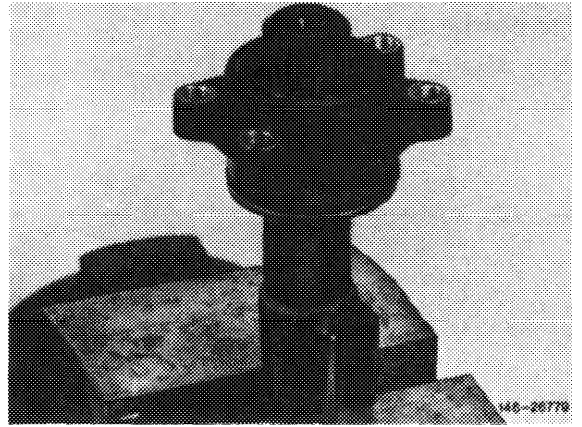


16 The friction torque can also be measured with torque wrench in combination with wrench socket.

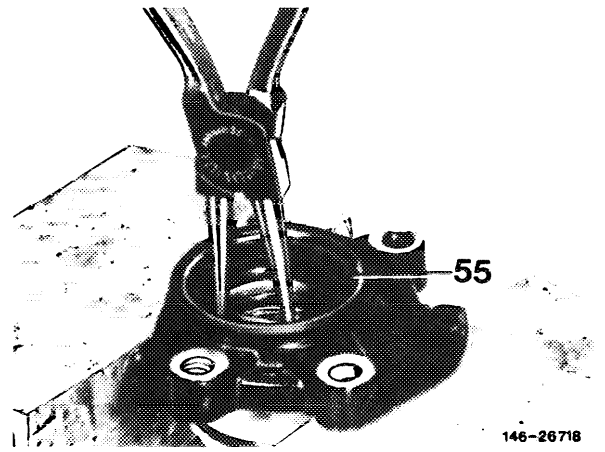
Special tool 123 589 02 21 00,  
123589000800



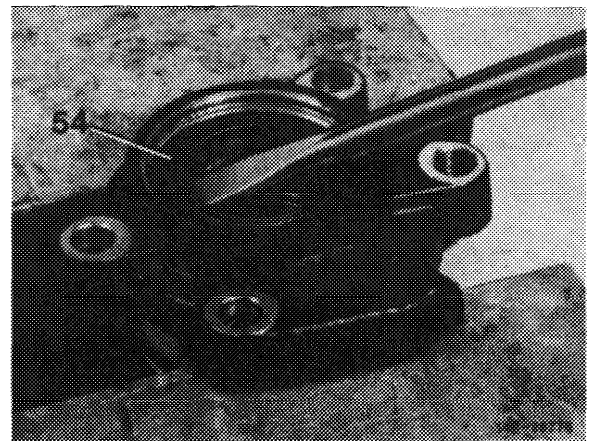
17 Remove steering case cover from pitman shaft.



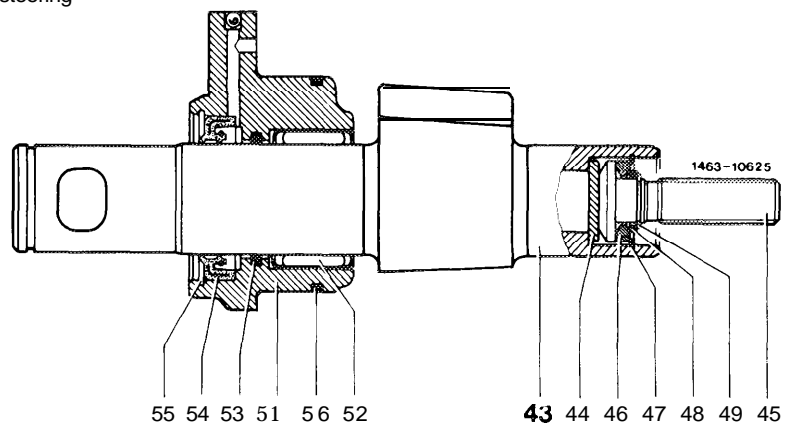
18 Take locking ring (55) out of steering case cover.



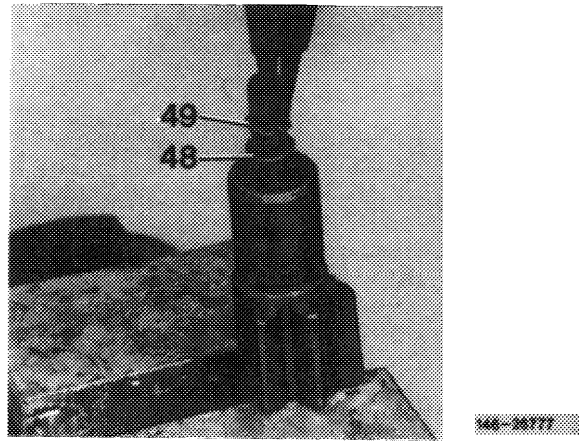
19 Force radial sealing ring (54) out of steering case cover by means of a screwdriver.



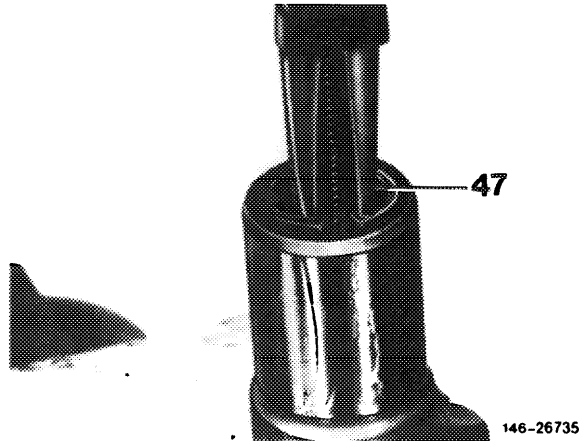
20 Remove O-rings (53 and 56) out of steering case cover.



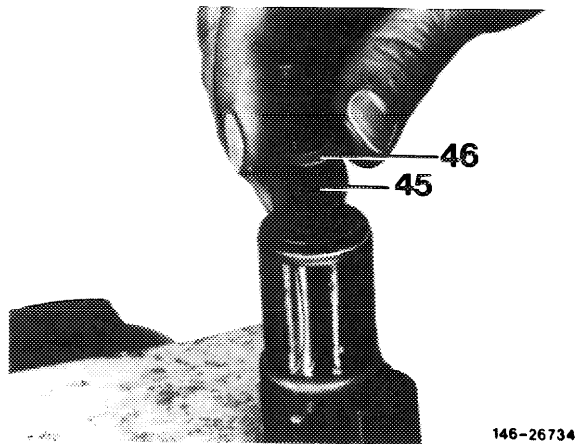
21 Take locking ring (49) out of adjusting screw.  
Then remove thrust ring (48).



22 Take locking ring (47) out of pitman shaft.

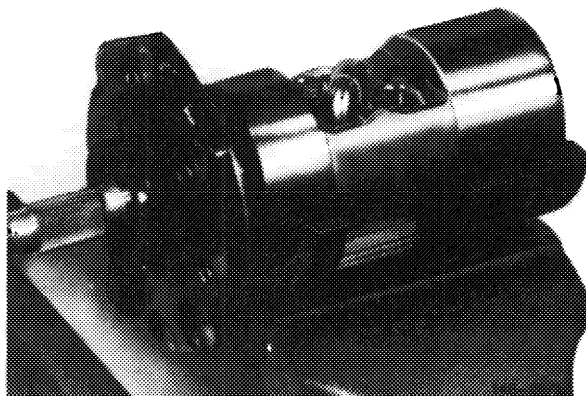


23 Remove adjusting screw (45) with thrust washer (46).

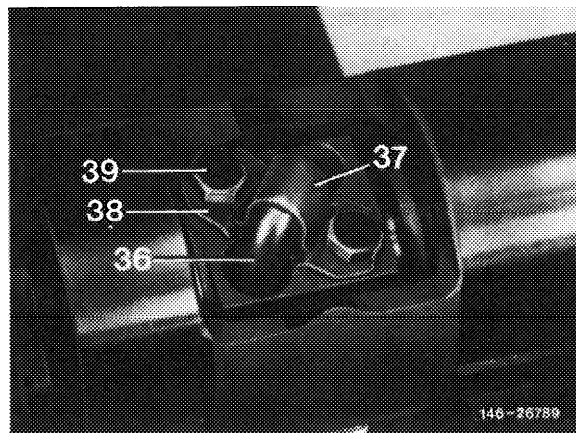


24 Place bearing cap with steering worm and working piston into assembly tray.

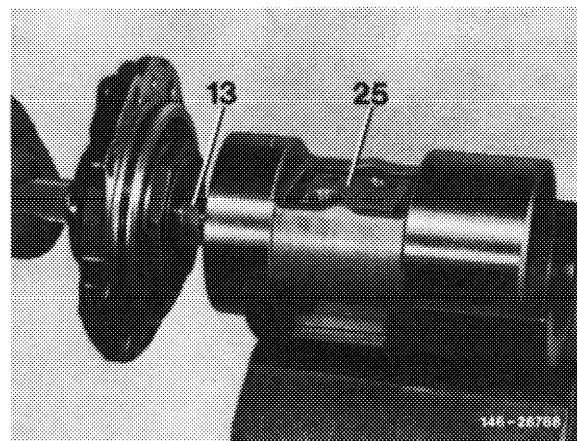
Special tool 201 589 02 59 00



25 Unbend locking plate (38), unscrew hex. head screws (39) and remove locking plate, holding clamp (37) and both ball guide halves (36).

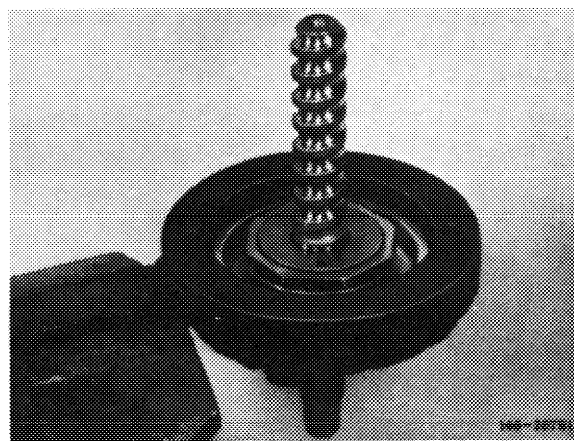


26 Unscrew steering worm (13) from steering nut (25). Make sure that no balls (23 each) are lost.



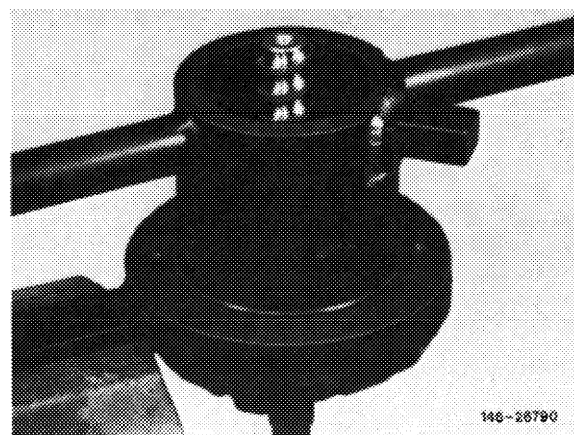
27 Remove O-ring from bearing cap and screw bearing cap into fixture.

Special tool 201 589 05 31 00



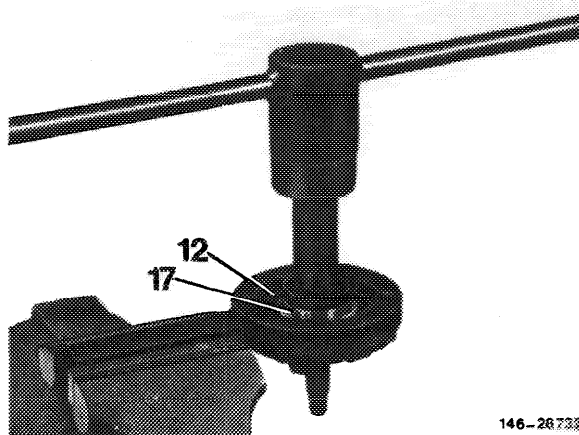
28 Unscrew hex. nut with tommy handle and socket wrench from bearing insert.

Special tool 201 589 02 09 00,  
1 2 6 5 8 9 0 0 1 6 0 0



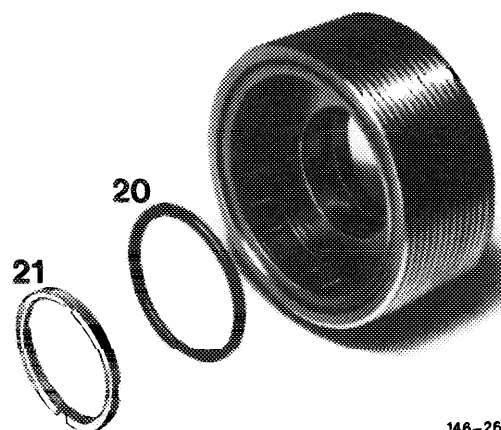
29 Unscrew bearing insert (17) with slot nut wrench out of bearing cap (12).

Special tool 201 589 00 07 00,  
123 589 01 16 00



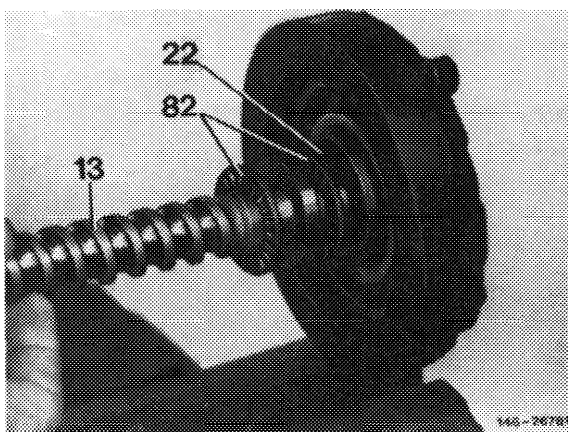
146-26733

30 Take teflon ring (21) and O-ring (20) out of bearing insert.



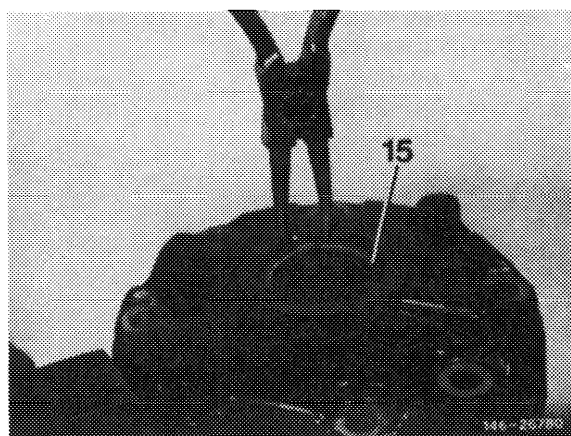
146-26731

31 Pull steering worm (13) out of bearing cap, take axial bearing (82) and washer (22) from steering worm.



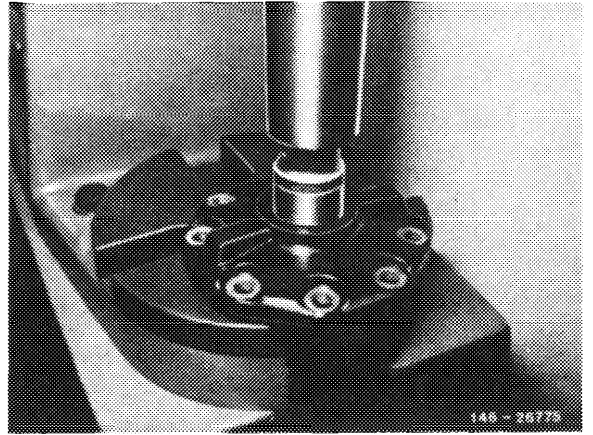
146-26781

32 Remove locking ring (15) from bearing cap.



146-26780

33 Force sealing ring out of bearing cap.



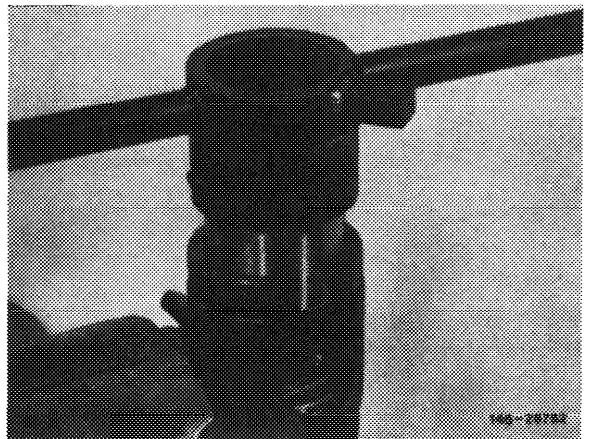
34 Insert working piston in assembly fixture and secure with plug.

