#### **GEARBOX**

## GROUP 13

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13

The speed gear is of the "mechanical type" with 5 speeds plus reverse and is part of a mechanical assembly including also the clutch and differential units.

Mamely, the front part includes the clutch unit with thrust bearing and control fork, and supports the ends of both main and pinion shafts.

The intermediate part is composed of a flange on which speed gear shafts with the related forks and rods for speed selection and engagement are supported and secured. This part constitutes a compact assembly which can be easily removed from rear part which, on its turn, supports the ends of speed gear shafts, acts as differential-speed gear casing, and contains the differential system.

Speed change takes place via a central floor lever connected to gearbox through a speed control lever and a linkage of "isostatic type".

This type of linkage allows a very smooth speed change to be obtained preventing the slightest sticking.

The isostatic control makes use of two levers: one for the speed selection and the other for the speed engagement, both housed on gearbox.

#### **DESCRIPTION**

The first lever, through tie rod and bracket, controls the rotation of speed selector rod around its axis, thus allowing speed selection to be obtained.

The second lever permits the longitudinal movements of speed selector rod, thus determining the engaging of the previously selected speeds.

- The forward speeds gears, in constant mesh, are helical-toothed to guarantee the utmost quietness and are fitted with synchronizers operated by sleeves.
- The reverse gears are straight toothed. Engagement takes place through the movement of a sliding gear which transmits the rotation of main shaft gear to that of pinion shaft thus causing motion reversal.
- The sleeves movement takes place through forks operated by the speed selector rods. The rods slide on a flange inside which are located the positioning devices and some interlock plungers having the purpose of preventing the simultaneous engagement of several speeds.

Another safety device for the reverse speed is secured on the clutch speed gear casing; it has the purpose of preventing the accidental

transition from 5th speed to reverse. The synchronizers, via friction action, cause the driven gear and coupling sleeve to assume same speed. This ease final coupling which causes the mating of coupling toothing between sleeve and driven gear.

In detail, the synchronizers of 2nd, 3rd, 4th and 5th speed, are fitted with two equal retainers: one used to gear down and the other to gear up, with a guide sector and a locking sector. The 1st speed synchronizer, in addition to the conventional retainer for the transition from the 2nd to 1st speed, and the guide and locking sectors, is fitted with another retainer for the transition from the neutral to the first speed, with spring, two plates and a pawl.

This solution allows a very smooth engagement of 1st speed to be obtained; infact, in the event of sticking of sleeve toothing on gear front toothing, the spring is compressed and permits the gears to perform a slight rotation and then, a correct mating.

