

Section 6

**FRONT END
AND
STEERING GEAR**

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GROUP 60

GENERAL TOOLS

Special tools are marked 999 or SVO (e.g. 9991801 or SVO 1801).

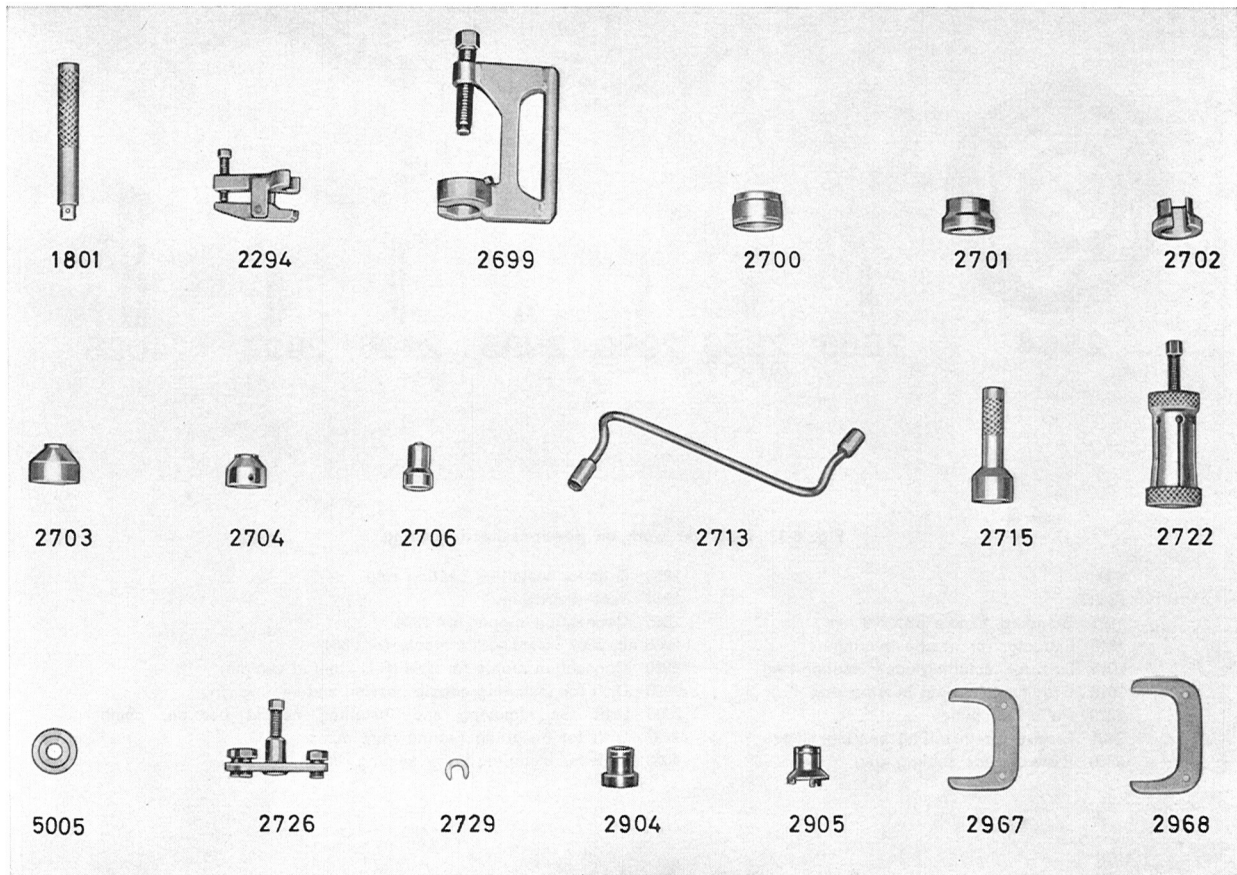


Fig. 6-1. Tools for wheel adjustment and work on front axle

- 999 (SVO)
- 1801 Standard handle 18×200
- 2294 Press tool, for removing ball joints, tie-rod end
- 2699 Press tool, for removing and installing ball joints and rubber bushings, control arms
- 2700 Sleeve, removing lower ball joint
- 2701 Sleeve, removing and installing upper ball joint and bushings in lower control arm, also installing lower ball joint
- 2702 Sleeve, removing and installing bushings upper control arm
- 2703 Drift, installing lower ball joint
- 2704 Drift, installing upper ball joint
- 2706 Drift, removing and installing bushings, upper control arm
- 2713 Spanner ($\frac{5}{8}$ ") for upper control arm shaft bolt
- 2715 Drift, installing and removing grease cap on hub
- 2722 Puller, inner ring, inner front wheel bearing
- 2726 Puller, front wheel hub
- 2729 Spacer, removing shaft, upper control arm
- 2904 Drift, removing and installing bushings for diagonal tires, lower control arm
- 2905 Drift, for removing and installing bushings for radial tires
- 2967 Gauge for lower ball joint, type 1
- 2968 Gauge for lower ball joint, type 2
- 5005 Drift, for installing outer ring, inner front wheel bearing and spacer hub

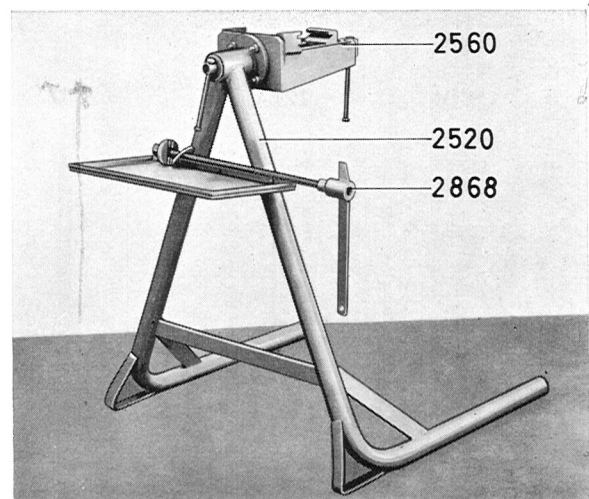
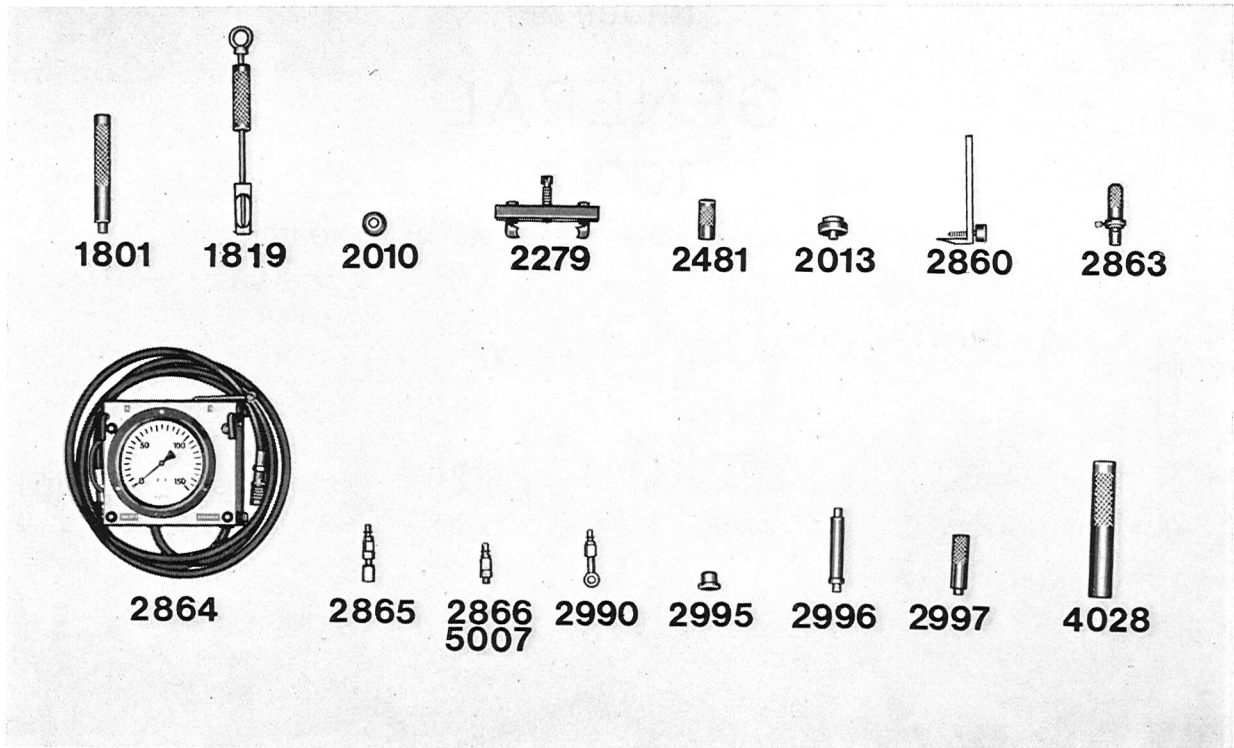


Fig. 6-2. Tools for work with removed front axle

- 999 (SVO)
- 2520 Stand for fixture
- 2560 Fixture
- 2868 Press tool for spring

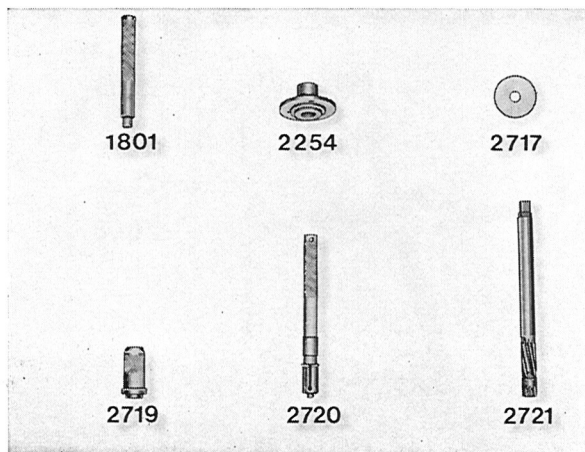
For removal and installation of front end complete, engine lift tool 5006 is also used, see Fig. 6-16.