Special tool 201 589 01 59 00



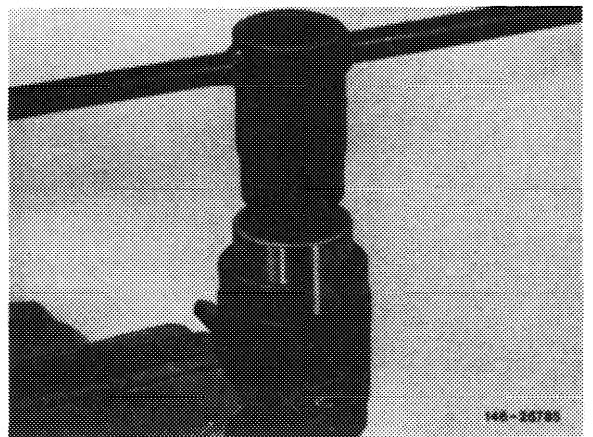
35 Unscrew slot nut with slot nut wrench and tommy handle from screw cover.

Special tool 126 589 00 16 00,  
201 589 01 07 00



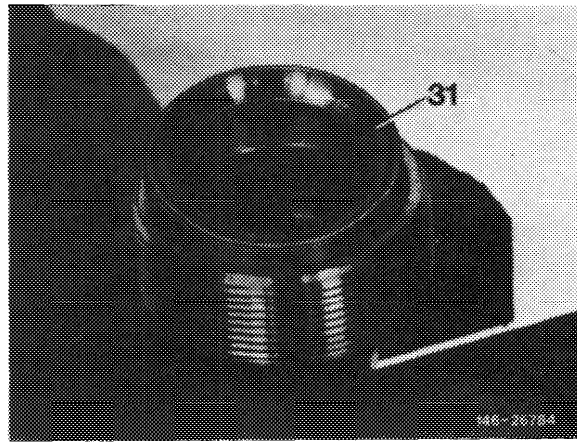
36 Unscrew screw cover with socket wrench and tommy handle from working piston.

Special tool 123 589 01 16 00,  
201 589 03 09 00

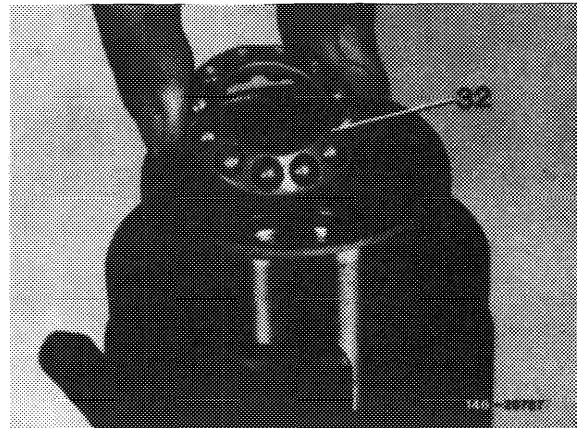




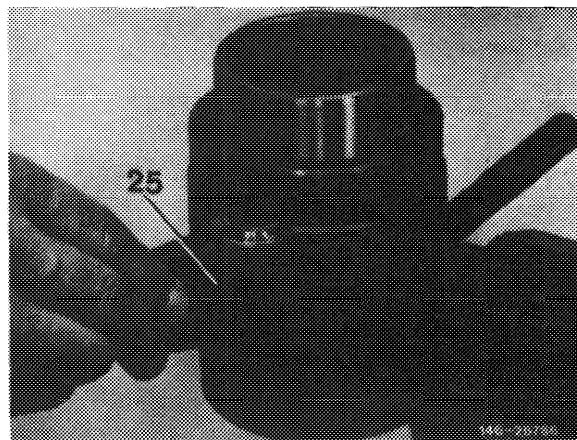
37 Take outer race (31) out of screw cover.



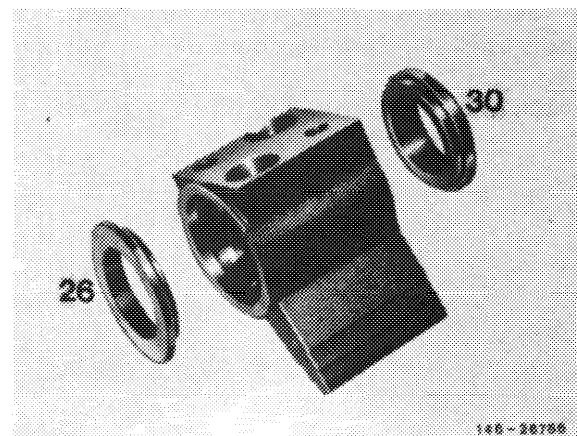
38 Remove ball cage (32) from steering nut.



39 Remove steering nut (25) from working piston.



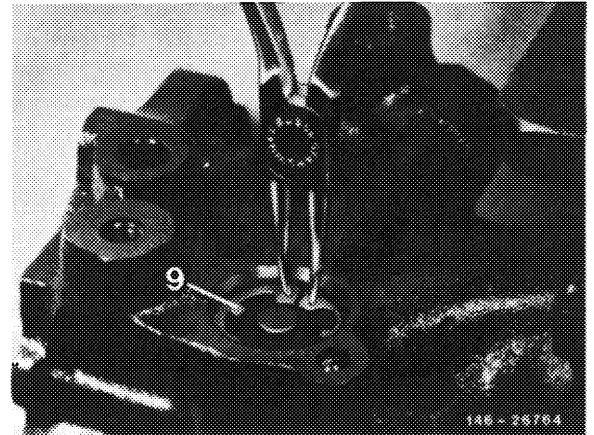
40 Force inner race (30) and bearing ring (26) out of steering nut.



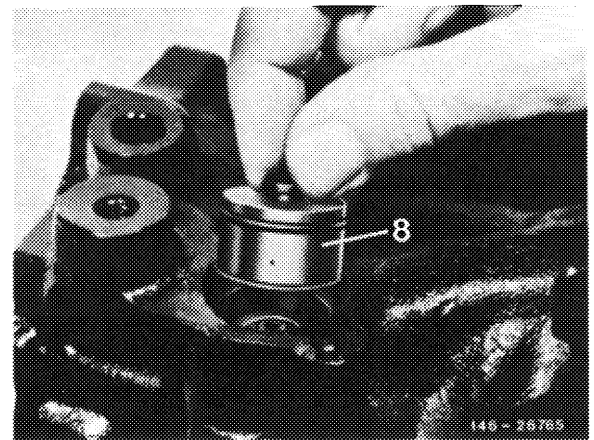
41 Take axial needle cage (28) and axial washer (27) out of working piston.



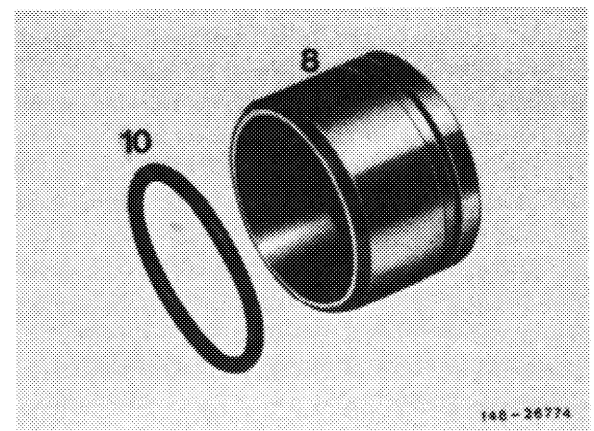
42 Take locking ring (9) out of steering case.



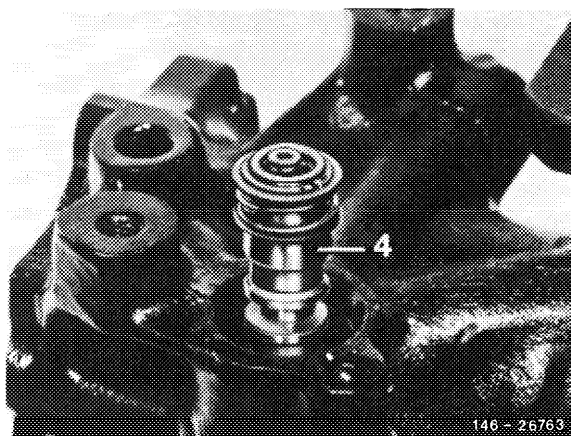
43 Pull closing cap (8) out of steering case.



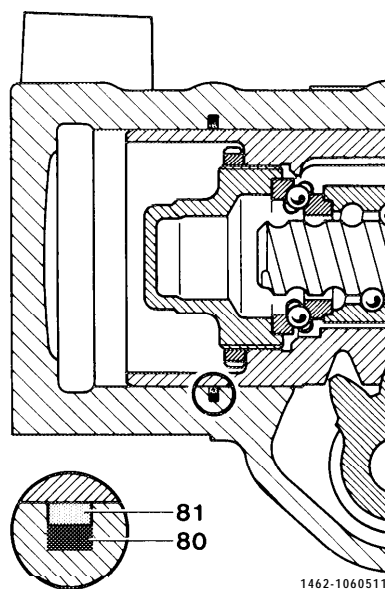
44 Remove O-ring (10) from closing cap (8).



45 Pull control valve (4) out of steering case. Make sure that the springs are not falling out of reaction piston.



46 Carefully remove teflon ring (81) and O-ring (80) from steering case.



## Checking

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Apply strict standards when checking steering components. When in doubt, replace respective part on principle.

**Note:** The ball circuit, that is, the steering worm and the steering nut, are assembled free of play at factory.

To maintain the specified clearance of 0.006 to 0.01 mm between straightedge of steering nut and control valve, both parts are assembled by selection. The same applies to steering case and the control valve mounted inside case. For this reason, except for gasket and bearing set, only the pitman shaft, the working piston and the case cover are available as spare parts.

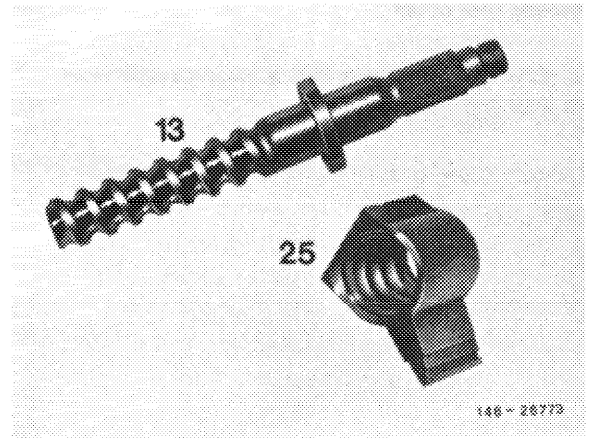
### Steering worm, steering nut

47 Check ball circuit of steering worm (13) and steering nut (25).

If score marks are showing up, renew steering.

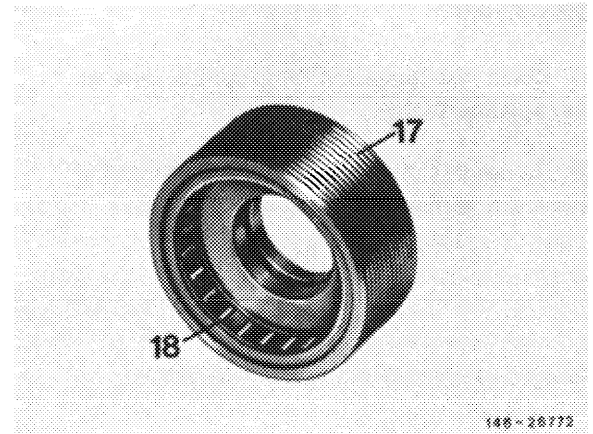
**Note:** Pitch of ball circuit

Steering gear: 765 900 = 10 mm  
765 901 = 10 mm  
765901 = 11 mm  
765 903 = 10 mm  
765 904 = 10.5 mm  
765 905 = 10.5 mm



### Bearing insert

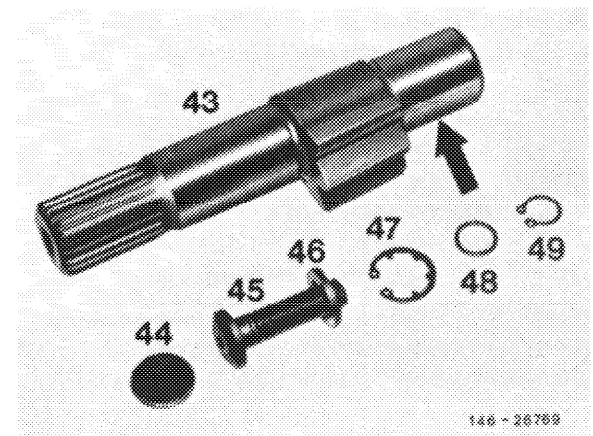
48 Check needle sleeve (18) for wear. If needle sleeve is damaged, completely renew bearing insert (17).



### Pitman shaft

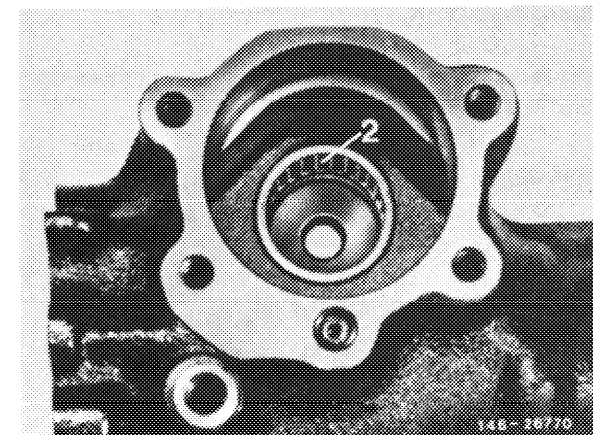
49 Check pitman shaft at bearing points and on tooth segment for wear. Check for distortion or other damage. Particularly check upper bearing point (arrow) of pitman shaft.

- 43 Pitman shaft
- 44 Thrust washer
- 45 Adjusting screw
- 46 Thrust washer
- 47 Locking ring
- 48 Thrust ring
- 49 Locking ring



### Steering case

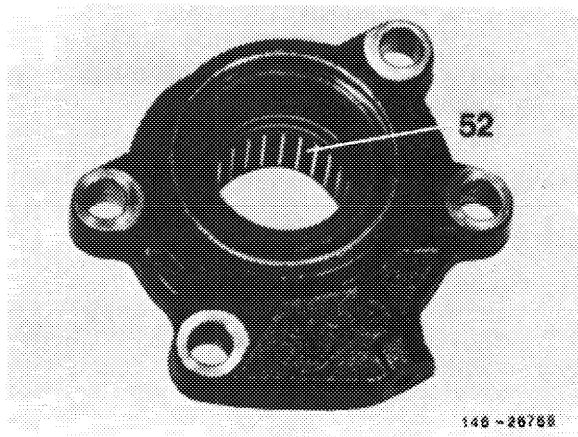
50 Check needle sleeve (2) in steering case for wear and quiet running. If needle sleeve is damaged, renew steering.