#### NOTE:

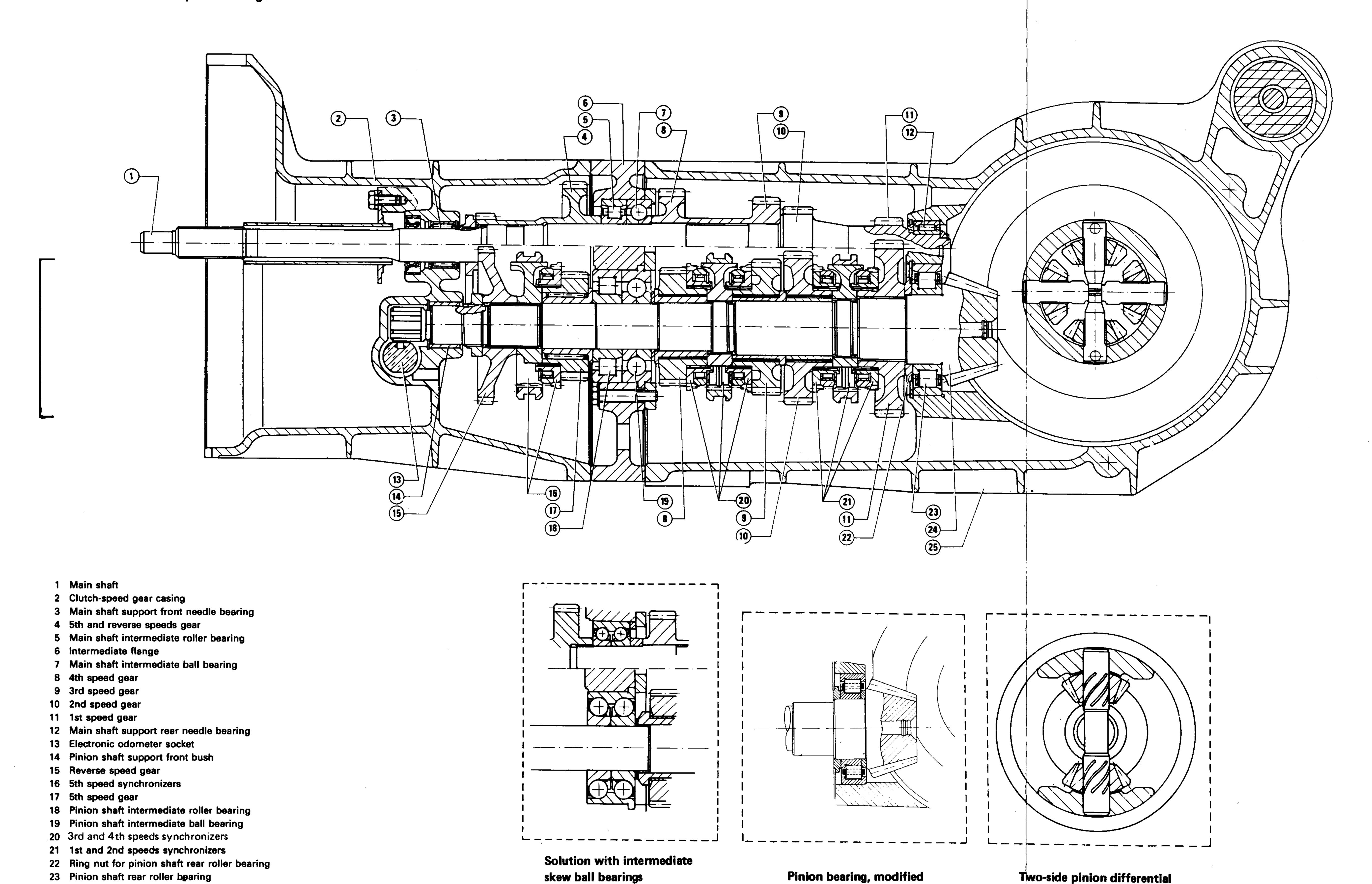
On certain models (See Unit 00 - Use of Units in the Car), a modified pinion underhead bearing, without retainer ring, is now assembled.

The two types of bearing are not interchangeable.