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Fig. 6-3. Tools for work on power-assisted steering

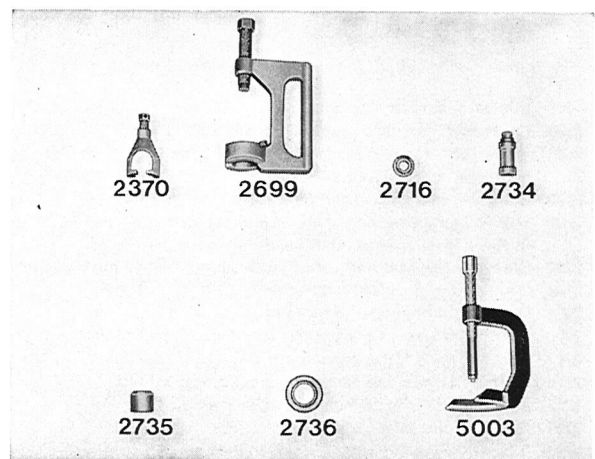
- | | | |
|--------------|------|--|
| 999 (SVO) | 2863 | Drift for installing sealing ring |
| 1801 | 2864 | Test instrument |
| 1819 | 2865 | Connection nipple for 2864 |
| 2010 | 2866 | alt. 5007 Connection nipple for 2864 |
| 2013 | 2990 | Connection nipple for 2864 (R-H steered vehicle) |
| 2279 | 2995 | Drift for installing needle bearing and sealing ring |
| 2481 | 2996 | Drift for removing and installing needle bearing, pump |
| 2860 | 2997 | Drift for installing sealing ring, pump |
| | 4028 | Drift for installing lower sealing ring |



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Fig. 6-4. Tools for work on removed mechanical steering

- | | |
|--------------|---|
| 999 (SVO) | |
| 1801 | Standard handle 18x200 |
| 2254 | Guide for reamer SVO 2721 |
| 2717 | Drift, for installing upper bearing race, steering worm |
| 2719 | Sleeve, for installing ring, pitman arm shaft |
| 2720 | Tool for removing bushing, pitman arm shaft |
| 2721 | Reamer for bushing, pitman arm shaft |



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Fig. 6-5. Tools for work on other steering components

- | | |
|--------------|---|
| 999 (SVO) | |
| 2370 | Puller, pitman arm |
| 2699 | Press tool, for removing and installing bushings on relay arm |
| 2716 | Drift, for installing bushing, pitman arm shaft |
| 2734 | Drift, for removing bushing, relay arm |
| 2735 | Drift, for installing bushing, relay arm |
| 2726 | Counterhold, for removing and installing bushing, relay arm |
| 5003 | Puller for steering wheel |

STEERING GEOMETRY

WHEEL ANGLES

The front wheels must have certain pre-determined settings, normally known as the "front end alignment" or the "wheel angles", in order to give the vehicle good steering properties and a minimum of tire wear.

The "wheel angles" refer to: caster, camber, king pin inclination, toe-out and toe-in.

CASTER

Caster generally refers to the longitudinal inclination (forwards or backwards) of the king pin. As this vehicle does not have a king pin, the caster consists of the angle between a vertical line and a line through the center of the ball joints (Fig. 6-6). Positive caster imparts a trailing action to the front wheels and helps to keep the front wheels in the straight-ahead position.

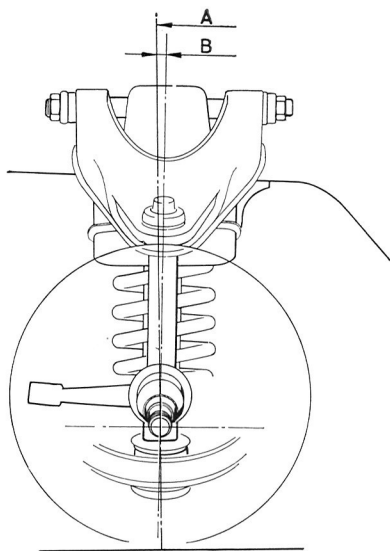


Fig. 6-6. Caster
A=Vertical line
B=Caster

CAMBER

Camber is the inclination of the wheel itself outwards or inwards. It is positive if the wheel is inclined outwards (see C, Fig. 6-7) and negative if the wheel inclines inwards. Incorrect camber causes uneven tire wear.

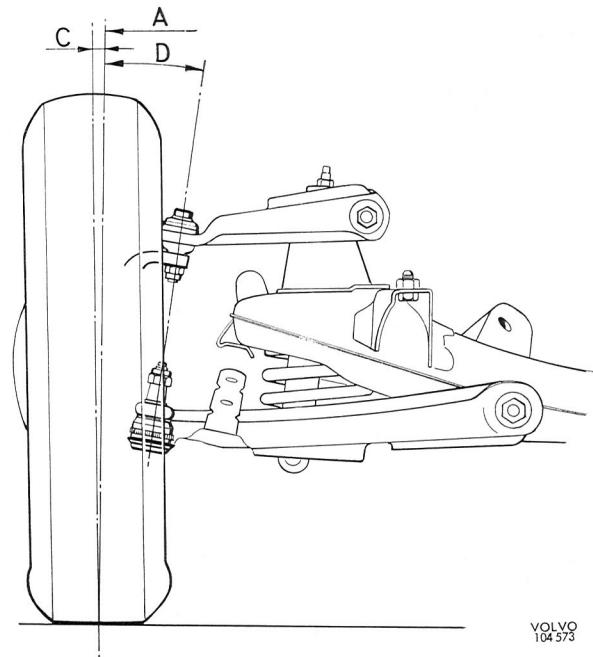


Fig. 6-7. Camber and king pin inclination
A=Vertical line C=Camber D=King pin inclination

KING PIN INCLINATION

King pin inclination means the inclination of the king pin inwards. Since this car does not have a king pin, the inclination is represented by an angle made between a vertical line and a line through the center of the ball joints (D, Fig. 6-7).

King pin inclination causes the center lines of the ball joints and the wheel to approach each other towards the road surface. This makes the wheel easier to turn. The inclination also assists the tendency of the wheel to run straight forwards since the car lifts very slightly when the wheels are turned.

TOE-OUT

To be in correct relative alignment, when negotiating a turn, the inside front wheel travels in a circle having a smaller radius than the circle traveled by the outside front wheel.

This relationship is determined by the design of the steering knuckle arms and the steering rod, see Fig. 6-8.

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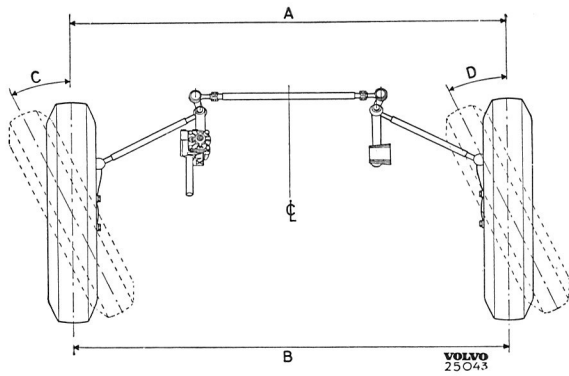


Fig. 6-8. Toe-out and toe-in

CHECKING WITH WHEEL ALIGNMENT INDICATOR (Master Toe Gauge)

The wheel alignment indicator should be calibrated between -2 to $+5$ m/km and is used as follows: Straight line with the indicator when the car is about 2 meters ($6\frac{1}{2}$ ft) from the indicator. **Let go** the steering wheel and slowly drive over the indicator plate ($2-4$ kmph= $2\frac{1}{2}$ miles). **NOTE:** The steering wheel must **not** be touched until the front wheels have come on the other side of the indicator.

If one of the red lamps lights, and a buzzer starts buzzing, then there is something wrong with the front wheel alignment and it should be adjusted.

PROCEDURE BEFORE ADJUSTING WHEEL ANGLES

Wheel angles can be influenced by the factors listed below. Therefore, before measuring and adjusting, any faults should be remedied.

1. Check tire pressure and wear.
2. Play in front wheel bearings.
3. Play in ball joints or control arm attachments.
4. Broken springs.
5. Abnormal (temporary) equipment or loading.

Other factors which can influence the steering during driving without being revealed when measuring the wheel angles are:

1. Wheel out-of-true more than 2.5 mm ($.1''$).
2. Defective shock absorbers.
3. Incorrect steering gear adjustment.
4. Play in intermediate arm journaling or steering rod parts.