Steering case cover

51 Check needle sleeve (52) in steering case cover for wear and quiet running.

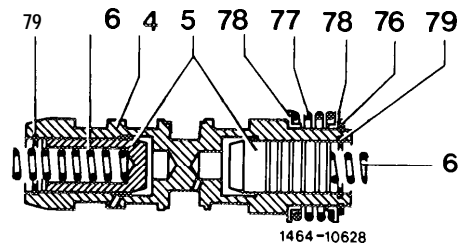
If needle sleeve is worn, completely renew cover.



Control valve

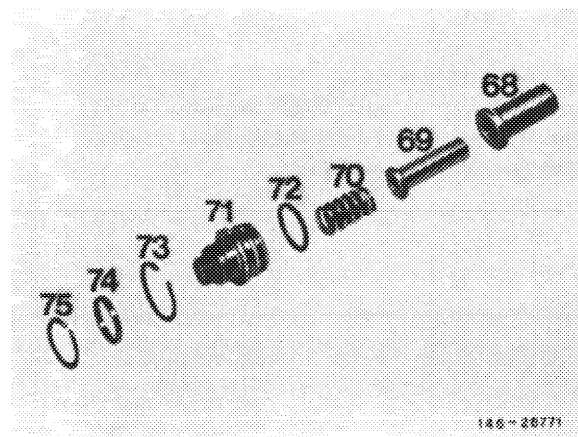
52 Check reaction piston (5) in control valve for easy operation.

53 Do not mix up springs (6) and compensating washers of both reaction pistons.



54 Check individual parts of compensation for play, particularly spring bolt (69) for wear.

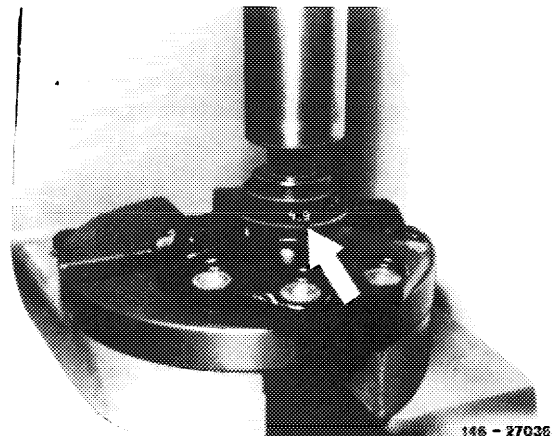
- 68 Bushing
- 69 Spring bolt
- 70 Compression spring
- 71 Cap
- 72 O-ring
- 73 Locking ring
- 74 Thrust ring
- 75 Locking ring



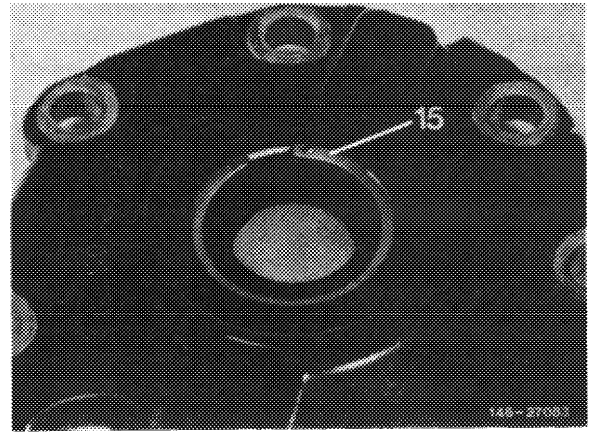
Bearing cap

55 Press sealing ring (14) with mandrel into bearing cap. Pressing-in depth 4.9 mm (arrow).

Special tool 201 589 05 31 05



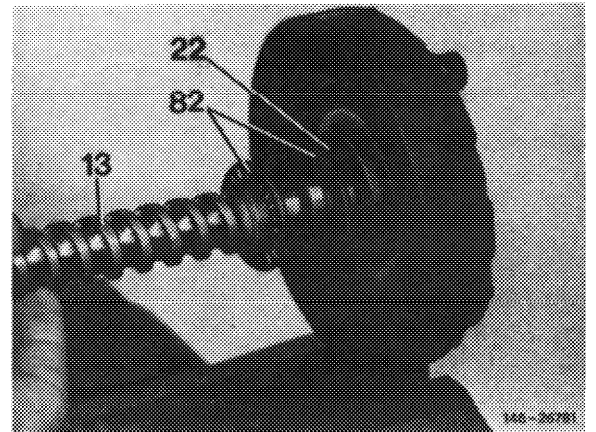
56 Insert locking ring (15) into bearing cap.



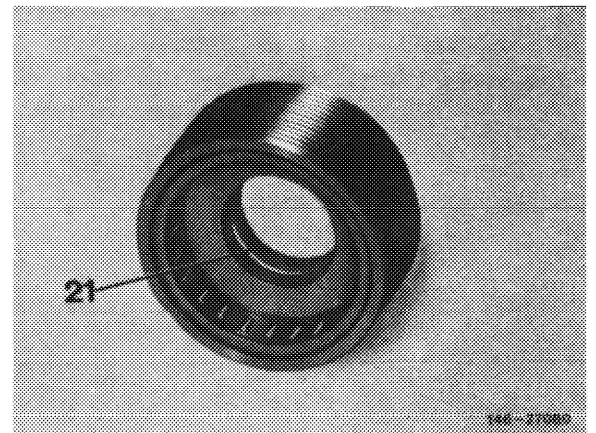
57 Screw bearing cap to fixture and clamp into vice.

Special tool 201 589 05 31 00

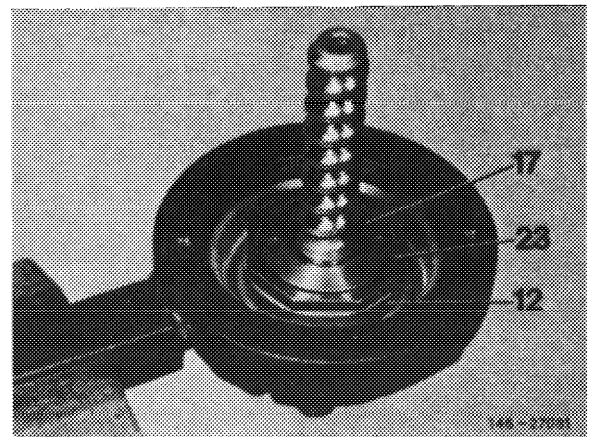
58 Slip washer (22) and axial bearing (82) on steering worm and insert steering worm into bearing cap. Make sure that the sealing ring is not damaged.



59 Insert O-ring and teflon ring (21) into bearing insert.

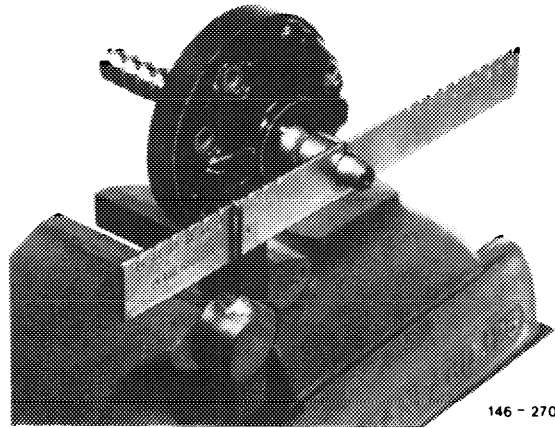


60 Screw bearing insert (17) into bearing cap (12) and tighten slightly. Screw hex. nut (23) with chamfer toward bearing cap on bearing insert.



61 Measure friction torque of steering worm in bearing cap (sealing parts only); for this purpose, place measuring device on splining of steering worm. The friction torque should amount to  $\leq 12$  Ncm = 200 g in notch 8-9 of measuring device.

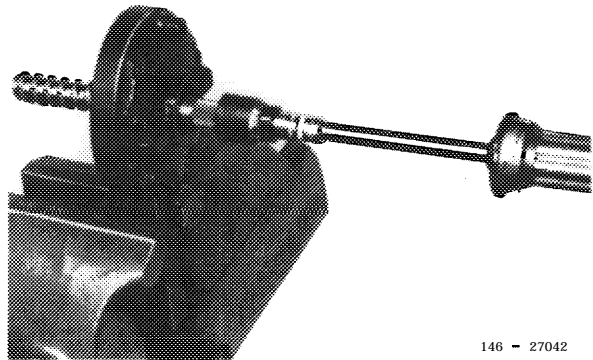
Special tool 116 589 03 21 00



146 - 27038

62 The friction torque can also be measured with torque screwdriver in combination with wrench socket.

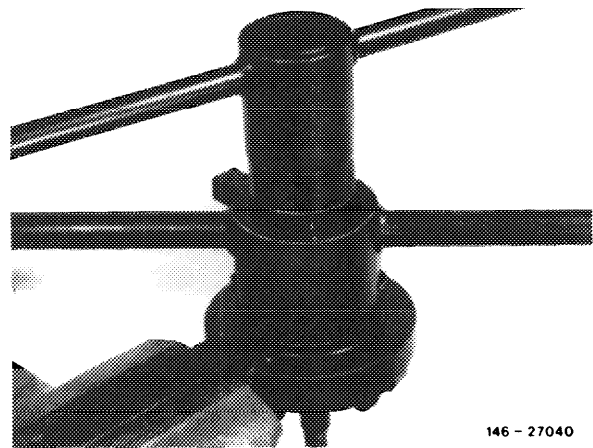
Special tool 123 589 02 21 00  
123589000800



146 - 27042

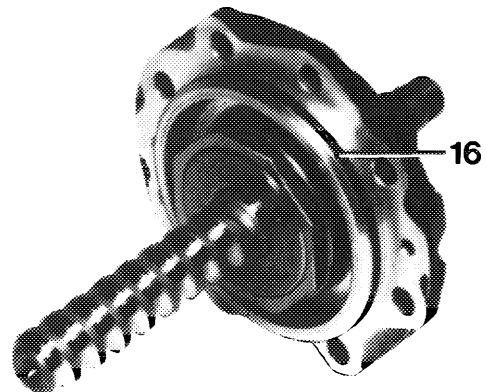
63 Tighten bearing insert (17) with socket wrench and tommy handle until an additional amount of friction torque of 4-7 Ncm is measured. Tighten hex. nut to 220-240 Nm and check friction torque once again.

Special tool 126 589 00 16 00  
201 589 02 09 00  
123 589 01 16 00  
201 589 00 07 00



146 - 27040

64 Remove bearing cap with steering worm from fixture and insert O-ring (16).

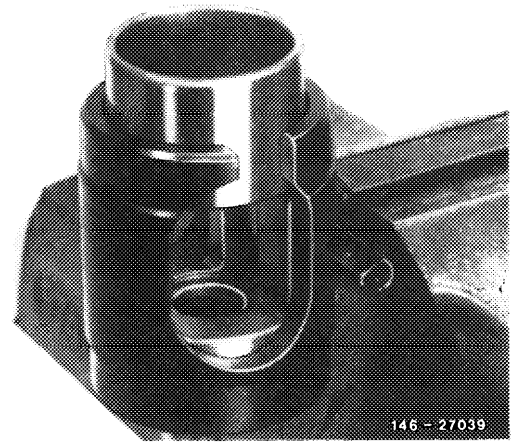


146 - 27041

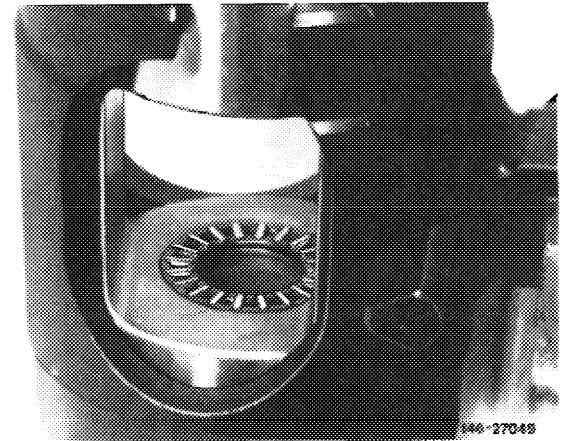
Working piston and steering nut

65 Insert working piston into fixture and secure with plug.

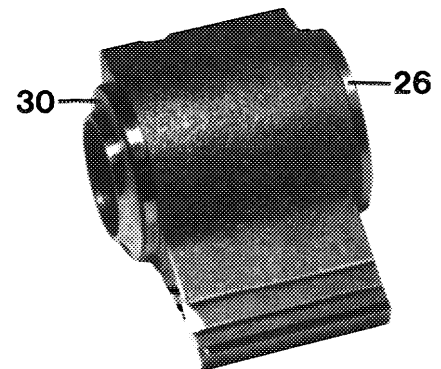
Special tool 201 589 01 59 00



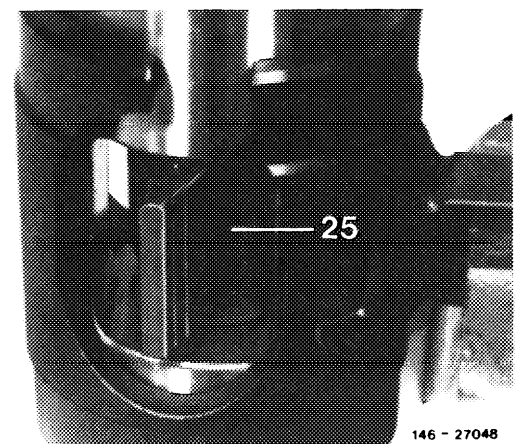
66 Insert axial washer and axial needle cage into working piston.



67 Insert bearing ring (26) and inner race (30) into steering nut.

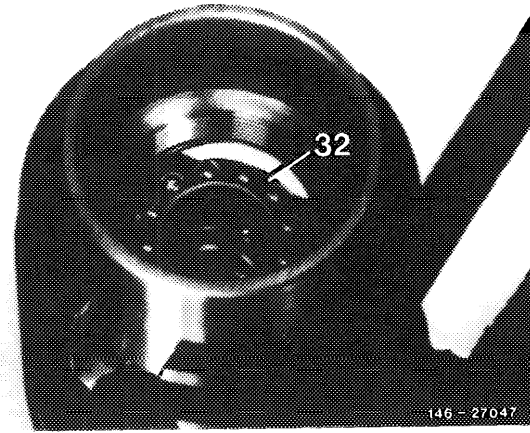


68 Insert steering nut (25) into working piston in such a manner that the bearing ring rests on axial needle cage.

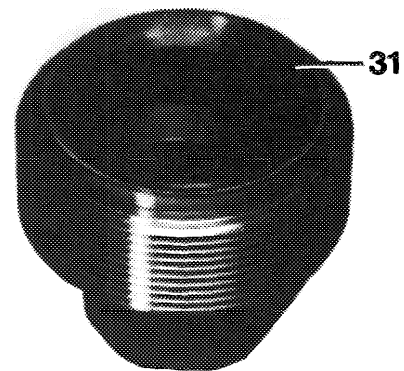




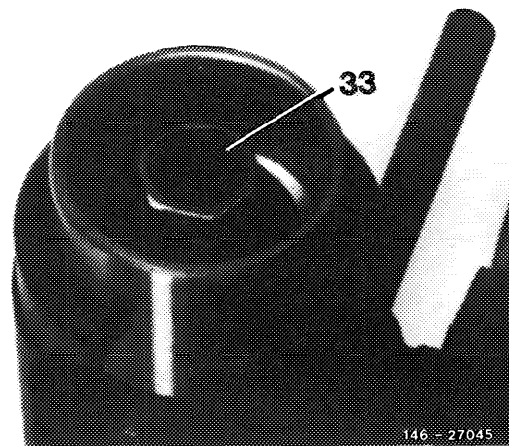
69 Place ball cage (32) on steering nut in working piston.