#### Solution with intermediate roller-ball compound bearings

24 Pinion shaft

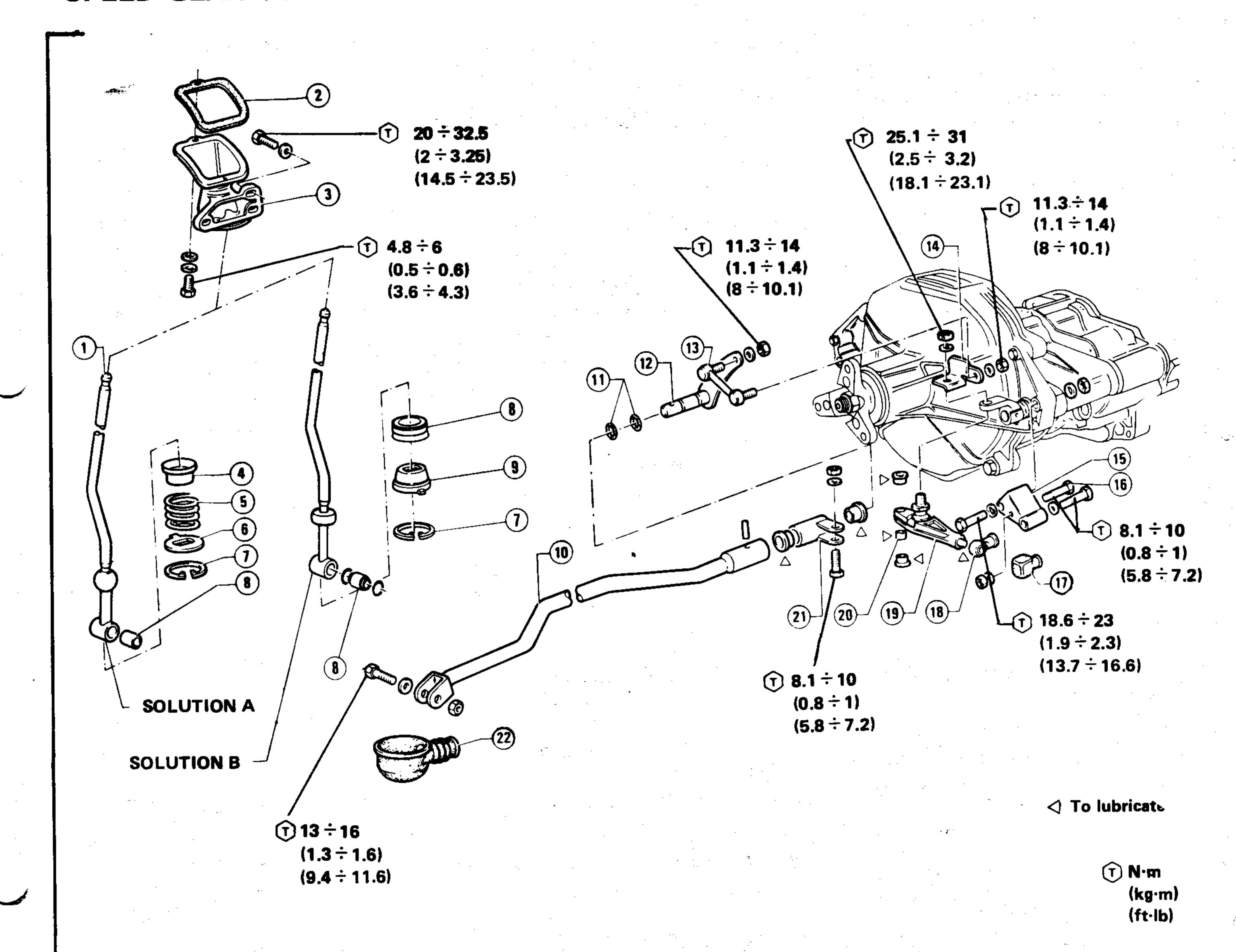
25 Differential-speed gear casing



3 - 4 PA360900000000

### OUTER LINKAGE

#### SPEED GEAR CONTROL ASSEMBLY