MEASURING WHEEL ANGLES

The wheel angles are measured with special measuring instruments of which there are many different types. No general description can, therefore, be given as to how measuring should be made.

The measuring principle is that camber is measured directly with the wheels pointing straight forwards. Caster and king pin inclination cannot be measured directly. Instead, the angular alteration which occurs when the wheel is turned from 20° outwards to 20° inwards is measured on the instrument.

Many types of modern wheel alignment measuring instruments require that the wheels are locked with, for example, the help of a pedal jack. When measuring the toe-in, the so-called "wheel spreader" should be applied at the front between the wheels at a spring force of 100—150 N (22—33 lb). When measuring the wheel angles, follow the instructions for the measuring instruments concerned.

CHECKING KING PIN INCLINATION

The king pin inclination, which on this vehicle is represented by the inclination of the centerline of the ball joints, should be 7.5° at a camber of 0° . This cannot be adjusted and is difficult to measure exactly due to the tension and resilience in the parts, so that the angle read on the instruments will not be the exact king pin inclination but can serve as a guide.

CHECKING TOE-OUT

1. Before running the vehicle front wheels onto turntables, set the turntables to zero and lock them. Make sure the wheels point straight ahead.
2. Turn the wheels to the left until the right wheel has turned 20° inwards. The scale on the left turntable should then read $22.5 \pm 1^\circ$.
3. Check the position of the right wheel in the same manner by turning the wheels to the right until the left wheel has turned 20° inwards, when the right turntable scale should give the same reading previously indicated on the left. Both measurements should thus lie within the above mentioned tolerances, otherwise it means that the steering gear or front end is distorted.
4. There are no adjusting possibilities, but if the toe-out is incorrect, the steering arms and steering rods should be checked. Replace any parts that are damaged.

ADJUSTING WHEEL ANGLES

NOTE: The front wheel angles are always adjusted in the following order:

1. Caster
2. Camber
3. Toe-in

To save time and labor, caster and camber should be adjusted at the same time, see under "Adjusting the camber".

FRONT END ALIGNMENT (camber, caster, toe-in, check and adjust, incl. tire wear check=Volvo Standard Times Op. No. 60152.

CASTER

The caster for each wheel should be within a tolerance range of 1° to $+2^\circ$, that is min 1° and max. 2° positive. The difference between both sides should not, however, exceed $\frac{1}{2}^\circ$.

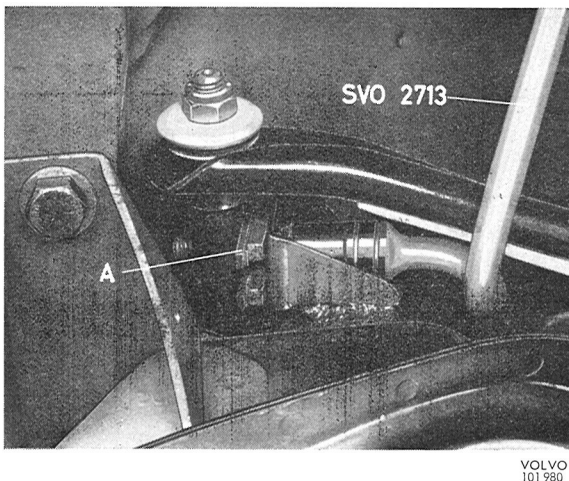


Fig. 6-9. Adjusting caster and camber
A=Shims

To adjust, slacken the special bolts at the upper control arm shaft with tool 2713 (Fig. 6-9). Use one end of the tool for the front bolt and the other for the rear bolt. After the bolts have been slackened several turns, the requisite number of shims can be either removed or added, whichever is the case. Positive caster is obtained by either **adding** shims to the **rear** bolt or **removing** shims at the **front** bolt.

The diagram in Fig. 6-10 shows the shim thicknesses required for a certain alteration in angle. Shims are stocked in thicknesses of .15—.5—1.0—3.0 and 6.0 mm (.006—.020—.039—.12 and .24"). The caster is altered to the same extent by either

1. removing a shim at one of the bolts,
2. adding a shim to the other bolt,
3. moving over half of the required shim thickness from one bolt to the other.

For proper camber, adjustment should be according to alternative 3.

After adjustment has been made, tighten the bolts to a torque of 55—70 Nm (40—50 lbft).

CAMBER

The camber for each wheel should be within a tolerance range of 0° to $+\frac{1}{2}^\circ$, that is, it should be min. 0° and max $\frac{1}{2}^\circ$ positive.

To adjust, slacken the special bolts at the upper control arm shaft several turns with tool 2712 (Fig. 6-9). Use one end of the tool for the front bolt and the other for the rear bolt. Then either increase or reduce the number of shims equally for both bolts. More **positive** camber is obtained by **removing** shims, and **negative** camber by **increasing** the number of shims.

The shim thickness required for a certain alteration in angle is shown in the diagram in Fig. 6-10. Shims are stocked in thicknesses of .15—.5—1.0—3.0 and 6.0 mm (.006—.020—.039—.12 and .24"). The camber is altered by removing or adding an equal number of shims at both the bolts. After adjustment torque the bolts to 55—70 Nm (40—50lbft).

To save time and labor, adjust the caster and camber at the same time by removing or adding shims for the camber and altering the number of shims for the caster. If, for example, the camber is increased $.6^\circ$ and the caster $1/4^\circ$, first remove 2.5 mm (.1") in shims at both the bolts and move .3 mm (.012") in shims from the front to the rear bolt.

TOE-IN

Check and adjust toe-in=Volvo Standard Times Op. No. 60106

Toe-in should be 2—5 mm ($\frac{1}{8}$ ") with the wheel spreader. Incorrect toe-in is adjusted by slackening the lock nuts on the tie rod, after which the rod is turned in the required direction. The distance between the tires at the front is reduced, that is to say, toe-in is increased by turning the tie-rod in the normal direction of rotation of the wheels.

After adjustment torque the lock nut to 75—90 Nm (55—65 lbft).