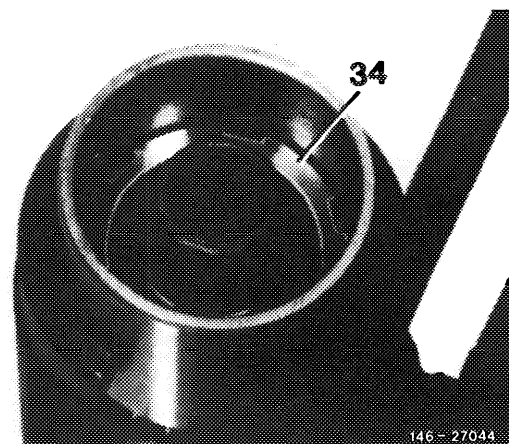
70 Push outer race (31) up to stop into screw cover.



71 Screw screw cover (33) into working piston.

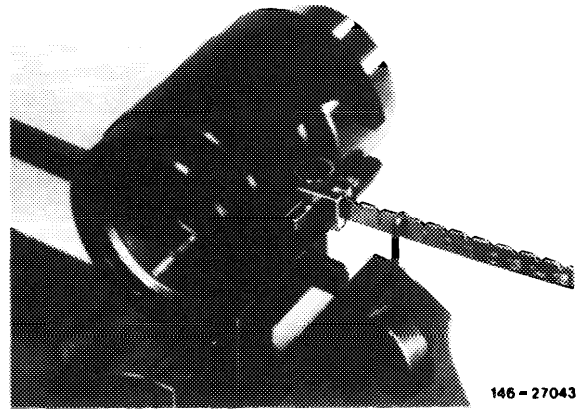


72 Screw slot nut (34) on screw cover and tighten slightly.



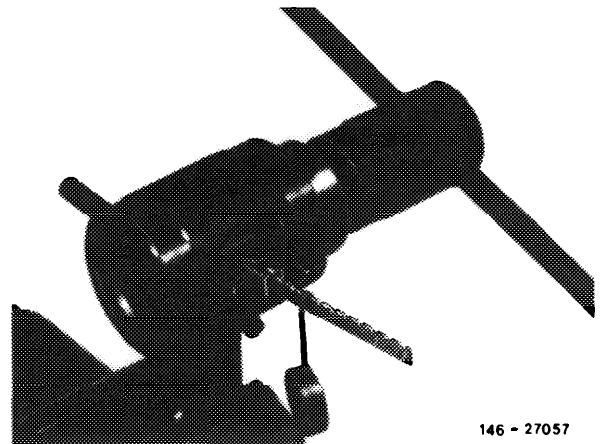
73 To measure friction torque of steering nut in working piston slip measuring device on straight-edge of steering nut.

Special tool 116 589 02 21 00



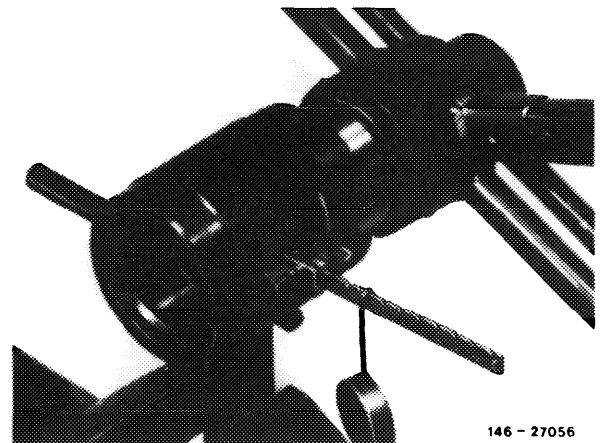
74 The friction torque should be 6-10 Ncm = 100 g in notch "6" to "10" of measuring device. To adjust screw cover tighten with socket wrench and tommy handle until the weight on measuring device is just barely turning the steering nut.

Special tool 123 589 01 16 00  
201 589 03 09 00



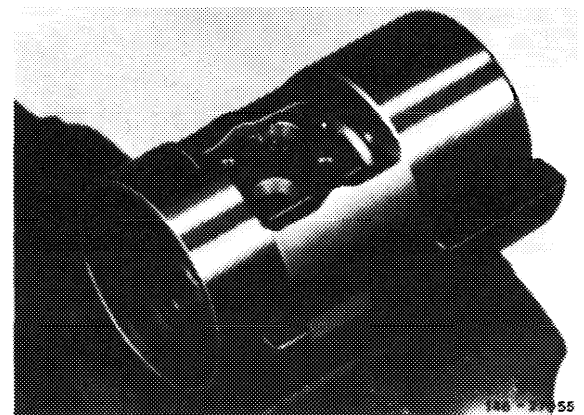
75 Tighten slot nut to a tightening torque of 200-240 Nm, while applying counterhold to screw cover. Then check friction torque of steering nut once again.

Special tool 126 589 00 16 00  
001 589 67 21 00  
201 589 01 07 00



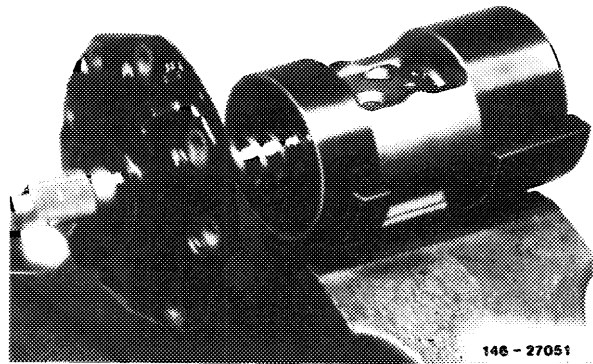
76 Remove working piston from device and place into assembly tray.

Special tool 201 589 02 59 00

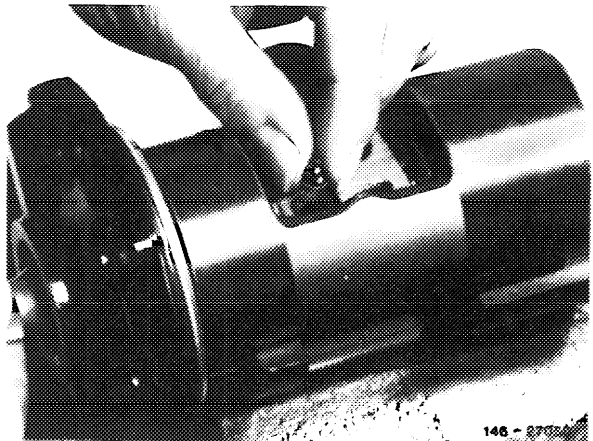


## Steering worm, steering nut

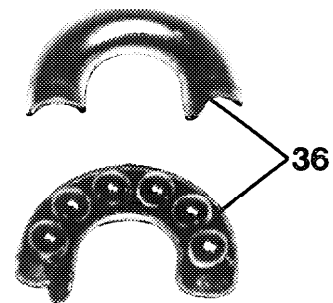
77 Introduce steering worm into steering nut until one ball race is fully seen through bore (for balls).



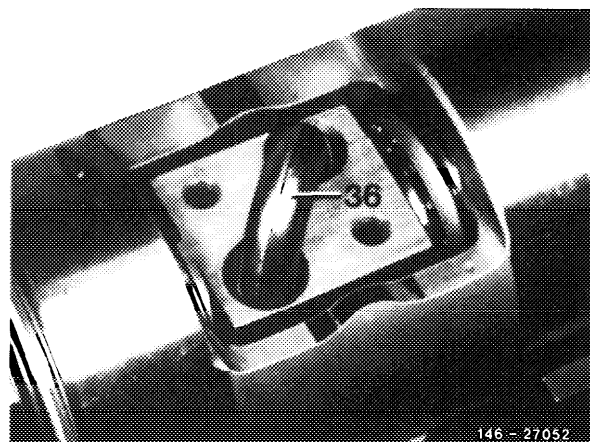
78 While slowly turning steering worm to the right, insert 17 balls into ball circuit.



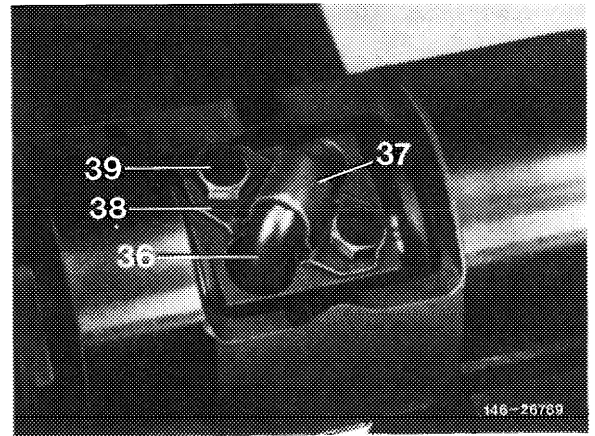
79 Fill one ball guide half (36) with grease and insert the remaining 6 balls. Place both ball guide halves on each other and close the openings with grease.



80 Insert ball guide halves (36) into steering nut.



81 Mount fastening clamps (37) and locking plates (38) on steering nut. Screw in hex. screws (39) and tighten to 12-16 Nm. Lock hex. head screws.

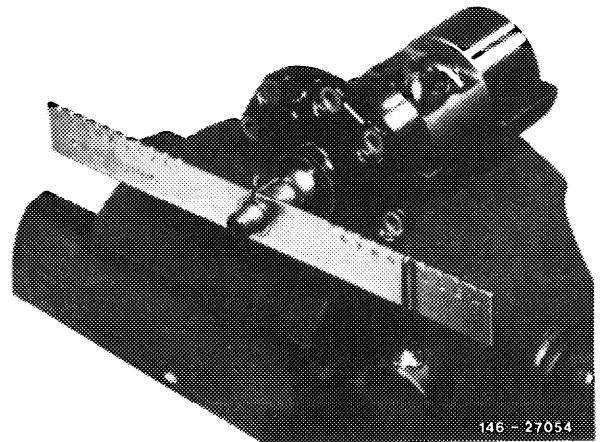


82 Place measuring device on splining of steering worm and measure friction torque of ball circuit.

Friction torque steering nut — steering worm should be 5–50 Ncm in mean range (i.e. 50 g in notch “10” as lowest or 500 g in notch “6” to “12” as highest friction torque).

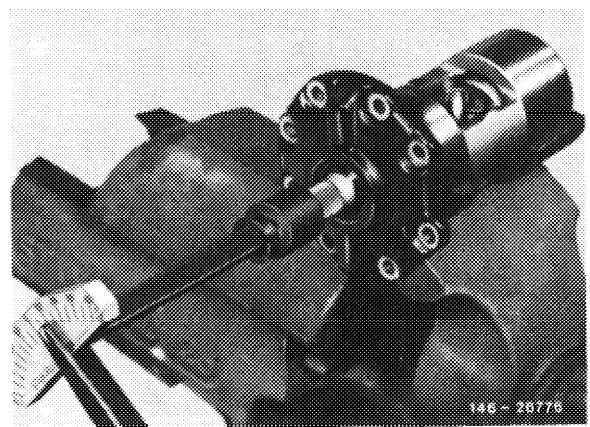
In a used steering gear the friction torque can increase outside center to 50 Ncm.

Special tool 116 589 03 21 00

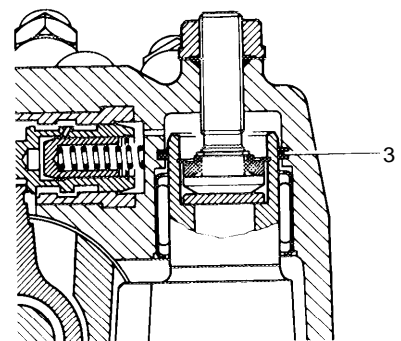


83 The friction torque can also be measured with the torque wrench in combination with a wrench socket.

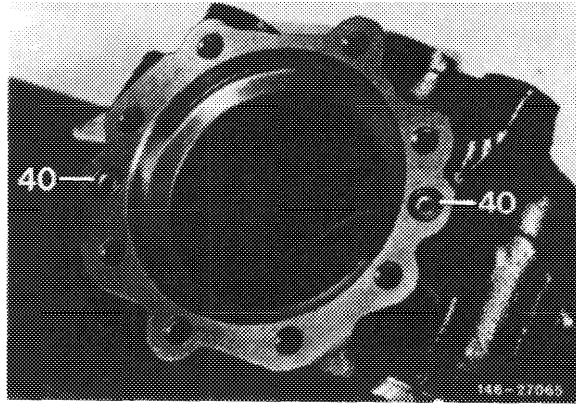
Special tool 123 589 02 21 00  
123589000800



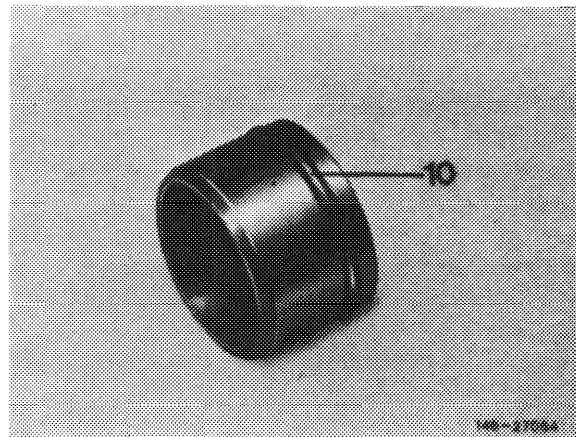
84 Insert O-ring (3) into steering case.



85 Insert O-rings (40) for bearing cap into steering case



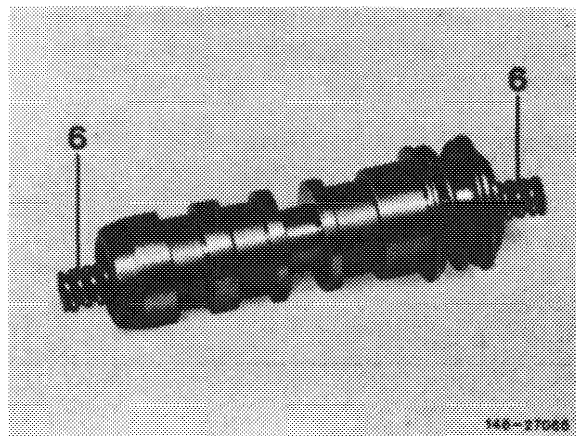
86 Insert O-ring (10) on closing cap for control valve.



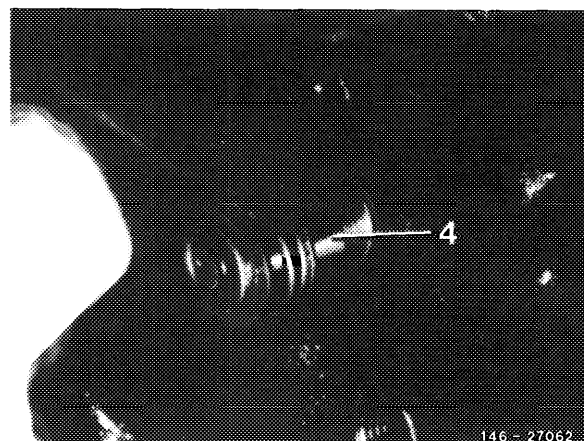
87 Grease springs (6) and insert into reaction pistons.