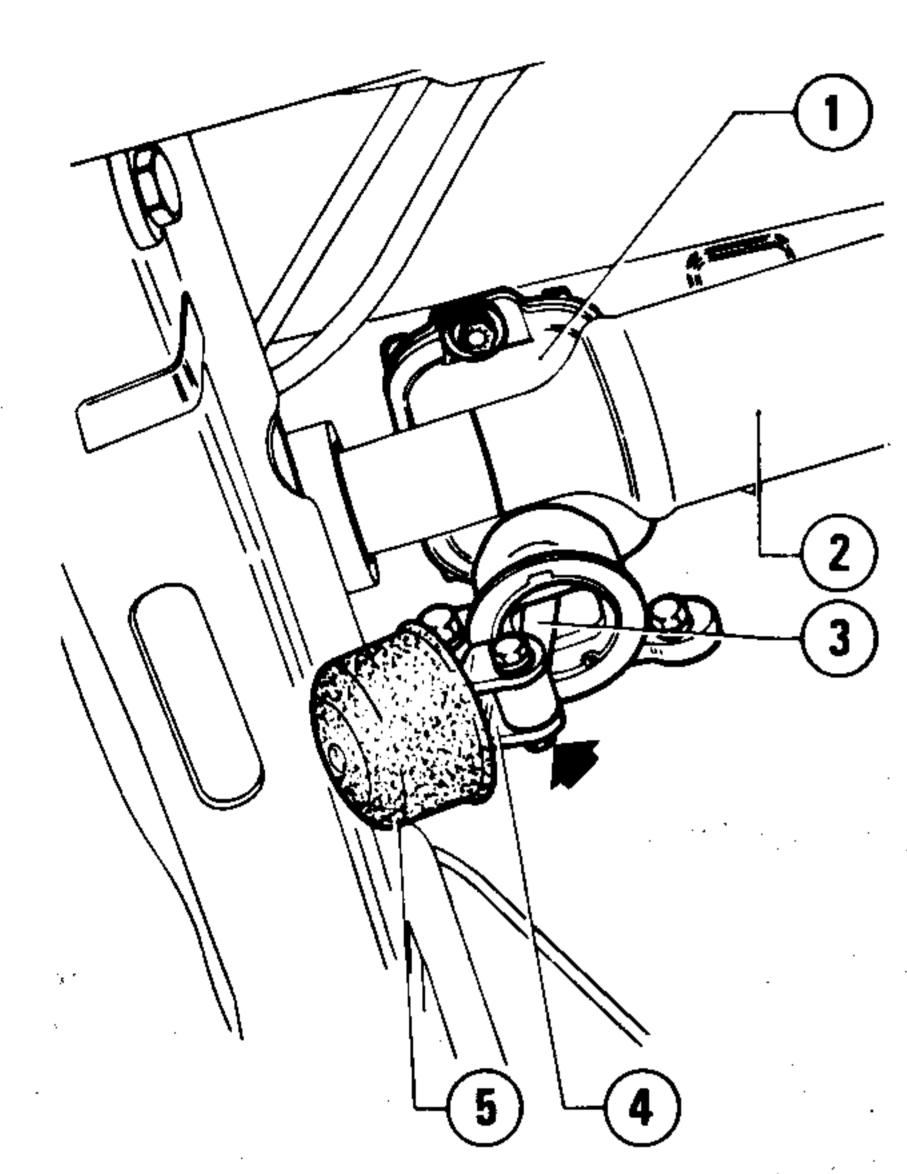


- 1 Speed gear control lever
- 2 Gasket
- 3 Speed gear control lever support
- 4, Cup
- 5 Spring
- 6 Plate
- 7 Retaining ring
- 8 Bush
- 9 Spacer
- 10 Speed gear control outer rod
- 11 O-Rings