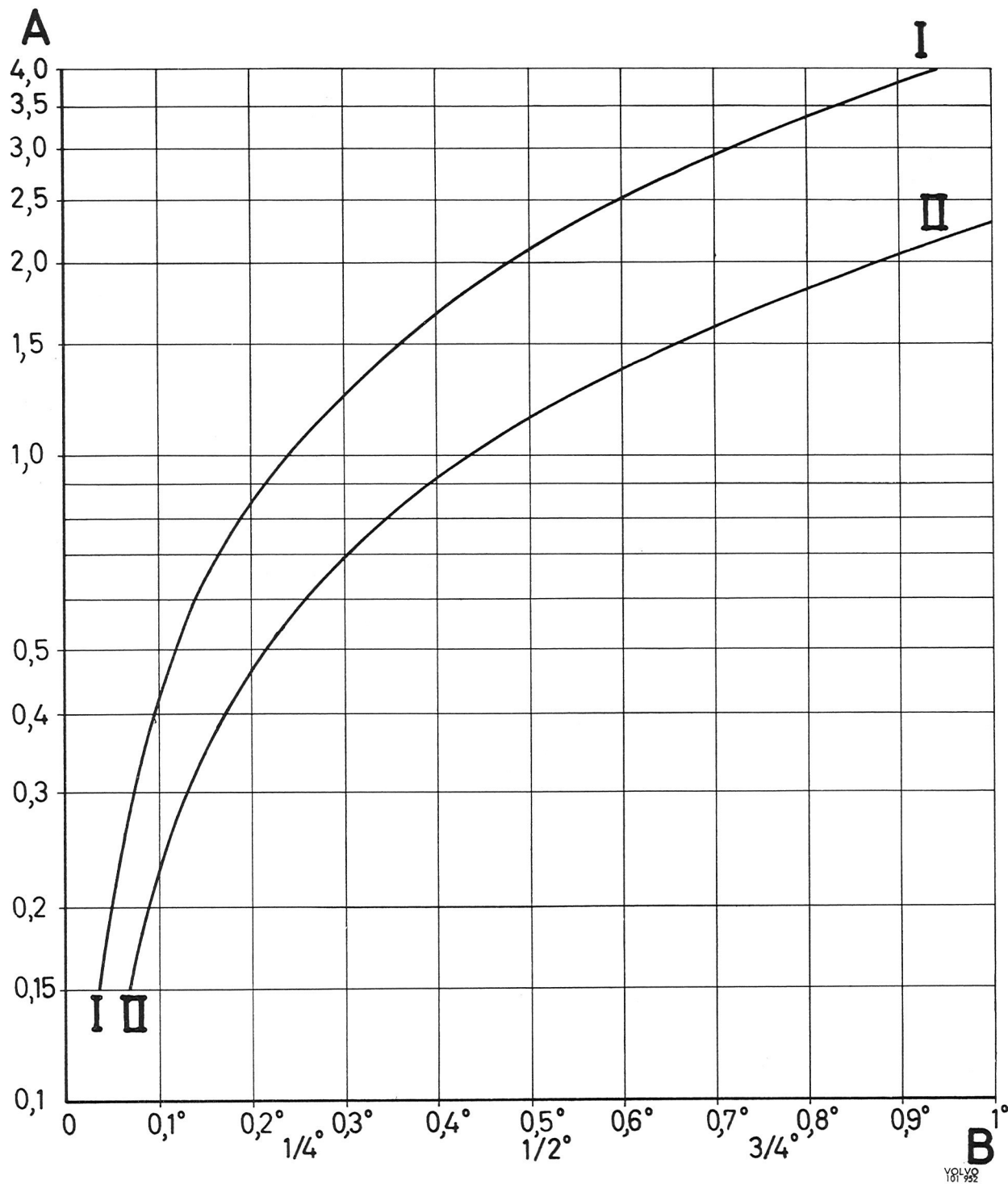


Fig. 6-10. Diagram for alteration of caster and camber

I=Camber
 II=Caster
 A=Shims (mm)
 B=Alteration of angle

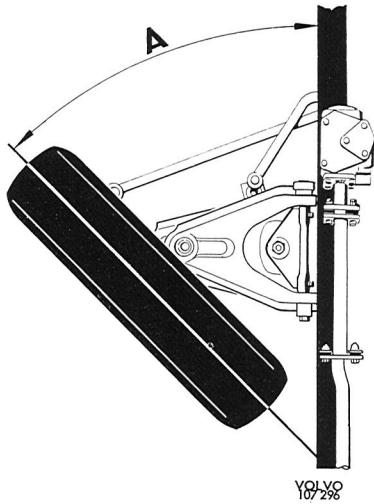


Fig. 6-11. Adjusting max. wheel lock
 A=40—41° without power steering
 38—39° with power steering

ADJUSTING STEERING LIMITS

Turning of the wheels is limited by stop screws at the pitman arm (Fig. 6-12) and at the relay arm. Adjust as follows:



Fig. 6-12. Adjusting screw, max. wheel lock

1. Turn the left wheel for a left hand turn as far as it goes. Check the wheel lock according to Fig. 6-11. If the lock is not as in this figure, then adjust to this angle with the adjusting screw (Fig. 6-12).
 2. Repeat this procedure with the right wheel and the stop screw on the other arm.
- NOTE:** Check that brake hoses are clear at full wheel lock.

GROUP 62

FRONT AXLE

GENERAL INFORMATION

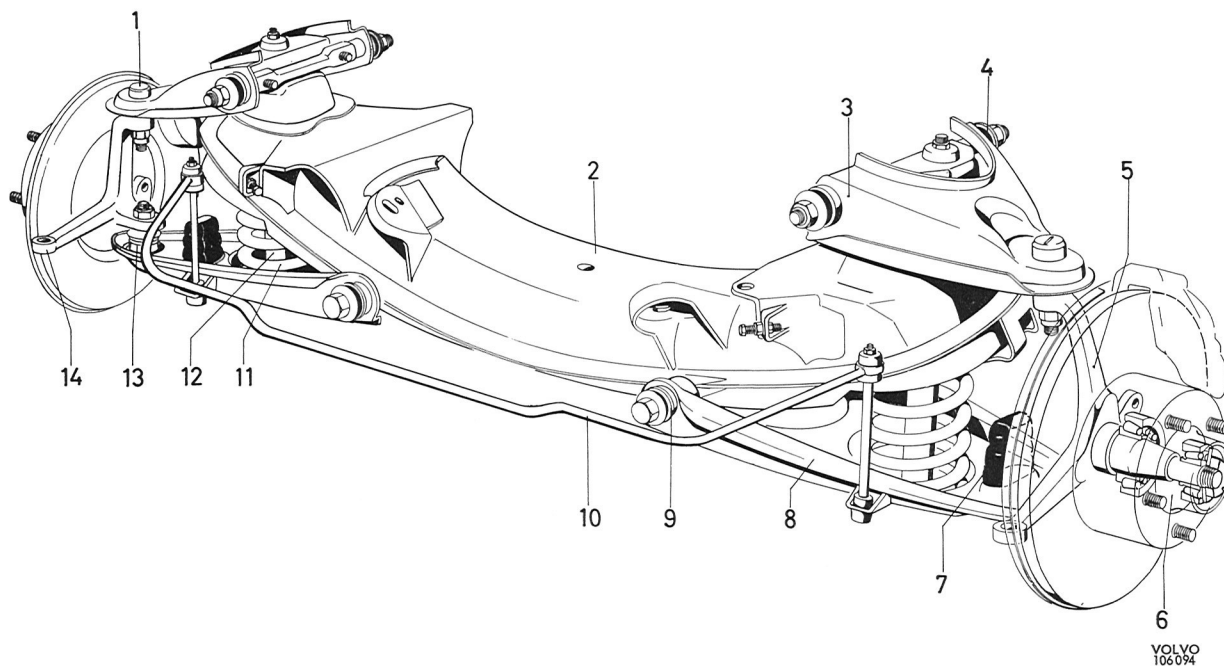


Fig. 6-13. Front axle

- | | |
|-----------------------------------|------------------------------|
| 1. Upper ball joint | 8. Lower control arm |
| 2. Front axle member | 9. Lower control arm bushing |
| 3. Upper control arm | 10. Stabilizer |
| 4. Upper control arm bushing | 11. Coil spring |
| 5. Steering knuckle (hub carrier) | 12. Shock absorber |
| 6. Hub | 13. Lower ball joint |
| 7. Rubber buffer | 14. Steering arm |

The vehicle has independent front wheel suspension. This means that there is no actual front axle, this being replaced by a robust box-section front axle member, which is bolted to the self-supporting body. The front wheel suspension and springs are attached at the ends of the member. The construction is illustrated in Fig. 6-13.

The steering knuckle (hub carrier) is pivoted on the upper and lower control arms by ball joints (1 and 13) which are pressed into the control arms. The control arms shafts are carried in rubber bushings

(4 and 9), which are journaled in the control arms. Camber and caster are adjusted by shims between the upper control arm shaft and its attachment in the front axle member (see Fig. 6-9).

The front wheels are carried in taper roller bearings Fig. 6-13. The front spring assembly consists of coil springs (11) inside which telescopic shock absorbers (12) are installed. In order to increase its anti-roll properties, the car is equipped with a stabilizer (10) which is attached partly to the lower control arm and partly to the body.

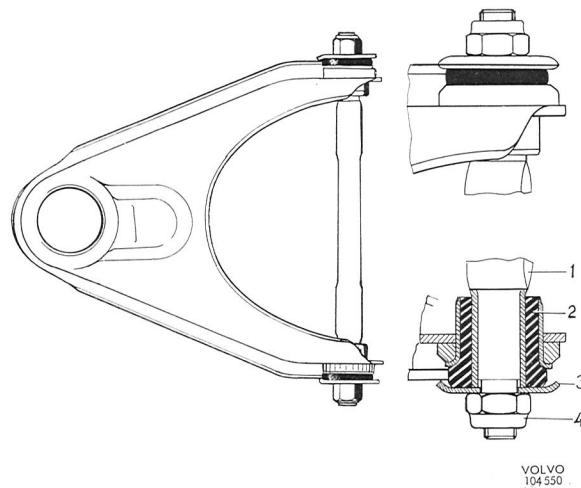


Fig. 6-14. Upper control arm

1. Control arm shaft 2. Bushing 3. Washer 4. Nut

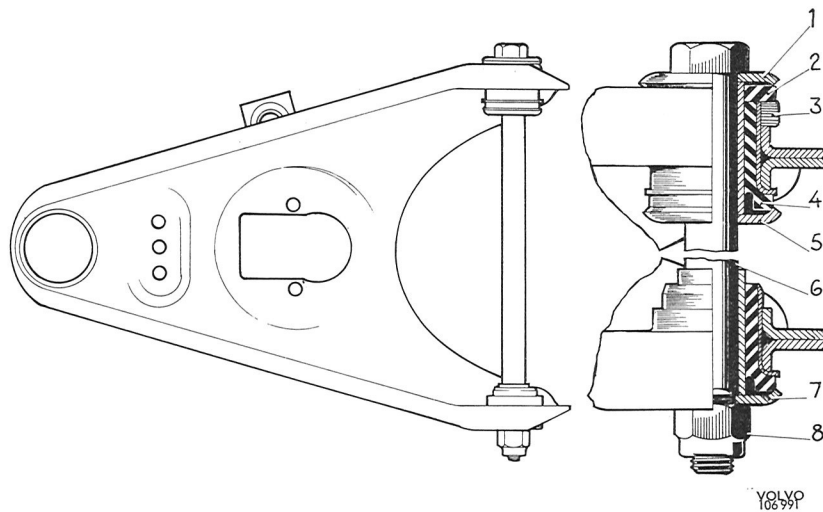


Fig. 6-15. Lower control arm

- | | |
|----------------|----------------------|
| 1. Washer | 5. Washer |
| 2. Rubber ring | 6. Control arm shaft |
| 3. Spacer ring | 7. Washer |
| 4. Bushing | 8. Nut |

SERVICE PROCEDURES

GENERAL

The ball joints require no lubrication and are therefore not equipped with lubricating nipples. However, the rubber seal should be inspected every 10 000 km (6 000 miles). The ball joint should be replaced if the seal is defective.

The control arms may only be straightened to a minor extent and then only in a cold condition. If the old part deviates to any great extent when compared to a new one, it should be replaced.

No straightening whatsoever is permitted for stub axles with steering knuckles.