**Attention!**

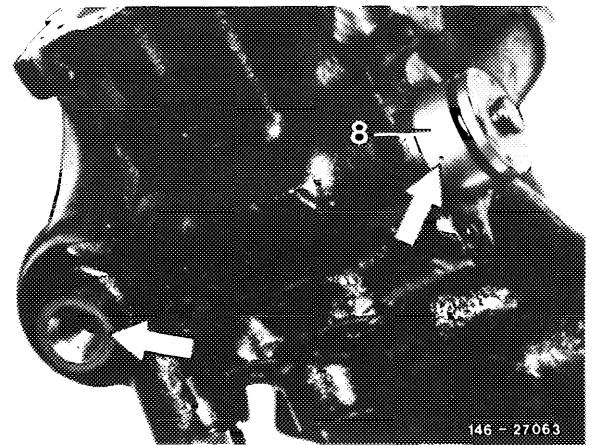
Do not mix up springs (6).



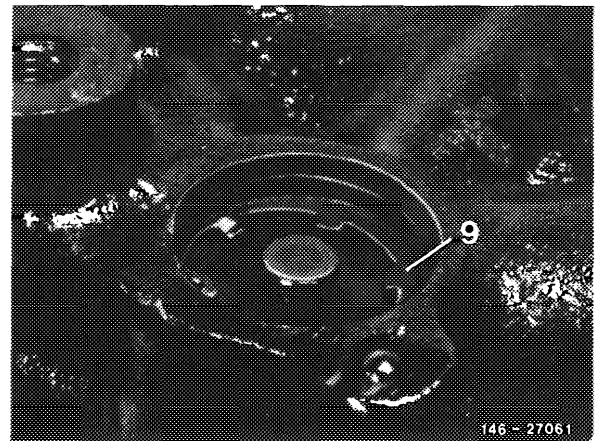
88 Insert control valve (4) into steering case, making sure that the springs are not falling out of control valve.



89 Punch closing cap (8) with a plastic hammer into steering case in such a manner that the bore in closing cap (arrow) points toward tapped hole for adjusting screw (arrow).



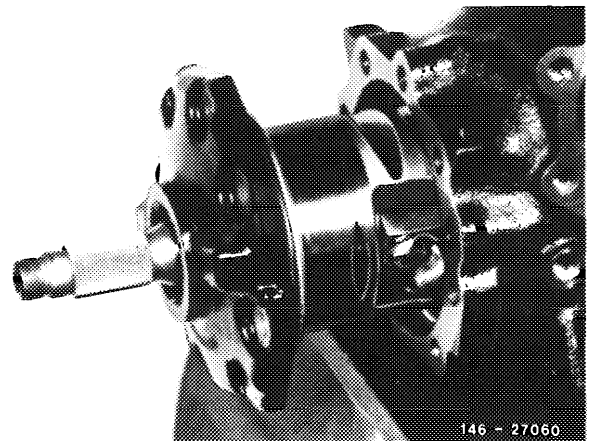
90 Insert locking ring (9) into steering case in such a manner that the lugs are pressing on closing cap. The locking ring should be correctly seated in groove of steering case.



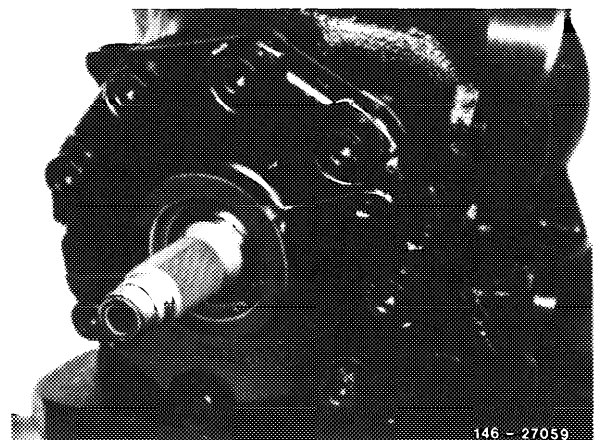
#### Steering case, working piston

91 Carefully introduce working piston complete with steering worm, steering nut and bearing cap into steering case, so that the straightedge of the steering nut is entering into groove of control valve.

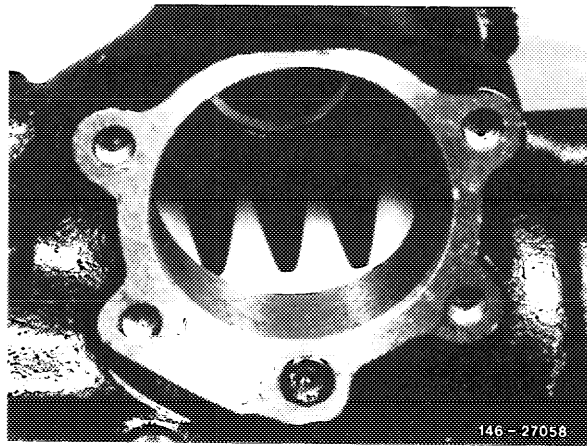
92 Turn bearing cap in such a manner that the oil channel on steering case is in alignment with oil bore in bearing cap. Pay attention to correct seat of O-rings.



93 Screw in hex. socket screws and tighten to 70-75 Nm.



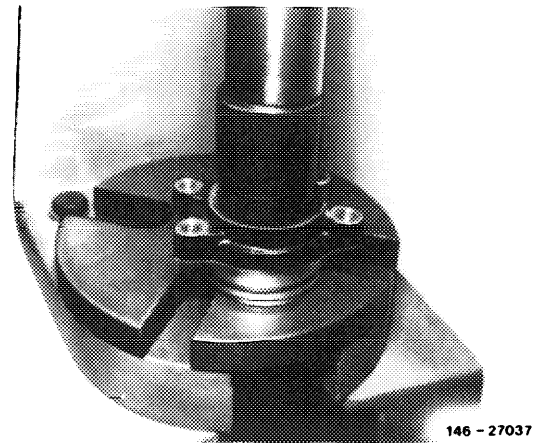
94 Turn steering worm in such a manner that the center tooth gap is in center of steering case.



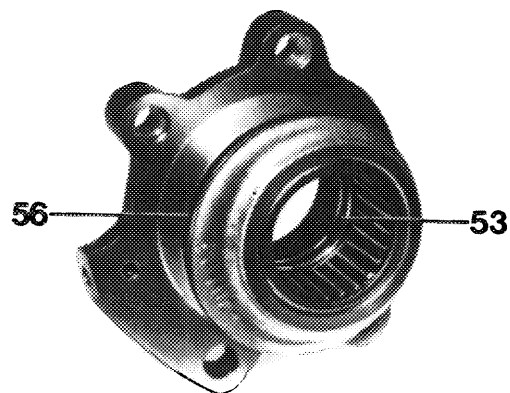
#### Pitman shaft, steering case cover

95 Press sealing ring with mandrel into steering case cover and mount locking ring.

Special tool 201 589 06 15 00



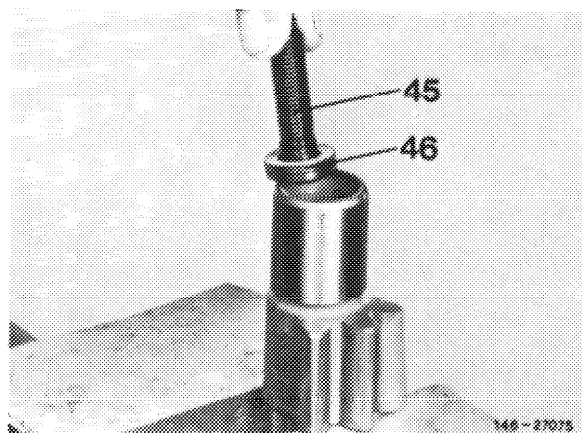
96 Insert O-rings (53) and (56) into steering case cover.



146 - 27067

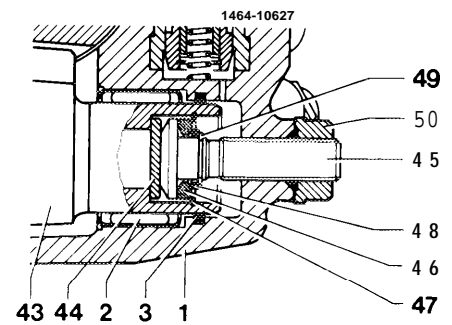
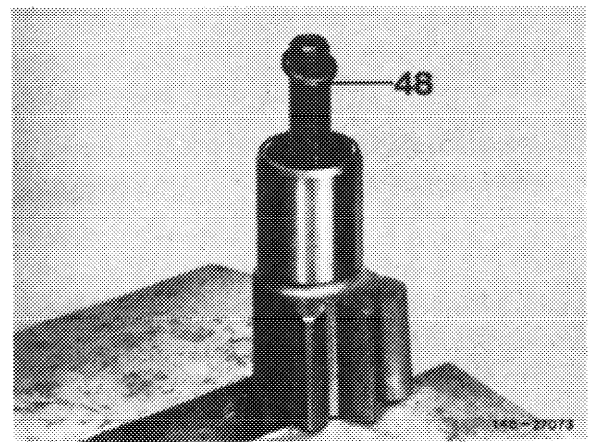
97 Insert adjusting screw (45) and thrust washer (46) into pitman shaft and mount locking ring. Pay attention to perfect seat of locking ring.

**Note:** The adjusting screw should be mounted in pitman shaft as much as possible free of play. For this purpose, thrust washers of the following thickness are available: 2.65 — 2.70 — 2.75 — 2.80 — 2.85 — 2.90 — 2.95 — 3.00 — 3.05 — 3.10 mm.

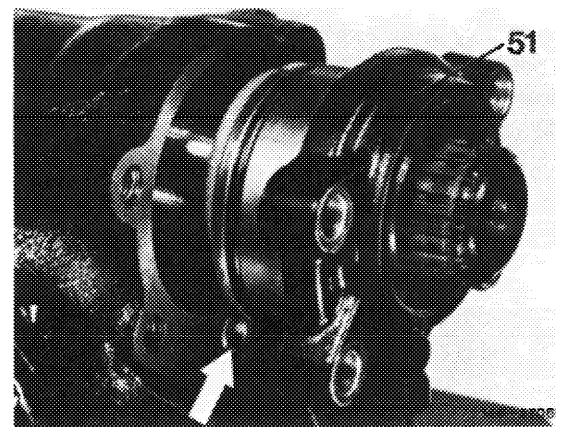


146 - 27075

98 Place thrust ring (48) on adjusting screw and mount locking ring (49).

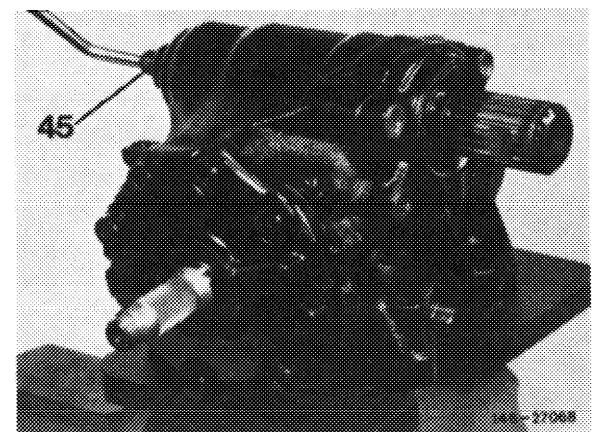


99 Slip steering case cover (51) on pitman shaft and introduce pitman shaft into steering case, so that the center tooth of the pitman shaft enters into center tooth gap of working piston. Pay attention to correct seat of O-ring (arrow).



100 Screw adjusting screw (45) into steering case until it is hard to move.

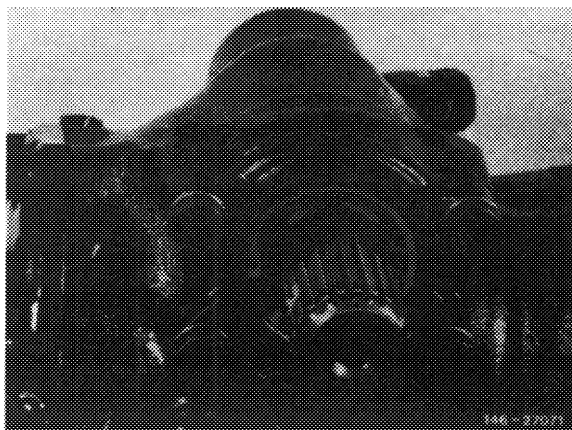
101 Turn steering case cover in such a manner that the oil channel and the bore in steering case cover are one above the other. Press steering case cover against steering case.





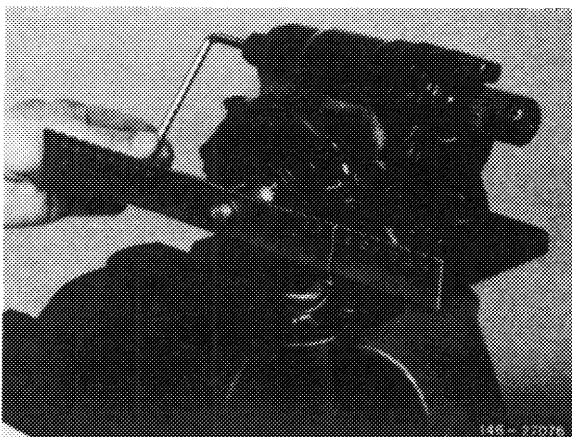
102 Screw new self-locking screws into steering case cover and tighten to 30-35 Nm.

103 Loosen adjusting screw (45) until the steering worm can be easily rotated. Measure friction torque of steering worm and write down friction torque.



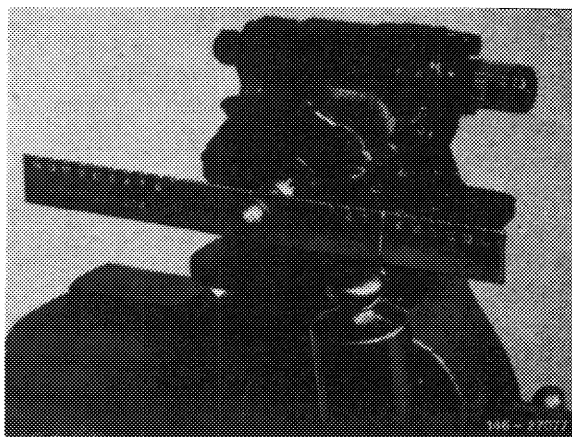
104 Slip measuring device on steering worm. Adjust pressure device of pitman shaft by turning adjusting screw counterclockwise until the friction torque is higher by 40-60 Ncm. This means that the friction torque of the steering worm amounts to 1 10–160 Ncm when the steering worm is turned beyond the center position. The steering is set correctly if a weight of 2000 g in notch "6" to "8" of measuring device turns the steering worm beyond center position.

Special tool 116 589 03 21 00



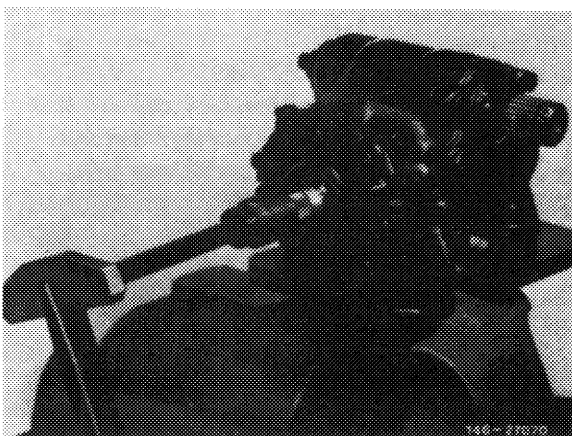
#### Attention!

When turning beyond center position a slight pressure point should be felt. When the steering worm is turned from lock to lock, the steering should not bind.