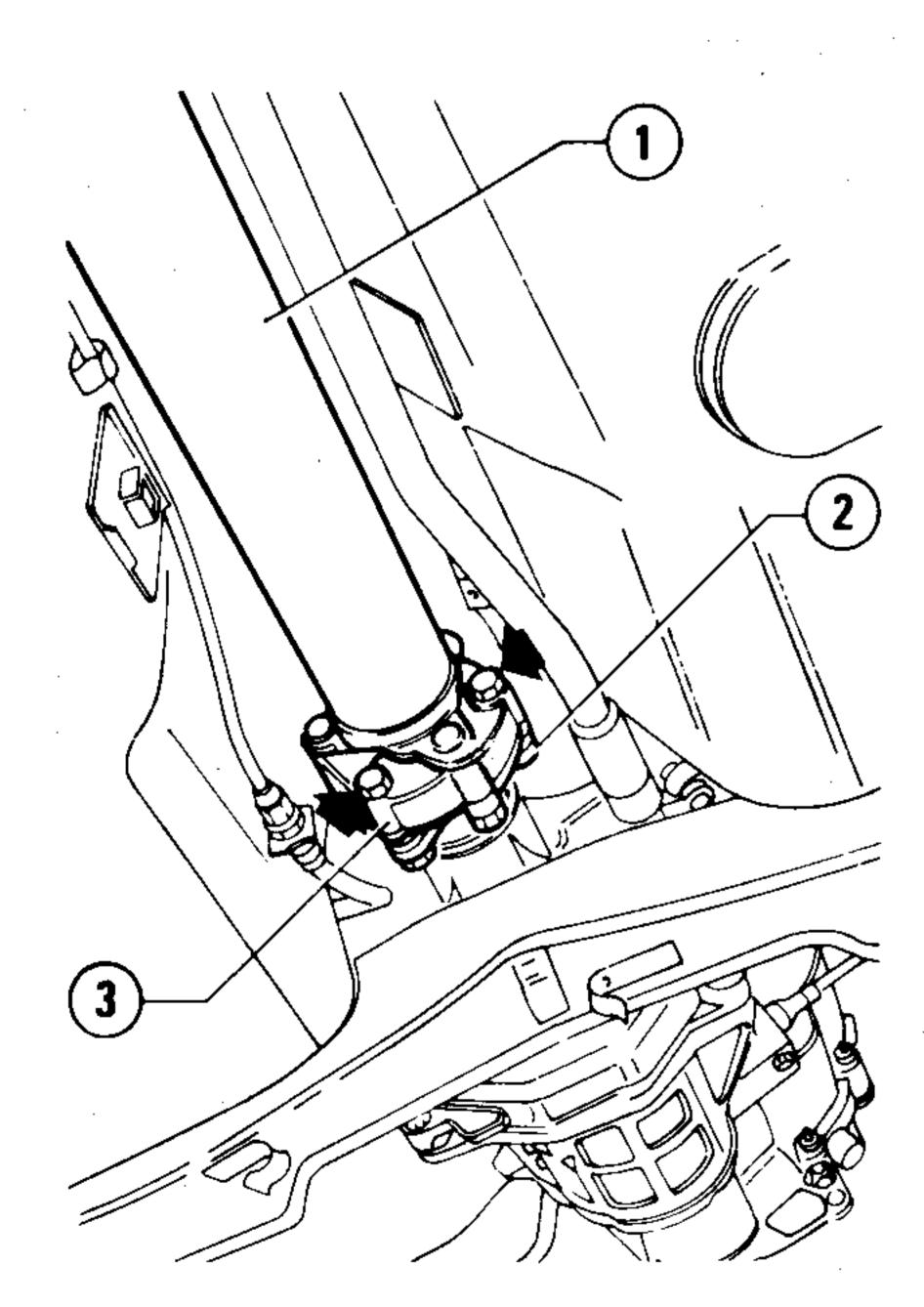
- 12 Speed transmission and selection lever
- 13 Speed selection tie rod
- 14 Bracket
- 15 Securing bracket
- 16 Bolt securing bracket to speed gear rubber pad
- 17 Guard
- 18 Pin with bush for speed transmission and angagement lever
- 19 Speed transmission and engagement lever
- 20 Bush
- 21 Bush for speed transmission and selection lever
- 22 Boot

#### **REMOVAL**

- 1. Set vehicle on lift, remove front and central element of exhaust pipe (Refer to: Group 04 "Exhaust system Removal" of the "WORKSHOP MANUAL Engines").
- 2. Move boot 5 and detach rod 4 from the related lever 3 by unscrewing the securing bolt. Recover boot.