The **tightening torque** is given in the "Specifications". Otherwise the standard torque applies for the respective bolting.

FRONT END COMPLETE REMOVAL

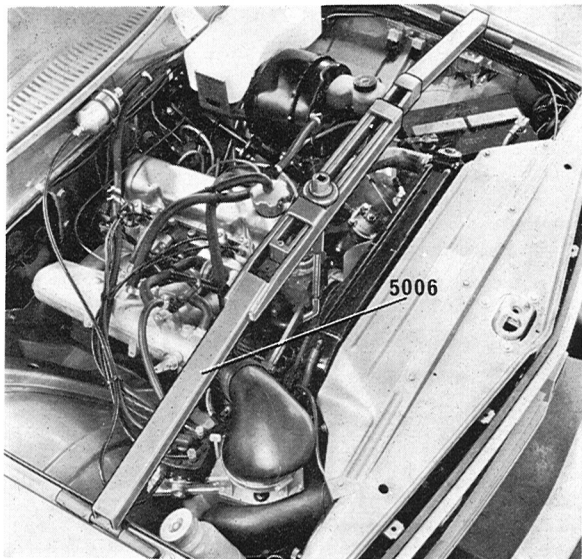


Fig. 6-16. Lifting tool for engine

1. Install the lifting tool 5006 according to Fig. 6-16. Hook it under the alternator bracket, as close as possible to the engine block. Raise the engine until the weight is taken off the front motor mount. Temporarily block the vent hole in the brake fluid container cover to reduce leakage. Remove the hub caps and loosen the nut for the front wheels a couple of turns.
2. Jack up the vehicle under the front jack attachment. Remove the front wheels.
3. Disconnect the steering rods from the steering arms with tool 2294 according to Fig. 6-21.
4. Remove the brake hose clamps from the stabilizer screws and remove the screws.
5. Remove the brake hoses from the bracket at the support member.
6. Remove the lower nuts for the front engine mountings.
7. Remove the front axle member attaching screws, lower and remove the front end.

DISASSEMBLY AND ASSEMBLY

Fixture 2560 and stand 2520 can suitably be used for work on a removed front end.

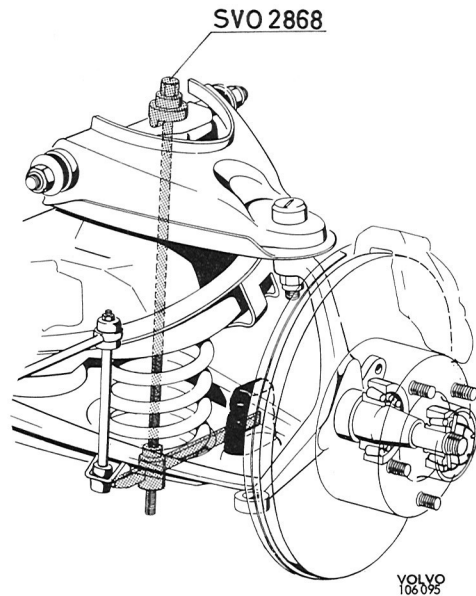


Fig. 6-17. Compressing spring

After the shock absorber has been removed, place tool 2868 as shown in Fig. 6-17. Compress the spring by screwing the spindle until there is clearance at the rubber buffer of the upper control arm.

Instructions, see under "Removal" and "Installation" for the various components.

If the rubber buffer which limits the engine mounting stop is to be replaced, place the new buffer on the rear side of the front axle member as shown in Fig. 6-18.

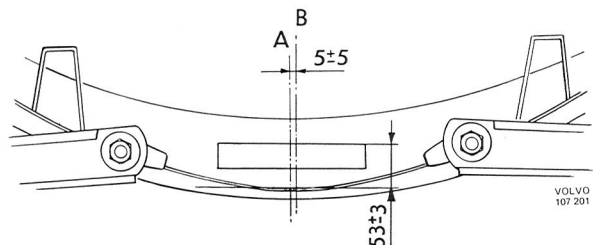


Fig. 6-18. Locating rubber buffer
A. Member centerline B. Buffer centerline

INSTALLATION

1. Fix the guide pins in the front holes for the front axle member.
2. Place a jack under the front end and raise the front end to position. Install rear bolts provided with plastic plugs. Remove the guide pins and install the front bolts (also those with plastic plug).

3. Tighten the engine mountings.
4. Install the brake hoses according to Fig. 5-15 (Section 5). Install the bolts for the stabilizer. Firmly secure the brake hoses.
NOTE: Check the location of the brake hoses according to Fig. 5-15 (Section 5).
5. Install the steering rods.
6. Bleed the brakes according to the instructions given in Section 5. Remove the temporary seal from the brake fluid container cap.
7. Install the front wheels. Lower the vehicle and remove the lifting device. Then install the timing gear cover screw with the flat washer.

STEERING KNUCKLE

REMOVAL

1. Remove the front wheel brake unit according to Section 5, "Removing the front wheel brake unit", points 1—4.

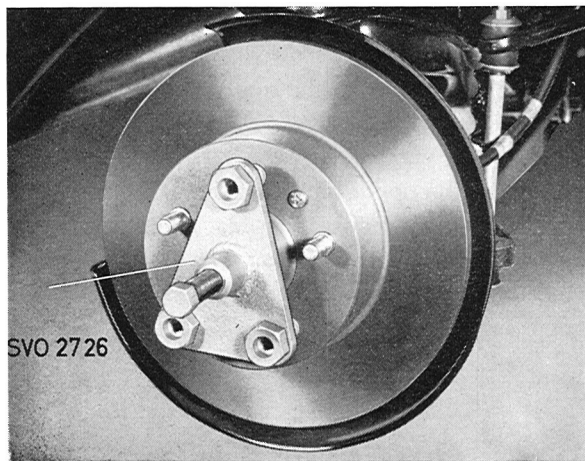


Fig. 6-19. Removing front wheel hub

2. Remove the grease cap with tool 2715. Remove the split pin and castle nut. Pull off the hub with puller 2726, see Fig. 6-19. Pull off the inner bearing for the steering knuckle with tool 2722, see Fig. 6-20.
3. Remove the steering rod from the steering arm with tool 2294, see Fig. 6-21.
4. Slacken, but do not remove the nuts for the ball joints and knock on the axle with a hammer until the ball joint pins loosen. Raise the lower control arm a little with the jack. Remove the nuts for the ball joints and then the steering knuckle.

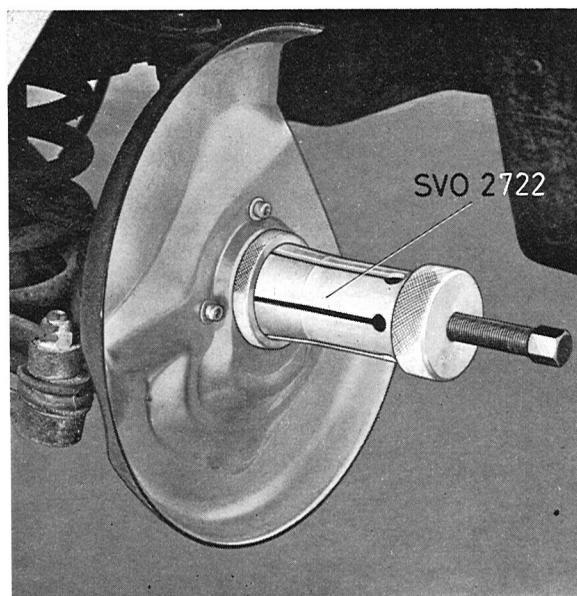


Fig. 6-20. Removing inner bearing

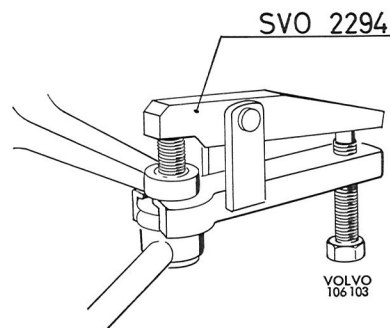


Fig. 6-21. Removing steering rod

EXAMINING BEARING COMPONENTS

Clean the hub and grease cap thoroughly. Make sure that all the old grease, even inside the hub is removed. Compressed air can suitably be used for a comprehensive cleaning of the bearings. Then wash the bearing components and allow them to dry. Drying by compressed air should be avoided since the air often contains water and dust particles. Accessible bearing components are dried with cotton or cloth rags (but not waste). The bearing surfaces must be dry of cleaning fluid in order not to reduce the adhesion of the grease which is applied later. A new bearing taken directly from its packing container should not be cleaned. After the cleaning, inspect the parts. If the bearing races or rollers are damaged, rusted or are blued,

replace the bearing. If the outer or inner ring is loose in its seat, try a new ring. The seals should be replaced if they are worn or damaged.

For lubrication of the wheel bearings, use only a high-class, durable grease for wheel bearings. Pack the bearings by hand with as much grease as possible between the roller retainers and the inner race. Grease also on the outside of the rollers and container. The intermediate spaces in the hub between the outer and inner bearing should be filled with grease, see Groups 46 and 77. Before installation, the wheel hub felt rings should be oiled generously with, for example, light engine oil.

Cleanliness of the bearings is of major importance for their lifetime. For this reason, do not let bearings not greased remain unprotected. Observe the greatest cleanliness.