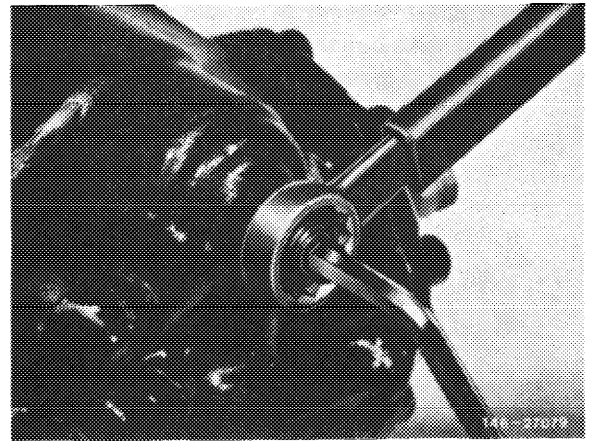
105 The friction torque can also be measured with torque wrench in combination with wrench socket.

Special tool 123 589 02 21 00  
123589000800



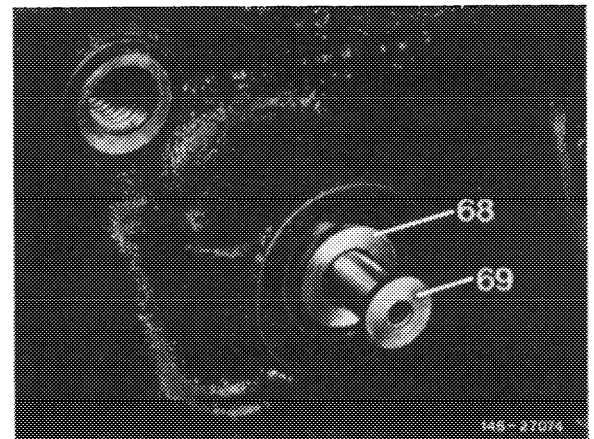
106 Screw SEAL-LOCK collar nut on adjusting screw and tighten to 60-65 Nm, while applying counterhold to adjusting screw.

107 Check total friction torque once again (item 104), which should amount to 1 10–160 Ncm = 2000 g in notch “6” to “8” of measuring device.



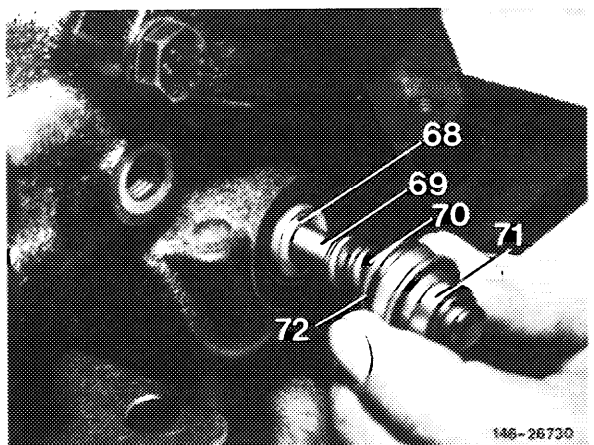
108 Slightly turn steering worm until the working piston is no longer in steering center.

109 Insert bushing (68) and spring bolt (69) into steering case.

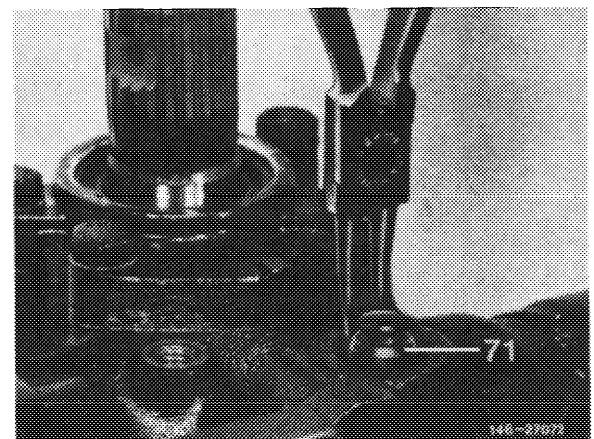


110 Renew O-ring (72) on cap (71).

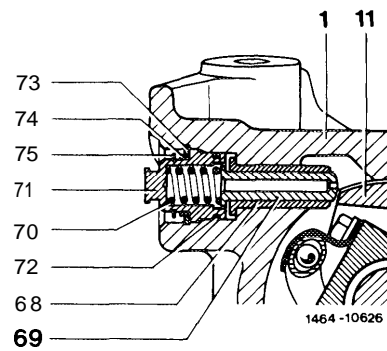
111 Insert compression spring (70) into cap and place cap with compression spring into steering case.



112 Push cap (71) against compression spring and insert locking ring.

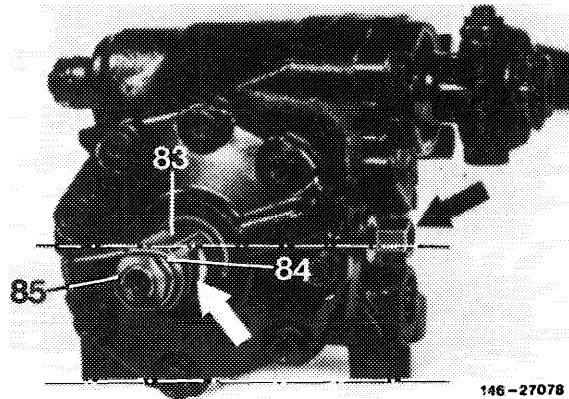


113 Place thrust ring (74) on cap and mount locking ring (75). Make sure that the locking ring is correctly seated in groove.



114 Screw center position control screw into steering (arrow), Slip dowel sleeve (83) onto steering worm so that the two surfaces are in parallel with fastening points of steering and the milled cut is pointing toward pitman arm (arrow).

115 Slip on supporting ring (84) and tighten nut (85) to 50 Nm.

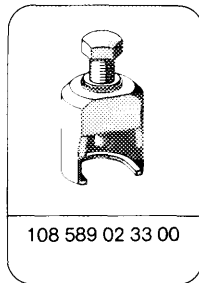


116 Unscrew center position check screw and screw in closing plug with sealing ring.

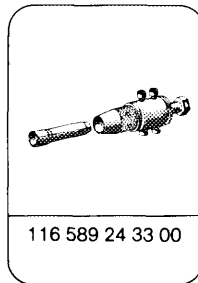
Note: Items 114 – 116 are valid for steering 765.900 only.

117 Install pitman arm (46-510).

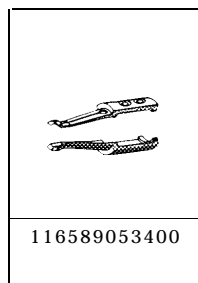
Special tools



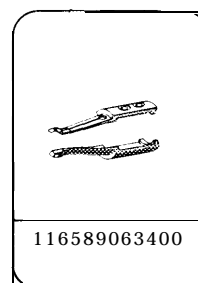
108 589 02 33 00



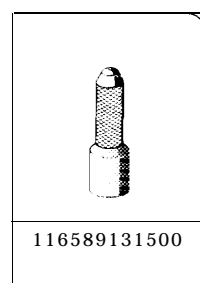
116 589 24 33 00



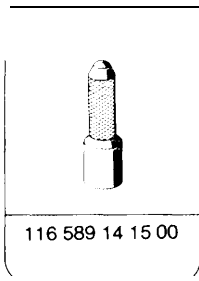
116589053400



116589063400



116589131500



116 589 14 15 00

Self-made tools

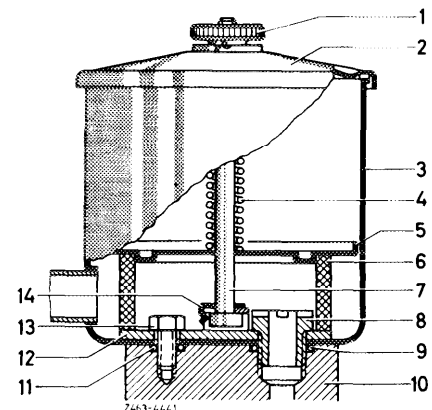
|                 |  |
|-----------------|--|
| Punch           | refer to section B item 17, Note       |
| Assembly sleeve | refer to section B and C item 10, Note |

A. Vickers power steering pump VP 27

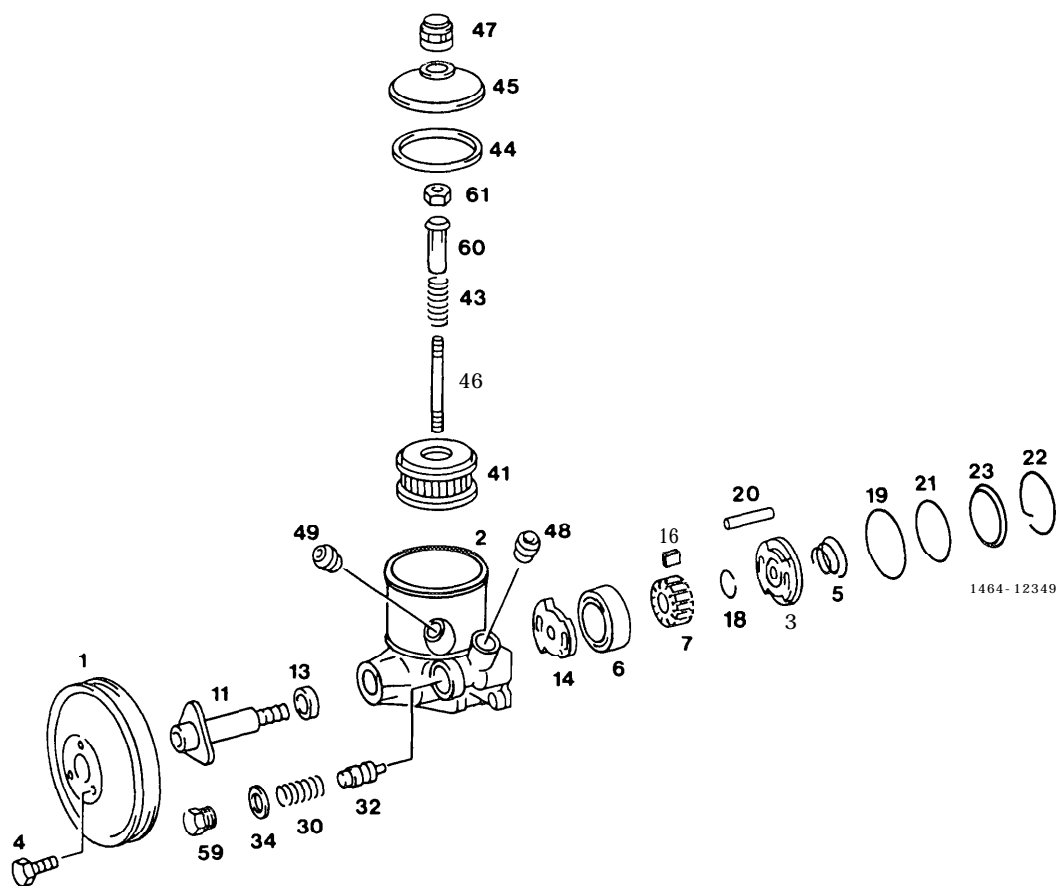
Disassembly

Supply tank

1 On power steering pump with screwed-on supply tank unscrew knurled nut (1) and remove closing cover (2) with paper gasket. Remove compression spring (4), settling plate (5) and filter ring (6). Unscrew hex. screw (13) and hollow screw (8). Remove supply tank (3) and O-rings (9 and 11) from pump housing (10).



## D. Vickers power steering pump VT 60 and ZF power steering pump ZL 60



|                                |                               |
|--------------------------------|-------------------------------|
| 1 Pulley                       |                               |
| 2 Pump housing                 | Check for damage              |
| 3 Pressure plate at cover end  | Check ground surface for wear |
| 4 Hex. head screws             |                               |
| 5 Compression spring           |                               |
| 6 Cam ring                     | Check slide surface for wear  |
| 7 Rotor with blade             | Check slide surfaces for wear |
| 11 Drive shaft                 | Check for wear                |
| 13 Radial sealing ring         | Renew                         |
| 14 Pressure plate at drive end | Check ground surface for wear |
| 16 Blade                       | Check for easy operation      |
| 18 Locking ring                |                               |
| 19 O-ring                      | Renew                         |
| 20 Cyl. pins                   |                               |
| 21 O-ring                      | Renew                         |
| 22 Circlip                     |                               |
| 23 Cover                       |                               |

|    |                                      |                                |
|----|--------------------------------------|--------------------------------|
| 30 | Compression spring                   |                                |
| 32 | Volume control valve .....           | Check ground surfaces for wear |
| 34 | Sealing ring .....                   | Renew                          |
| 41 | Filter pack .....                    | Check for contamination        |
| 43 | Compression spring                   |                                |
| 44 | Gasket                               |                                |
| 45 | Closing cap                          |                                |
| 46 | Stud                                 |                                |
| 47 | Vent cap                             |                                |
| 48 | Sealing cone .....,.....,.....,..... | Renew distorted sealing cone   |
| 49 | Sealing cone ..,.....,.....,.....    | Renew distorted sealing cone   |
| 59 | Closing plug                         |                                |
| 60 | Plastic sleeve                       |                                |
| 61 | Self-locking hex. nut .....          | Renew                          |

**Self -made tool**

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Punch

---

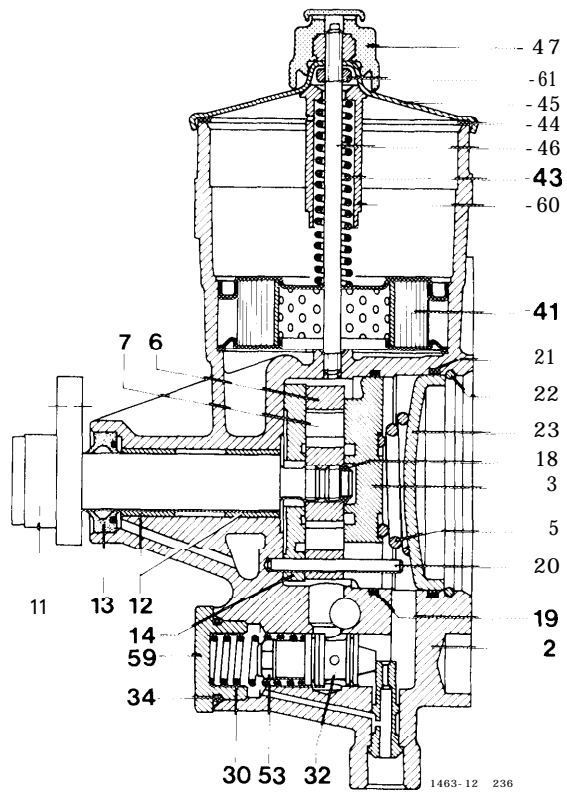
refer to Fig. item 4, Note

## Disassembly

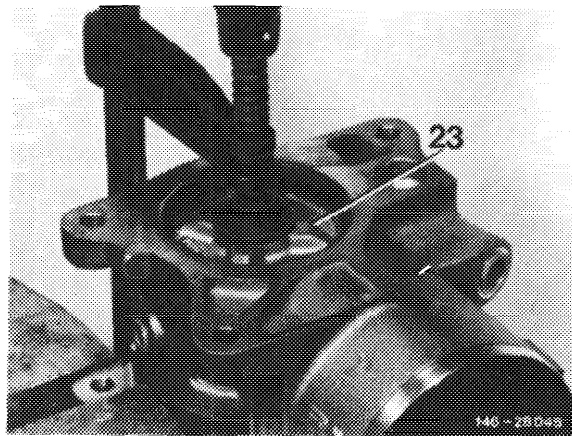
1 Unscrew vent cap (47), remove closing cap (45).