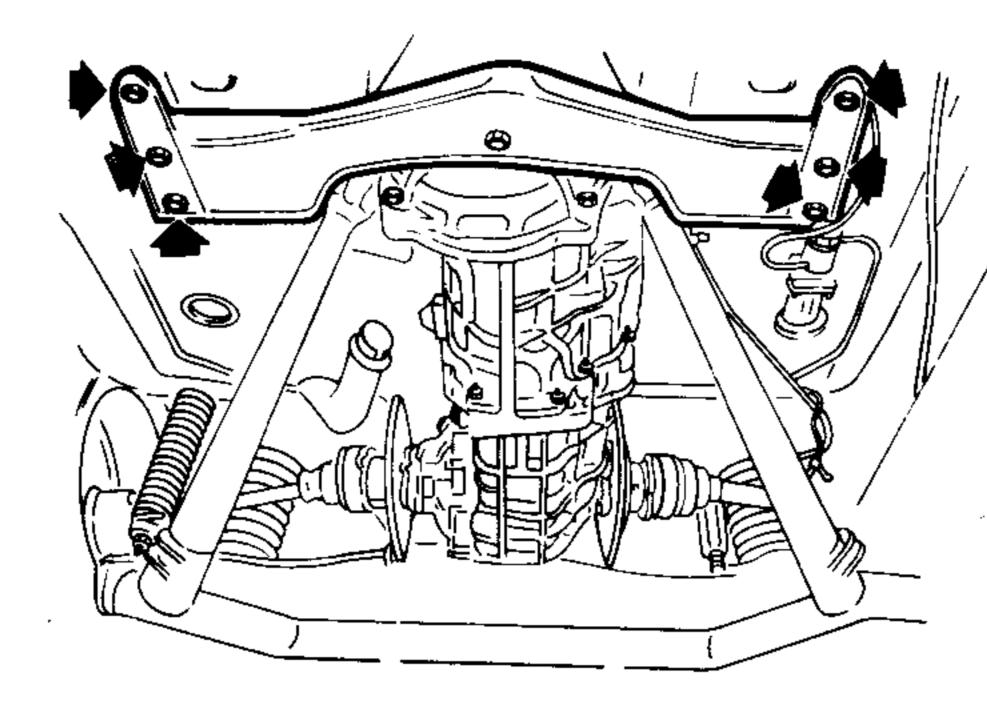


- 1 Speed gear control lever support
- 2 Propeller shaft
- 3 Speed gear control lever
- 4 Speed control rod
- 5 Boot
- 3. Detach propeller shaft 1 by unscrewing the three bolts securing rubber pad 3 to flange 2.