INSTALLATION

1. Place the inner bearing in position in the hub and press in the sealing washer (1, Fig. 6-20) until it goes against the bearing outer ring. Use drift 5005 and standard handle 1801.
2. Place the steering knuckle in position and tighten the ball joint nuts. If the ball joint twists, hold it firmly in position with a screw vise (see Fig. 6-22). Install the steering rod to the steering arm.

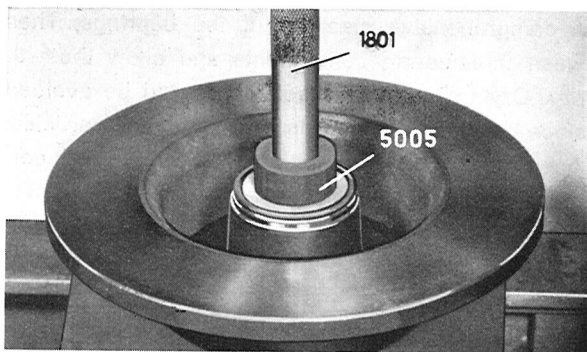


Fig. 6-22. Seal installation

3. Press the seal (2, Fig. 6-20) on the steering knuckle, without the tool, until it bottoms. It is important that the ring is not fitted at an angle.
4. Place the hub on the steering knuckle, the outer bearing, washer and castle nut.
5. Adjust the front wheel bearings by tightening the nut to 70 Nm (50 lbft). Then slacken the nut one third of a turn. If the slot in the nut does not coincide with the cotter pin hole in the steering knuckle, slacken the nut further until the cotter pin can be installed. Check that the wheel rotates easily but without any play.
6. Fill the grease cap half full of grease and tool 2715 for installation.
7. Install the front wheel brake unit and wheel according to Section 5, "Front brake caliper, installation".

UPPER BALL JOINT

CHECKING WEAR

This check can be made with the front end either jacked up or lowered. However, the upper control arm should not be against the rubber stop.

Check to see whether the ball joint has any **radial** clearance by bending up the wheel. If there is radial clearance, the upper ball joint should be replaced.

NOTE: Do not confuse possible play in the wheel bearings with clearance in the ball joint.

Axial clearance should not be measured for the upper ball joint.

REMOVAL

UPPER BALL JOINT, replace, one side, =Volvo Standard Times Op. No. 62150.

(62123 is the same operation, but wheel removed)

1. Remove the hub cap and slacken the wheel nuts slightly.
2. Jack up the front end of the vehicle under the front jack attachments. Remove the wheel.
3. Slacken but do not remove the nut for the upper ball joint. Knock with a hammer on the steering knuckle round the ball joint pin until it loosens from the axle. Remove the nut and suspend the upper end of the axle with a wire to avoid straining the brake hoses. See Fig. 6-23.
4. Loosen the nuts for the control arm shaft a 1/2 turn. Lift up the control arm slightly and press out the ball joint with press tool 2699 and sleeve 2701, see Fig. 6-23.

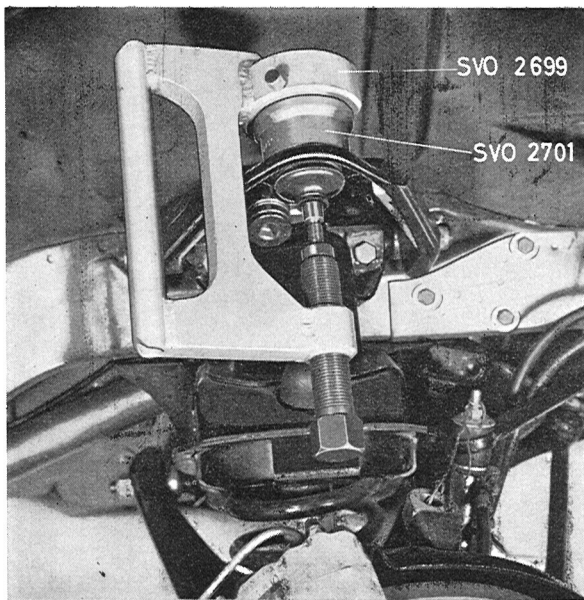


Fig. 6-23. Removing upper ball joint

INSTALLATION

1. Before installing the ball joint, check that the rubber cover is filled with grease. Bend the pin end over the slot, see Fig. 6-24. Check that the grease forces its way out. If necessary top up with multipurpose grease.

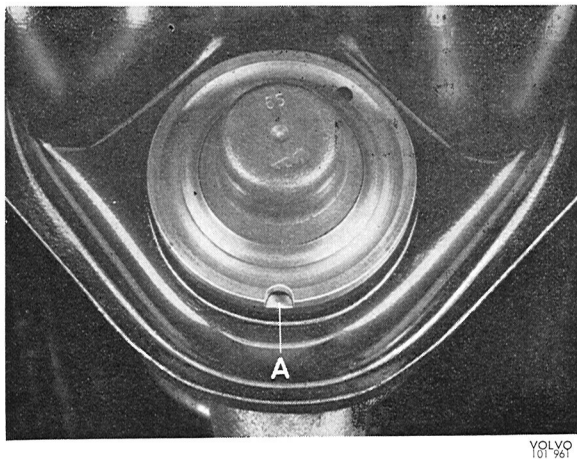


Fig. 6-24. Location of upper ball joint
A=Slot

2. Press the ball joint into the control arm with press tool 2699, sleeve 2701 and drift 2704, see Fig. 6-25. Make sure that the ball joint recess comes in line with the longitudinal shaft of the control arm (Within $\pm 8^\circ$) either externally or internally, see Fig. 6-24, as the pin has maxi-

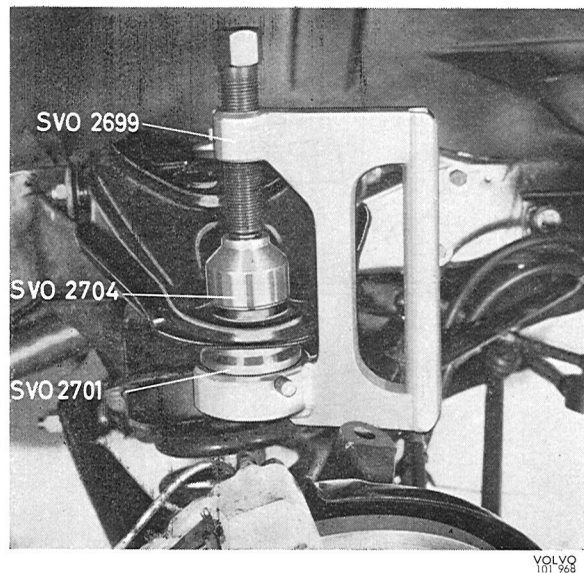


Fig. 6-25. Fitting upper ball joint

imum movement along this line. Should the ball joint be incorrectly installed when being pressed in, turn the tool 2699 half a turn and then press the ball joint into the correct position.

3. Turn down the control arm and tighten the nuts for the control arm shaft. Tighten the ball joint against the steering knuckle. If the pin rotates, hold it firmly with a screw vise, see Fig. 6-26.

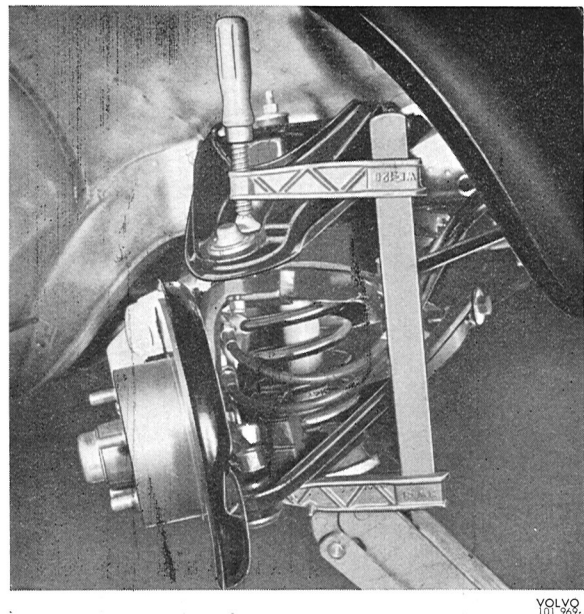


Fig. 6-26. Upper ball joint securely held by vise

4. Install the wheel and wheel nuts. Lower the vehicle and torque the wheel nuts to 100–140 Nm (70–100 lbft). Install the hub cap.