2 Unscrew self-locking hex. nut (61) from stud (46), remove plastic sleeve (60), spring (43) and filter pack (41).

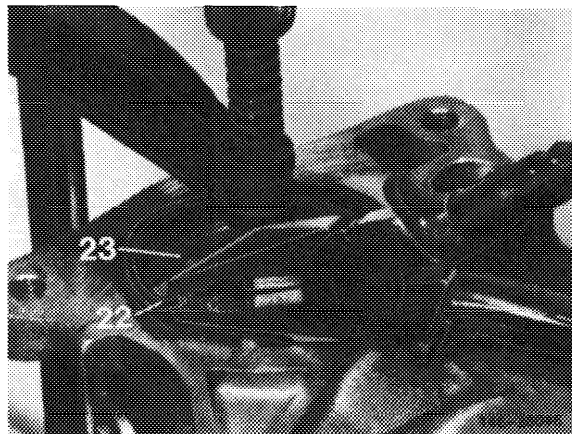
- 2 Pump housing
- 3 Pressure plate at cover end
- 5 Compression spring
- 6 Cam ring
- 7 Rotor with blade
- 11 Drive shaft
- 12 Bearing bushings
- 13 Radial sealing ring
- 14 Pressure plate at drive end
- 18 Locking ring
- 19 O-ring
- 20 Cyl. pin
- 21 O-ring
- 22 Circlip
- 23 Cap
- 30 Compression spring
- 32 Volume control valve
- 34 Sealing ring
- 41 Filter pack
- 43 Compression spring
- 44 Gasket
- 45 Closing cap
- 46 Stud
- 47 Vent cap
- 53 Valve screw
- 59 Closing plug
- 60 Plastic sleeve
- 61 Self-locking hex. nut



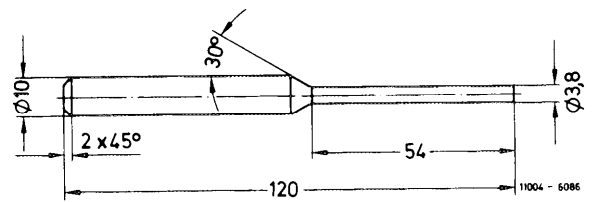
3 Force cover (23) slightly into housing by means of a hand press or a screw clamp.



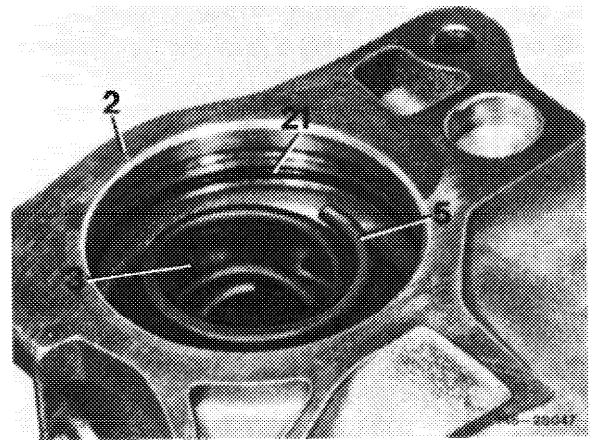
4 Take circlip (22) out of housing. Remove cover (23).



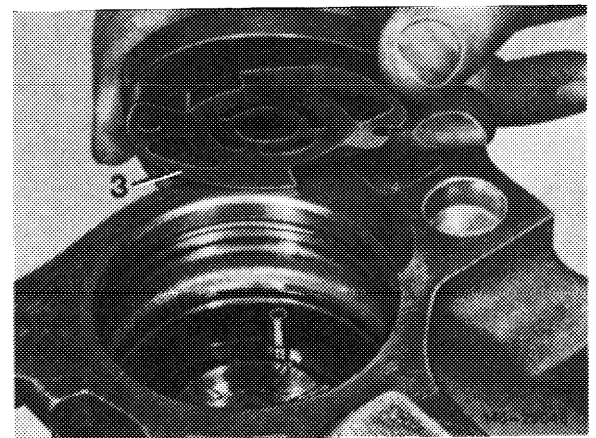
Note: On Vickers power steering pump, remove circlip with self-made punch through bore in housing.



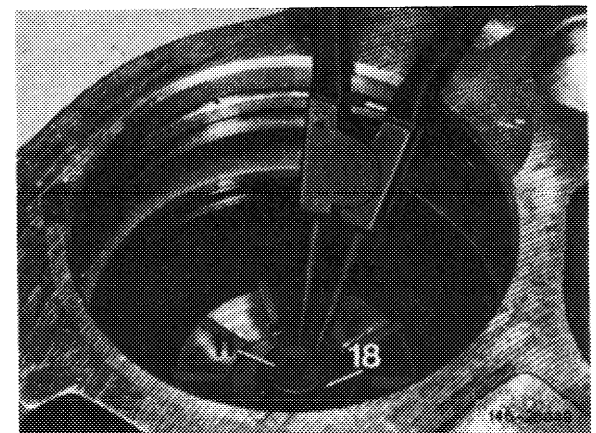
5 Remove spring (5) and O-ring (21) from pump housing (2).



6 Remove pressure plate (3).

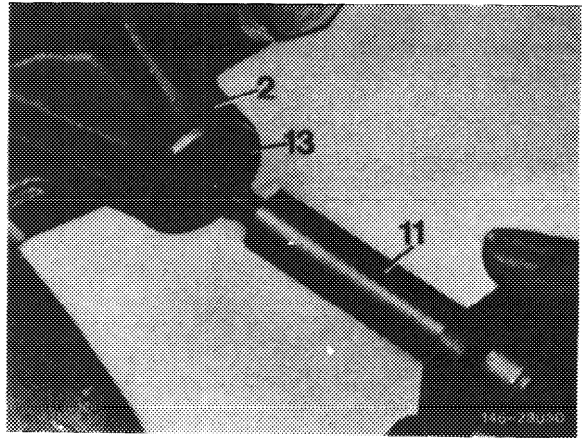


7 Take locking ring (18) out of drive shaft (11).





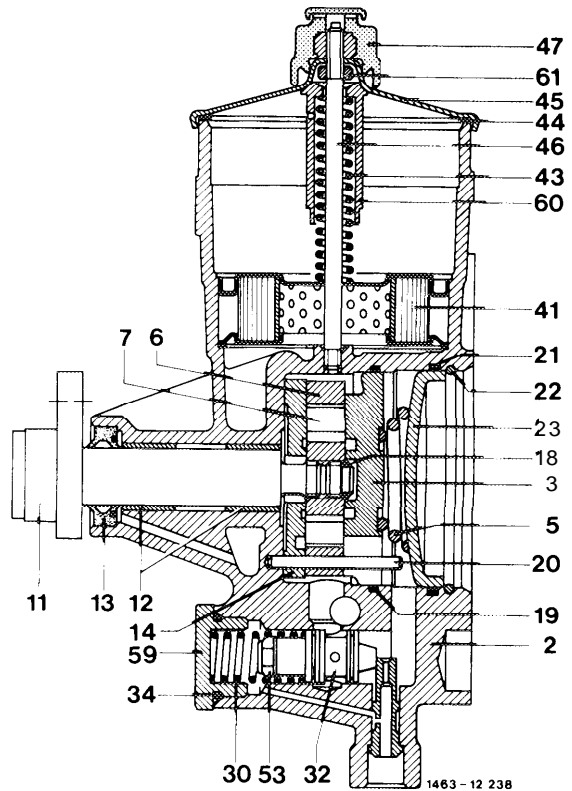
8 Loosen drive shaft by means of light hammer blows from rotor, remove drive shaft (11).



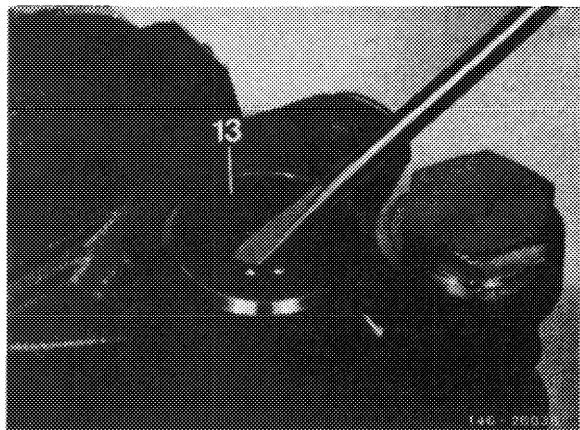
9 Remove rotor (7) with its 10 blades, cam ring (6) and pressure plate (14) at drive end from pump housing.

10 Remove cyl. pins (20).

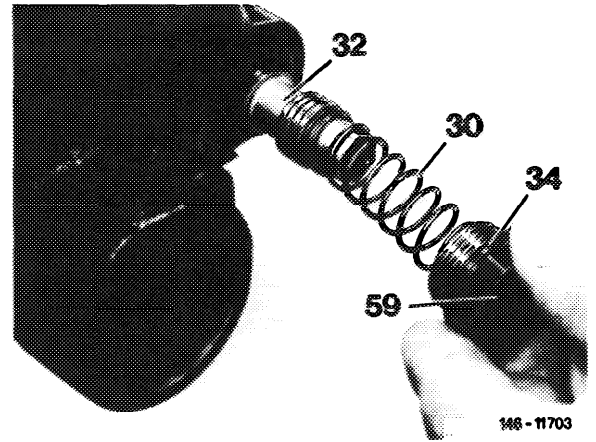
- 2 Pump housing
- 3 Pressure plate at cover end
- 5 Compression spring
- 6 Cam ring
- 7 Rotor with blade
- 11 Drive shaft
- 12 Bearing bushings
- 13 Radial sealing ring
- 14 Pressure plate at drive end
- 18 Locking ring
- 19 O-ring
- 20 Cyl. pin
- 21 O-ring
- 22 Circlip
- 23 Cover
- 30 Compression spring
- 32 Volume control valve
- 34 Sealing ring
- 41 Filter pack
- 43 Compression spring
- 44 Gasket
- 45 Closing cap
- 46 Stud
- 47 Vent cap
- 53 Valve screw
- 59 Closing plug
- 60 Plastic sleeve
- 61 Self-locking hex. nut



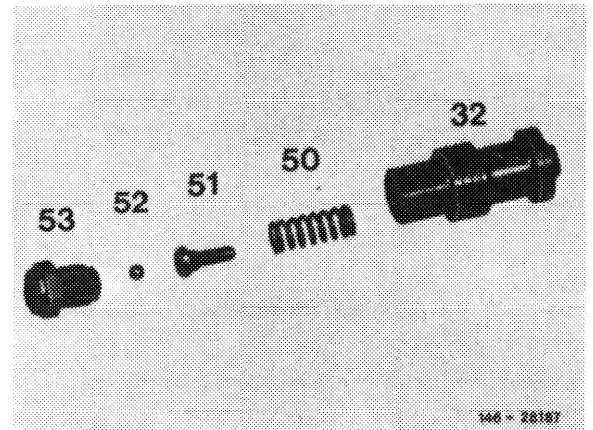
11 Force out radial sealing ring (13) by means of a screwdriver.



12 Screw closing plug (59) out of housing. Remove compression spring (30) and volume control valve (32).



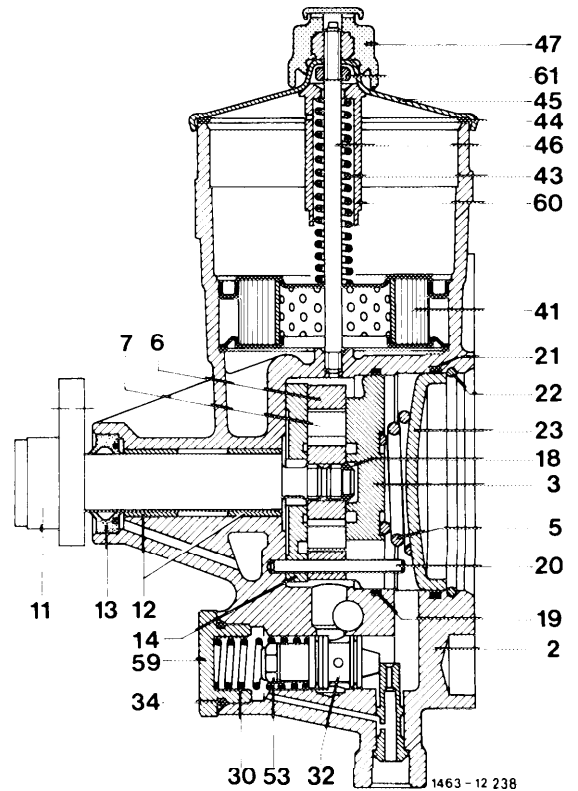
13 Clamp volume control valve (32) at its unground part into vice and unscrew valve screw (53). Remove valve ball (52), valve cone (51) and compression spring (50) from volume control valve.





3 Check ground surface of both pressure plates (14) and (3). If the pressure plates are worn, recondition power steering pump by using repair set "pump element".

- 2 Pump housing
- 3 Pressure plate at cover end
- 5 Compression spring
- 6 Cam ring
- 7 Rotor with blade
- 11 Drive shaft
- 12 Bearing bushings
- 13 Radial sealing ring
- 14 Pressure plate at drive end
- 18 Locking ring
- 19 O-ring
- 20 Cyl. pin
- 21 O-ring
- 22 Circlip
- 23 Cover
- 30 Compression spring
- 32 Volume control valve
- 34 Sealing ring
- 41 Filter pack
- 43 Compression spring
- 44 Gasket
- 45 Closing cap
- 46 Stud
- 47 Vent cap
- 53 Valve screw
- 59 Closing plug
- 60 Plastic sleeve
- 61 Self-locking hex. nut



4 Check drive shaft (11) and bearing bushings (12) for wear. If required, install bushings (12) from repair set "drive shaft".

5 Check both sealing cones (connection high-pressure expanding hose, return pipe). Renew distorted sealing cones. For this purpose, cut a thread of 7 or 10 mm for a few turns into sealing cone. Then pull sealing cone out of housing by means of a 7 or 10 mm screw.

6 Position new sealing cone in housing and force into housing by screwing high-pressure expanding hose or return pipe into housing.