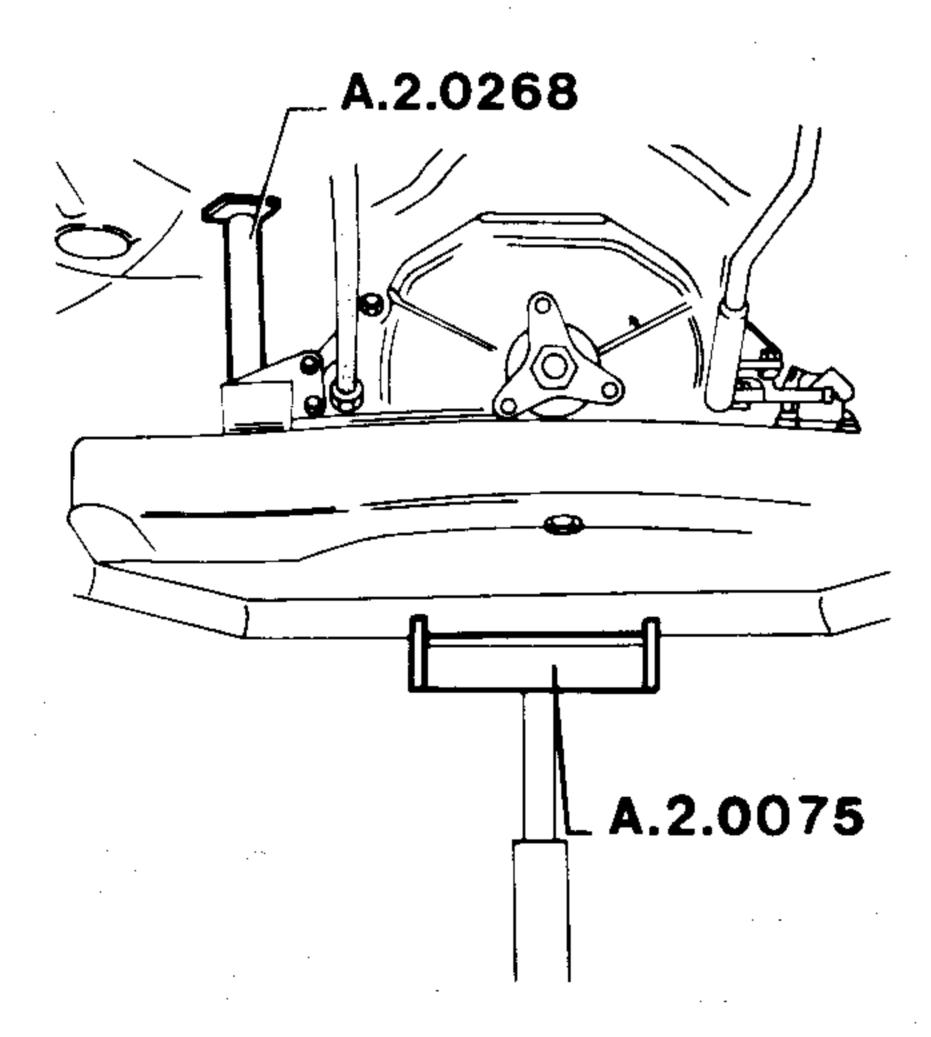


- 1 Propeller shaft
- 2 Flywheel-clutch shaft flange
- 3 Rubber pad

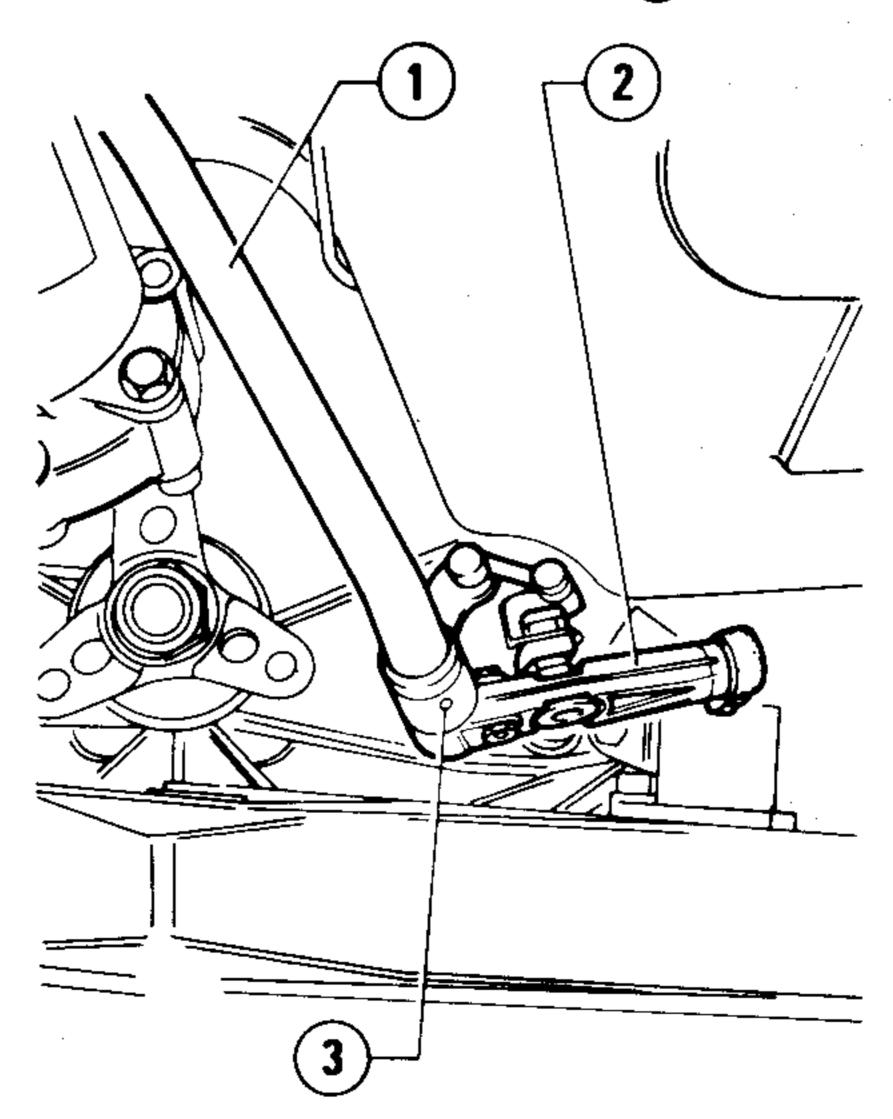
4. Unscrew the six screws securing axle front cross member to body.