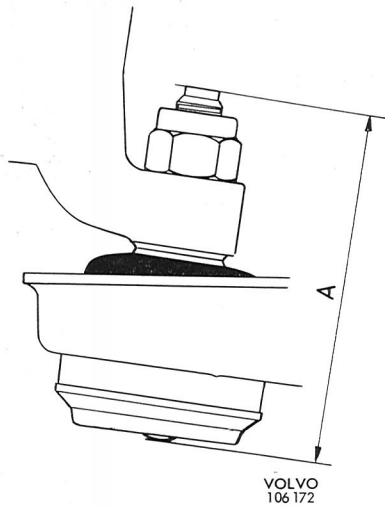


Fig. 6-27. Lower ball joint, type 1 (without spring)
A=Max. 99.3 mm (3.91")

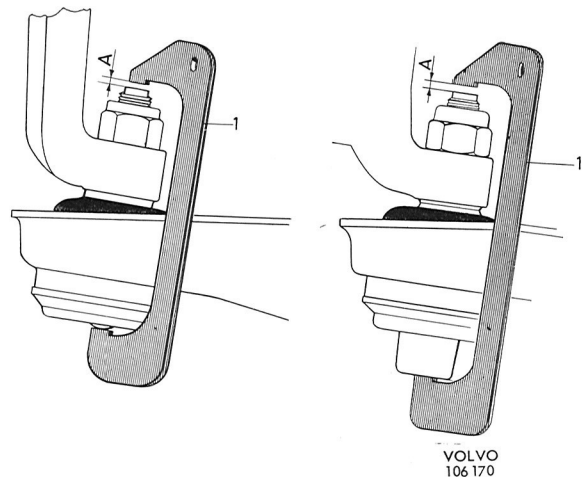


Fig. 6-29. Approved ball joints
1. 2967 for ball joint type 1
2968 for ball joint type 2
A=Clearance

LOWER BALL JOINT CHECKING WEAR

There are two types of lower ball joints. Type 2 (Fig. 6-28) has a built-in spring, while type 1 (Fig. 6-27) does not have such a spring.

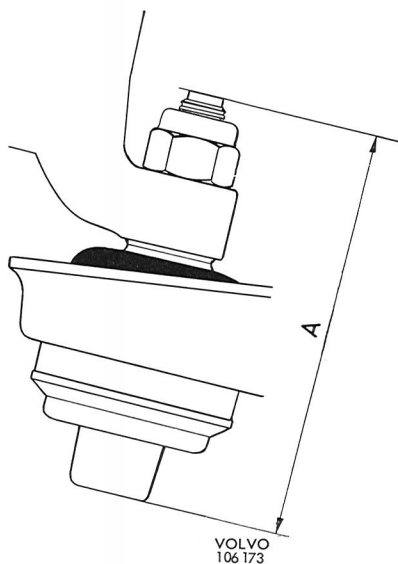


Fig. 6-28. Lower ball joint, type 2 (with spring)
A=Max. 113 mm (4.5")

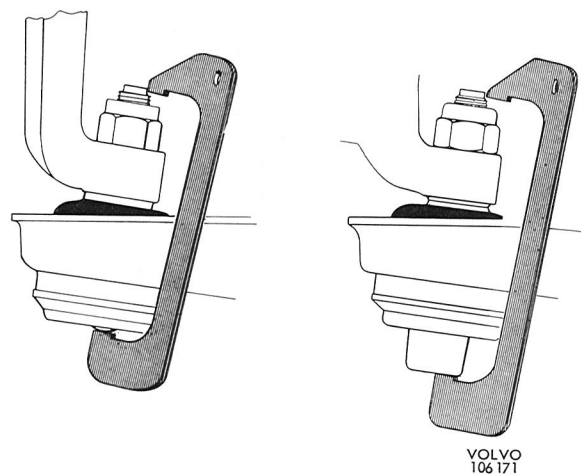


Fig. 6-30. Worn ball joints

BALL JOINT CHECK TOOLS

This tool is for a quick check on the lower ball joint in its operating position. The check should be made with normal load on the wheels, that is, with the vehicle standing on the ground, or a platform or similar. The wheels should point straight forwards. The tool cannot be used when jacking with a jack or hoist, which off-loads the ball joint.

The check is made as follows: Place the gauge over the ball joint. If the gauge (see Fig. 6-29) can be fitted over the ball joint, then the joint can be approved. If the length of the ball joint is greater than the tool span (see Fig. 6-30), the ball joint should be replaced.

REMOVAL

LOWER BALL JOINT, one side, replace=Volvo Standard Times Op. N. 62154
(62125 is the same operation, but wheel removed)

1. Remove the hub cap and slacken the wheel nuts slightly.
2. Jack up the vehicle under the front jack attachment. Remove the wheel.
3. Disconnect the steering rod from the steering arm with tool 2294, see Fig. 6-21, and disconnect the brake lines from the stabilizer bolt.
4. Loosen the nuts for the upper and lower ball joints, but do not remove them. Knock with a hammer until the ball joints loosen from the axle. Raise the lower control arm with the jack. Remove the nuts.
5. Remove the steering knuckle with hub and the front wheel brake, unit, and place them on a stand or similar.

INSTALLATION

1. Press the ball joint out of the lower control arm with press tool 2699 and sleeve 2700, see Fig. 6-31.

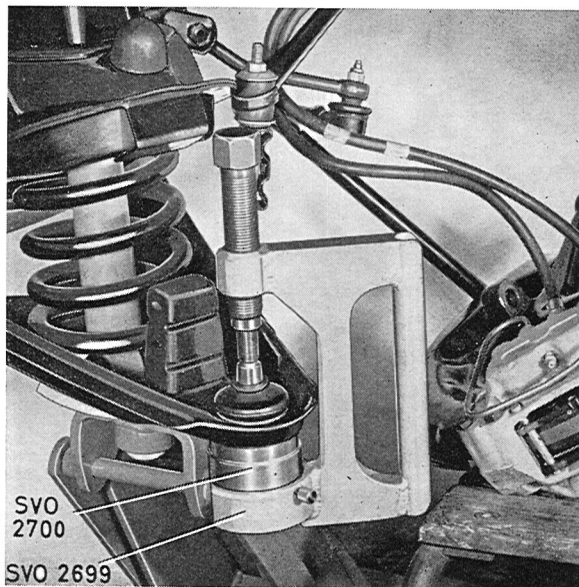


Fig. 6-31. Removing lower ball joint

2. Check that the rubber cover is filled with grease by breaking the pin to the side so that grease is forced out. If this does not happen, then fill the rubber cover with grease.

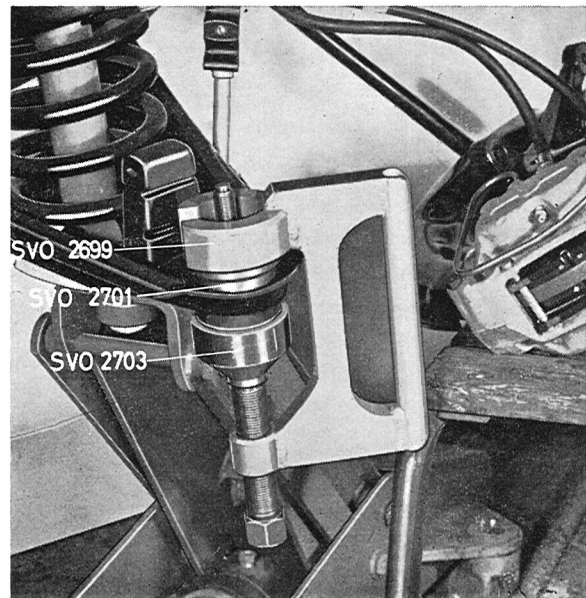


Fig. 6-32. Installing lower ball joint

3. Press the ball joints into the control arm with tools 2699+2701+2703, see Fig. 6-32. Should the ball joint not fit correctly, turn the tool 180° and tighten finally with the tool in this position. The ball joint must not be loose in the control arm.
4. Install the steering knuckle and tighten the nuts of the upper and lower ball joints. If the pins rotate, fix them securely with a screw vise, see Fig. 6-26. Install the steering rod and lower the jack in order to take the load off the control arms. Point the wheels straight forwards and fasten the brake hoses to the stabilizer screw.
5. Install the wheel. Lower the vehicle and tighten the wheel nuts. Install the hub cap.

UPPER CONTROL ARM (A-FRAME)

Replace, one side=Volvo Standard Times Op. No. 62212

REMOVAL

1. Follow operations 1—3 described in "Replacing upper ball joint".
2. Remove the screws for the control arm shaft with tool 2713, see Fig. 6-9.

NOTE: Keep the shims in a safe place. Lift off the control arm.