## 46-740 Assembly of power steering pump

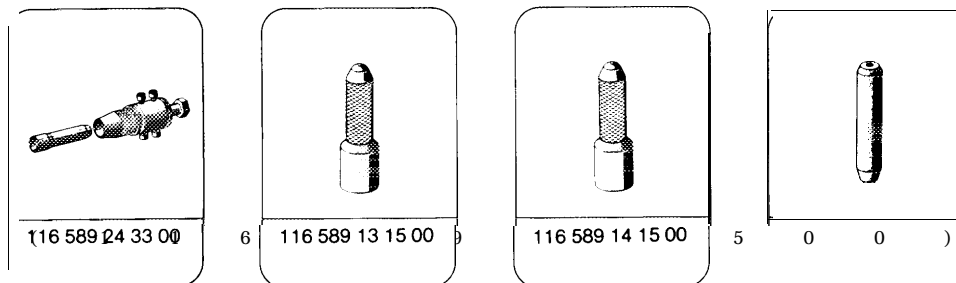
### Data

|                         |               |          |
|-------------------------|---------------|----------|
| End play of drive shaft | on new pumps  | max. 0.7 |
|                         | on used pumps | max. 1.0 |

### Tightening torques

|  | Nm    |
|--|-------|
| Hex. screws on pump housing            | 35-40 |
| Hollow screw for fastening supply tank | 35-40 |

### Special tools



### Self-made tools

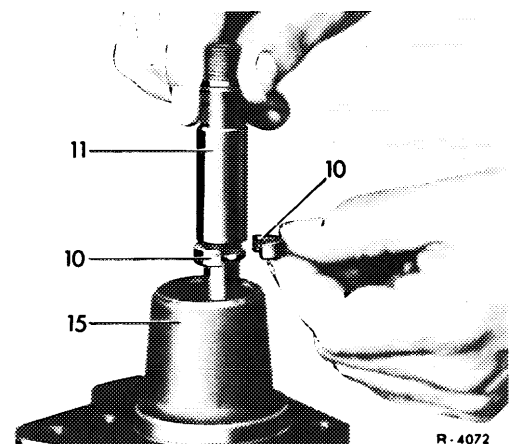
|   |                                      |
|---|--------------------------------------|
| Pressing-in tool for bearing bushing                                | refer to Fig. item 2, note           |
| Assembly sleeve   | refer to section B fig. item 9, note |
| Assembly mandrel for needle bearing                                 | refer to section B fig. item 2, note |
| Pressing-in mandrel for radial ball bearing and radial sealing ring | refer to section C fig. item 3, note |

## A. Vickers power steering pump VT 27

### Drive shaft and sealing ring

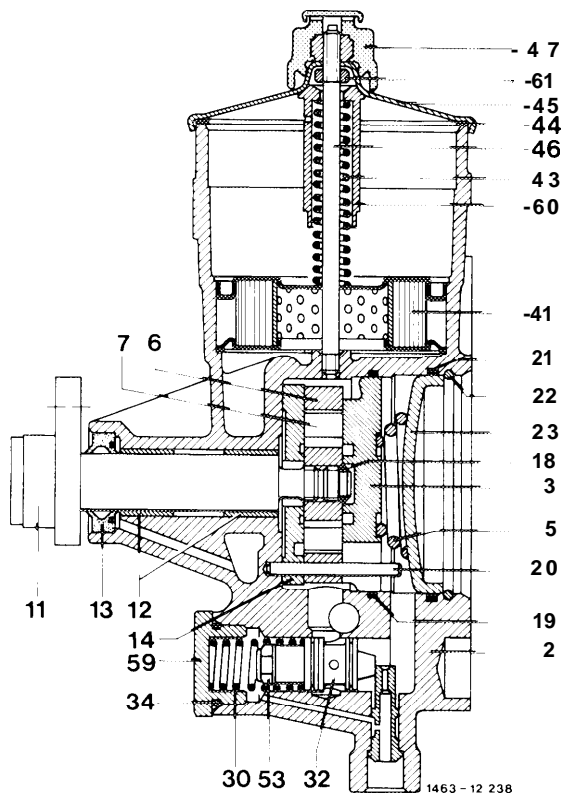
1 Place both shell halves (10) on drive shaft (11).

**Note:** Shell halves determine end play of drive shaft and are contained in repair set "drive shaft".

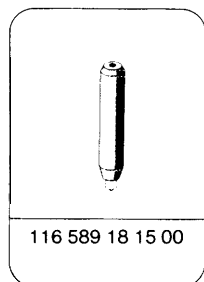
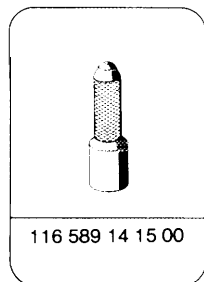


D. Vickers power steering pump VT 60 and ZF power steering pump ZL 60

- 2 Pump housing
- 3 Pressure plate at cover end
- 5 Compression spring
- 6 Cam ring
- 7 Rotor with blade
- 11 Drive shaft
- 12 Bearing bushings
- 13 Radial sealing ring
- 14 Pressure plate at drive end
- 18 Locking ring
- 19 O-ring
- 20 Cyl. pin
- 21 O-ring
- 22 Circlip
- 23 Cover
- 30 Compression spring
- 32 Volume control valve
- 34 Sealing ring
- 41 Filter pack
- 43 Compression spring
- 44 Seal
- 45 Closing cap
- 46 Stud
- 47 Vent cap
- 53 Valve screw
- 59 Closing plug
- 60 Plastic sleeve
- 61 Self-locking hex. nut



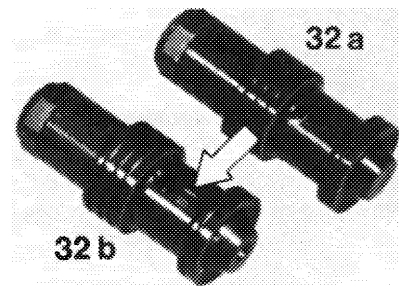
Special tool



Note

Prior to assembly, moisten all parts with manual transmission oil.

1 With a new volume control valve pay attention to correct opening pressure of pressure relief valve. Also pay attention to manufacturer, as well as to the mark (arrow) stamped into ZF valve.

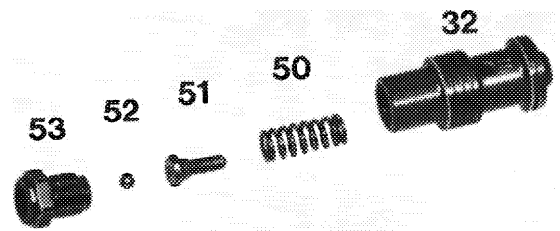


32a Vickers valve  
32b ZF valve

146 - 28158

2 Clean volume control valve prior to assembly, immerse into manual transmission oil and insert into housing bore. The valve should slide easily in housing bore.

3 Install pressure relief valve into volume control valve. Insert compression spring (50), valve cone (51) and valve ball (52).



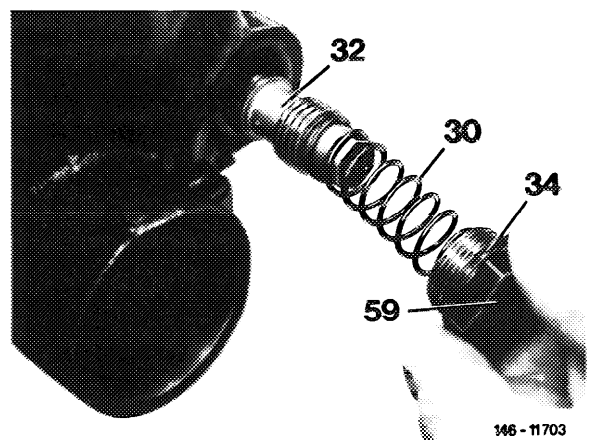
146 - 28157

4 Clamp volume control valve at its unground part into vice and tighten valve screw.

5 Insert volume control valve (32) and compression spring (30) into housing.

Note: Install volume control valve in such a manner that the valve screw of the pressure relief valve points toward closing plug.

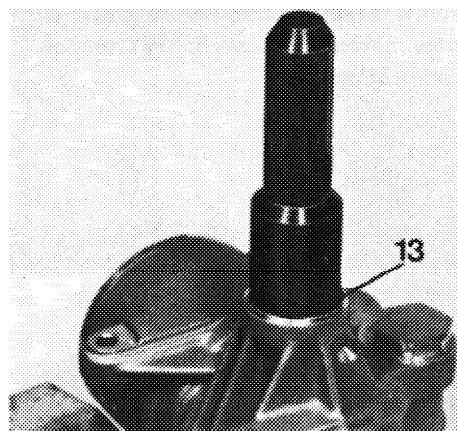
6 Screw in closing plug (59) with a new sealing ring and tighten.



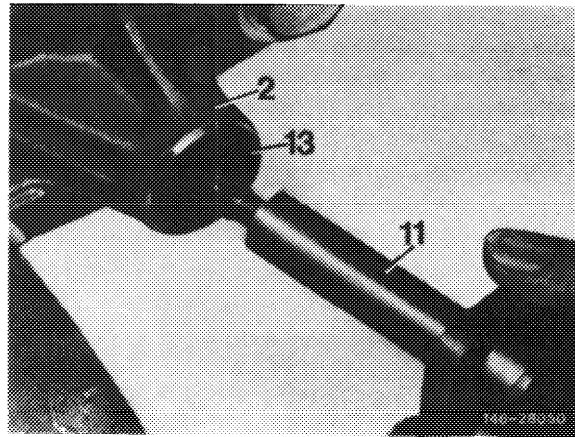
146 - 11703

7 Press radial sealing ring (13) into housing by means of a punch.

Special tool 116 589 14 15 00

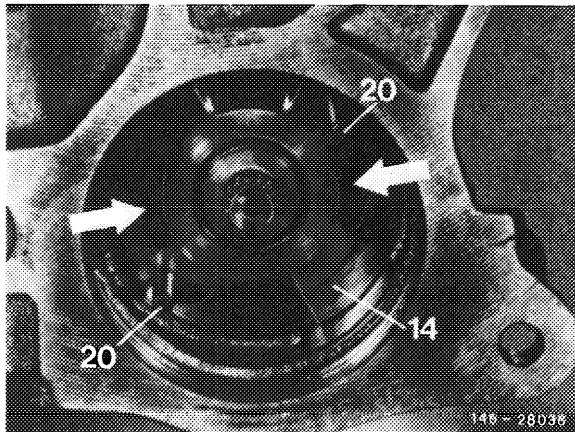


8 Slide drive shaft (11) into housing.



9 Insert pressure plate (14) at drive end with recesses (refer to arrows) toward rotor.

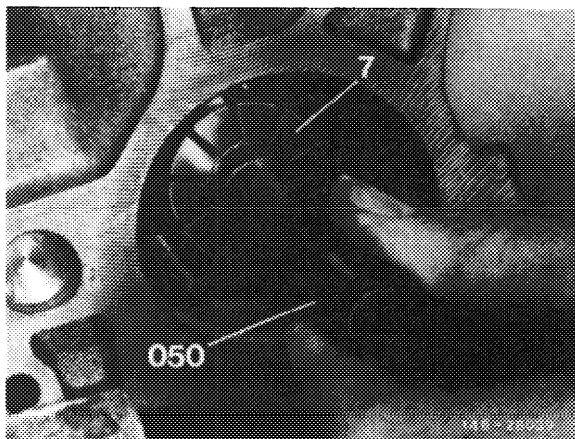
10 Insert cyl. pins (20).



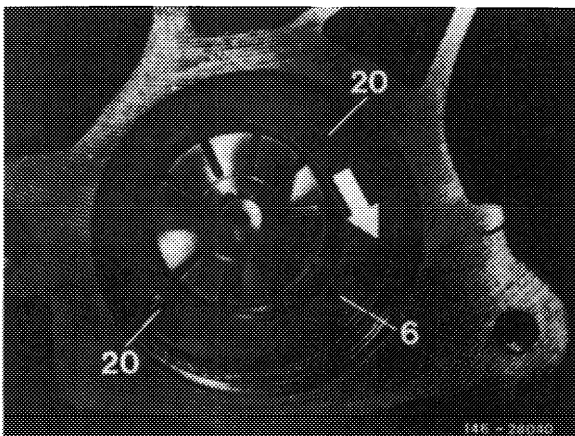
11 Insert rotor (7) into drive shaft. Chamfer on inside diameter of rotor toward pressure plate at drive end.

12 Insert locking ring (18) into groove of drive shaft (11) by means of assembly mandrel (050).

Special tool 116 589 18 15 00



13 Place cam ring (6) on cyl. pins (20) with cast-in directional arrow in upward direction. Pay attention to correct location of cam ring.

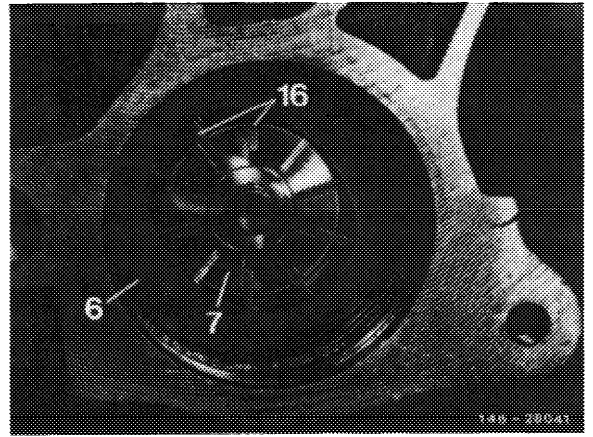




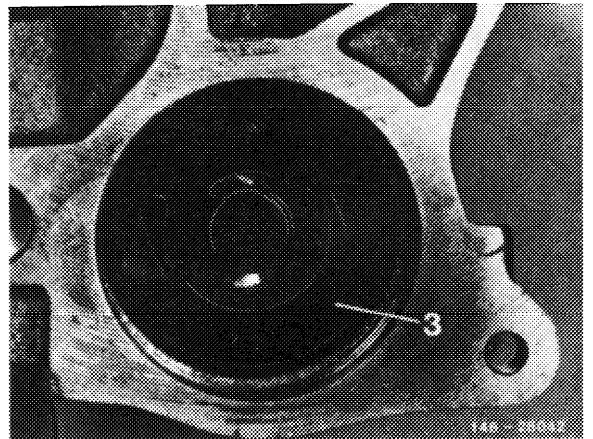
14 Insert blade (16) (10 each) with rounded off, metallicly glistening sides toward cam ring (6) into rotor (7).

15 Insert O-ring (19) into housing.

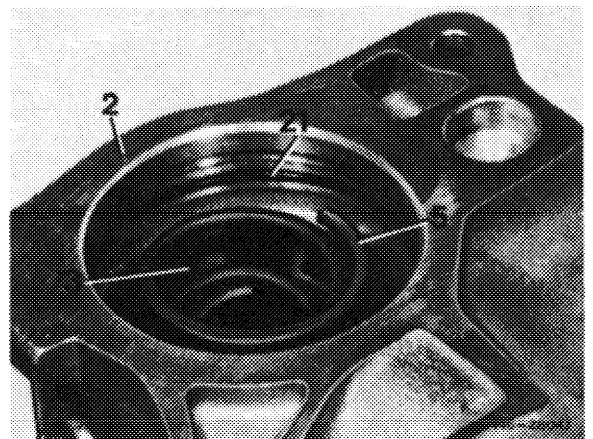
Note: The O-rings (19) and (21) have different diameters. The O-ring (19) with small diameter seals the pressure plate (3), the larger O-ring (21) seals cover (23) in relation to housing.



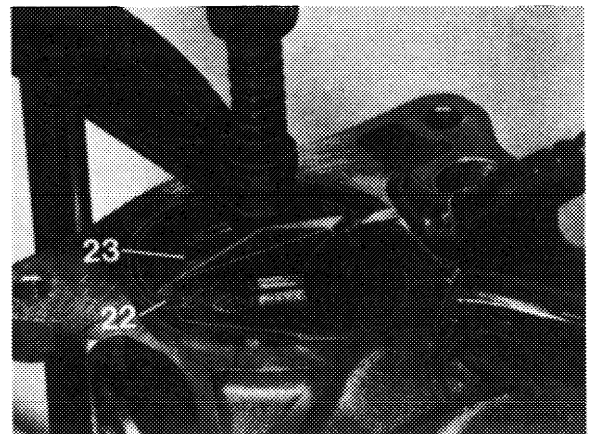
16 Insert pressure plate (3) into housing.



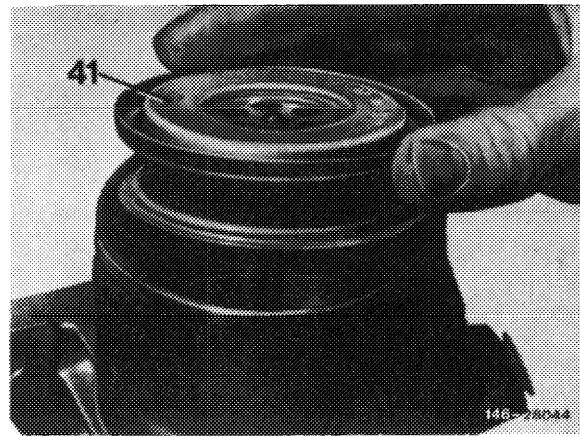
17 Insert O-ring (21) into housing. Place compression spring (5) on pressure plate (3).



18 Mount cover (23). Then press cover slightly into housing by means of a hand press or a screw clamp. Insert circlip (22) into groove of housing, pay attention to correct location of ring.



19 Insert filter pack (4).



20 Insert spring (43) and plastic sleeve (60), compress slightly, then mount new self-locking hex. nut (61). Mount closing cover, screw on vent cap.