REPLACING BUSHINGS

UPPER CONTROL ARM pivot shaft and/or bushing, replace, one side=Volvo Standard Times Op. No. 62230

1. Remove the nuts (4, Fig. 6-14) and the washers (3) for the control arm shaft.
2. Fix the control arm shaft securely in a vise. Carefully bend out the control arm ends so that tool 2729 can be attached, Fig. 6-33. Drive out

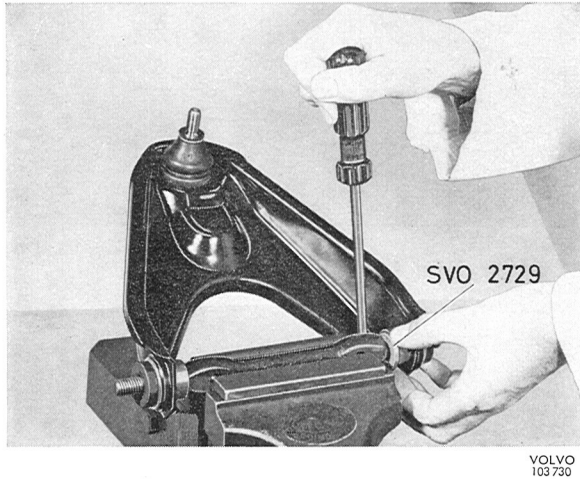


Fig. 6-33. Removing control arm shaft. 1. Removal of tool 2729

one of the bushings with a mallet and tool 2702, see Fig. 6-34. Turn the control arm, move

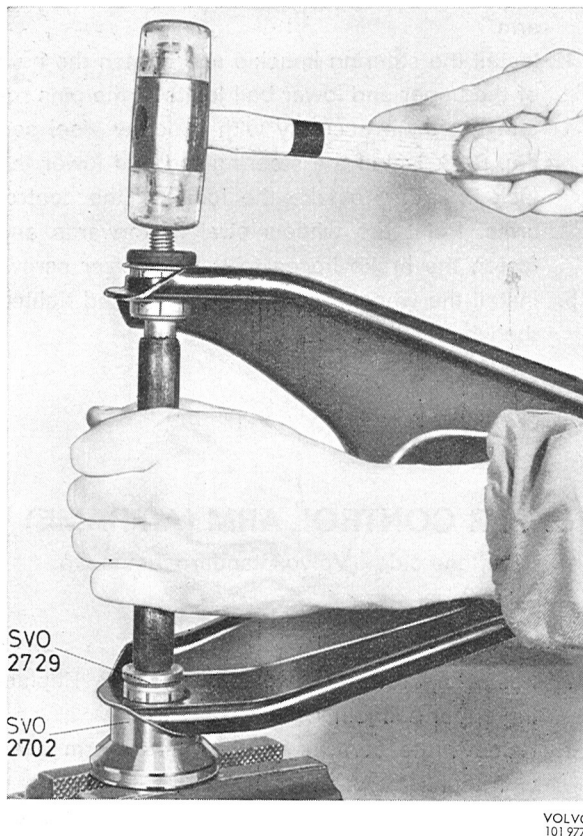


Fig. 6-34. Removing control arm shaft. 2. Driving out shaft

tool 2729 over to the other side and drive out the other bushing in the same way as for the first one.

3. Hold press tool 2699 firmly in a vise. Press in one of the bushings with tool 2702 and tool 2706, see Fig. 6-35.

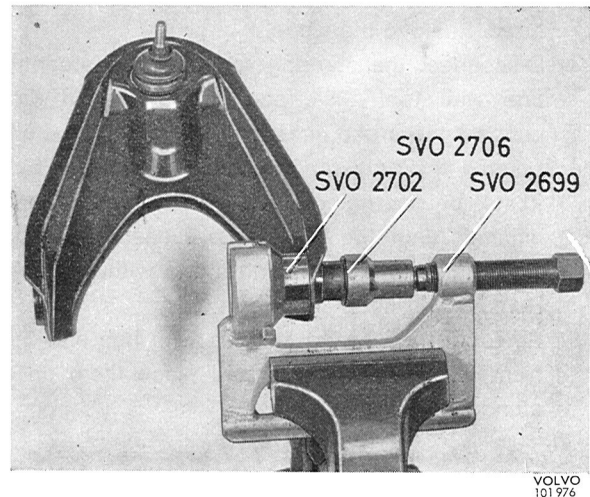


Fig. 6-35. First rubber, upper control arm

4. Install the control arm shaft and press in the other bushing with the sleeve 2702 + drift 2706, see Fig. 6-36. Make sure that the shaft fits the recess of the tool 2702.

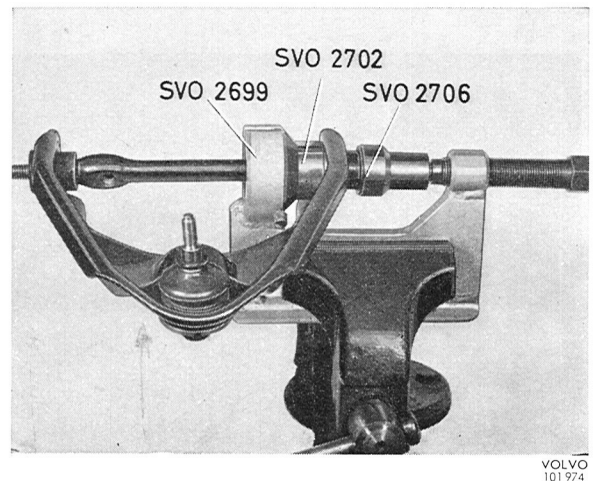


Fig. 6-36. Second rubber, upper control arm

5. Install the washers (3, Fig. 6-14) and the nuts (4). Tighten the nuts when the control arm is installed.

NOTE: The control arms is fixed with a special screw containing a nylon plug.

1. Place the control arm in position and install the screw by hand. Install the shims in the position they occupied previously. Tighten the screws with tool 2713. Torque the nuts for the control arm shaft to 55—62 Nm (40—45 lbft).

2. Install the upper ball joint in the steering knuckle and tighten the nut.
3. Install the wheel and wheel nuts. Lower the vehicle and torque the wheel nuts to 100—140 Nm (70—100 lbf). Install the hub cap.

LOWER CONTROL ARM (A-FRAME)

Replace, one side=Volvo Standard Times Op. No. 62208

REMOVAL

1. Remove the hub cap and loosen the wheel nuts a couple of turns.
2. Jack up the vehicle at the front jack attachment. Remove the wheel.
3. Remove the shock absorber, see Section 7, "Removing shock absorber".
4. Disconnect the steering rod from the steering arm with tool 2294, see Fig. 6-21. Loosen the clamp for the brake hoses. Remove the screw for the stabilizer.
5. Place the jack under the lower control arm. Loosen the nuts for the ball joints, and knock with a hammer until the ball joints loosen from the steering knuckle. Remove the nuts and lower the jack. Remove the steering knuckle with the front brake wheel unit and place them on a standard or suchlike.
6. Then lower the jack and remove the spring.
7. Remove the nut from the control arm shaft and take off the latter. Turn the relay arm with the tie rod so that the control arm shaft is free and thus can be removed. Take off the control arm.

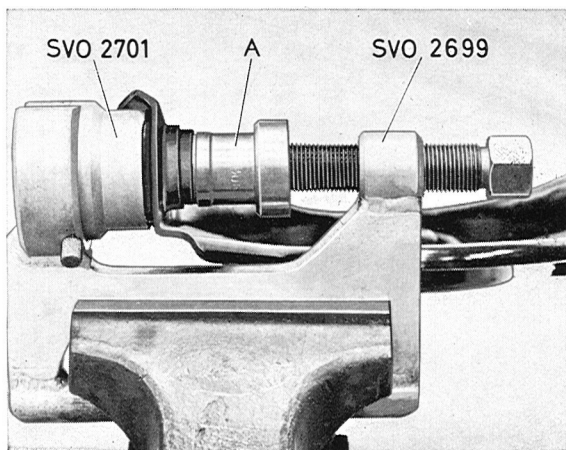


Fig. 6-37. Removing bushing, lower control arm
A=2904 for bushings intended for diagonal tires and
2905 for radial tires

REPLACING BUSHINGS

Lower A-frame pivot shaft and for bushing, replace, one side=Volvo Standard Times Op. No 62228

Note that there are special bushings intended for radial tires. When replacing bushings, observe if the vehicle is with radial or diagonal tires.

1. Tension the press tool 2699 in the vise. Remove the washer (1, Fig. 6-15), the rubber ring (2) and the spacer ring (3). Press the bushings out with counterhold 2701. Use drift 2904 for bushings where diagonal tires are installed and 2905 for radial tires. The tools are placed as shown in Fig. 6-37. The bushings are pressed out in the direction towards their flanges.
2. Press in the bushing with control arm and drift (A, Fig. 6-37) facing in the opposite direction.

NOTE: Both the bushings should be faced with the flange towards the rear in the vehicle, see Fig. 6-15. If it concerns a bushing for radial tires, its recess must also be turned downwards at right angles to the longitudinal direction of the control arm, see Fig. 6-38.

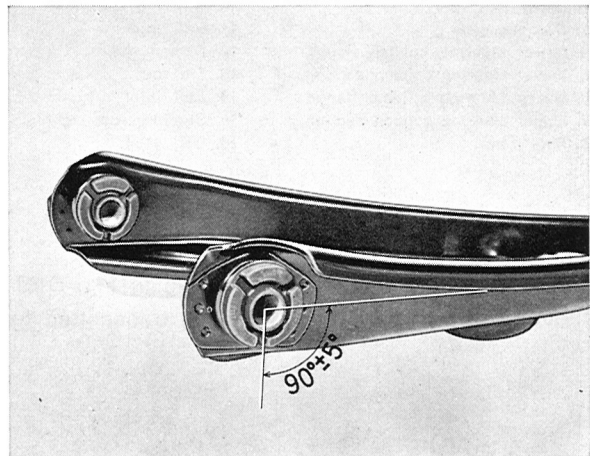


Fig. 6-38. Bushings for radial tires

INSTALLATION

1. Supplement the control arm with rings and washers as shown in Fig. 6-15. Position the control arm.
Install the control arm shaft. Keep the control arm fairly horizontal and tighten the nut for the control arm shaft.
2. Install the spring. Raise the jack and install the steering knuckle according to point 8 in "Replacing ball joint, lower control arm".
3. Install the shock absorber according to "Installing shock absorber".
4. Install the wheel. Lower the vehicle. Tighten the wheel nuts. Install the hub cap.