5. By means of a column lift fitted with support A.2.0075, operate on the De Dion axle in order to lower cross member together with clutch-speed gear-differential unit and then, interpose spacer A.2.0268 between one arm of axle and body.



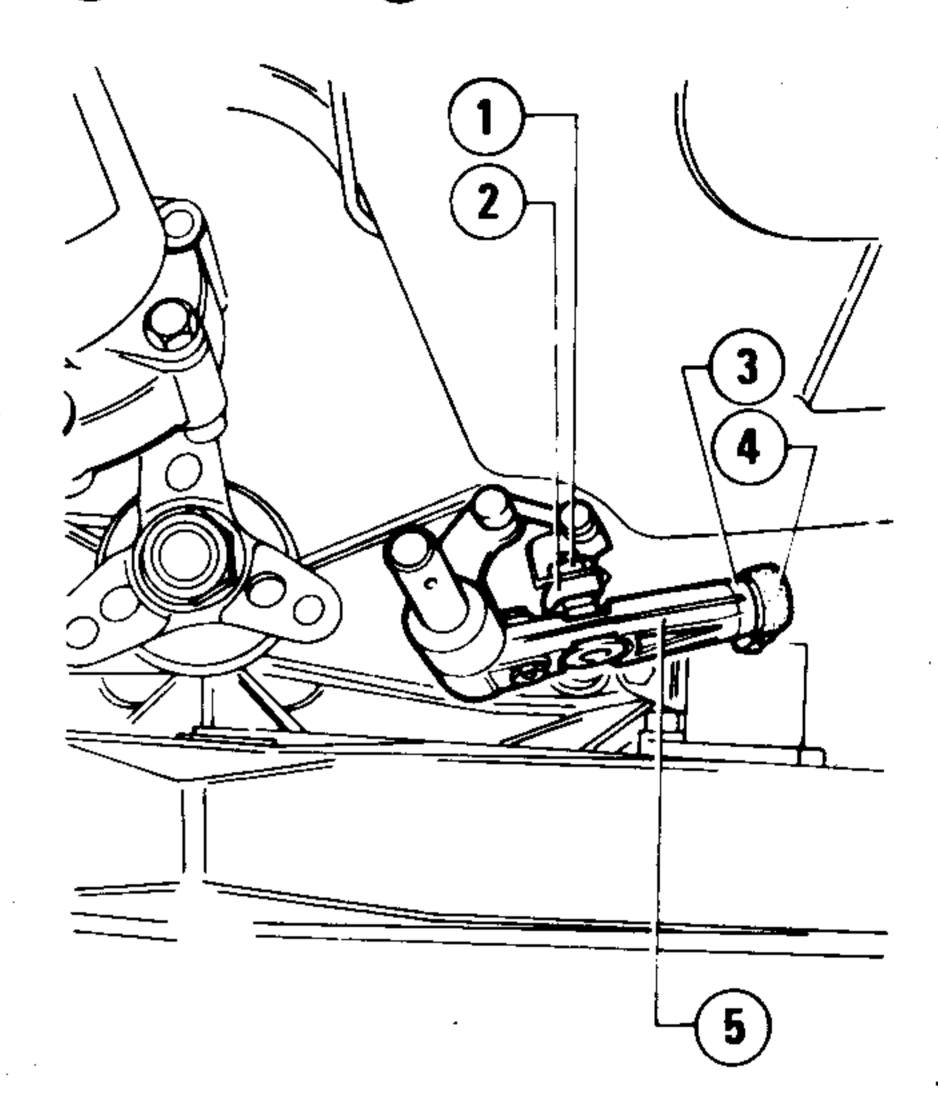
6. Withdraw pin 3 and remove rod 1 separating it from lever 2.



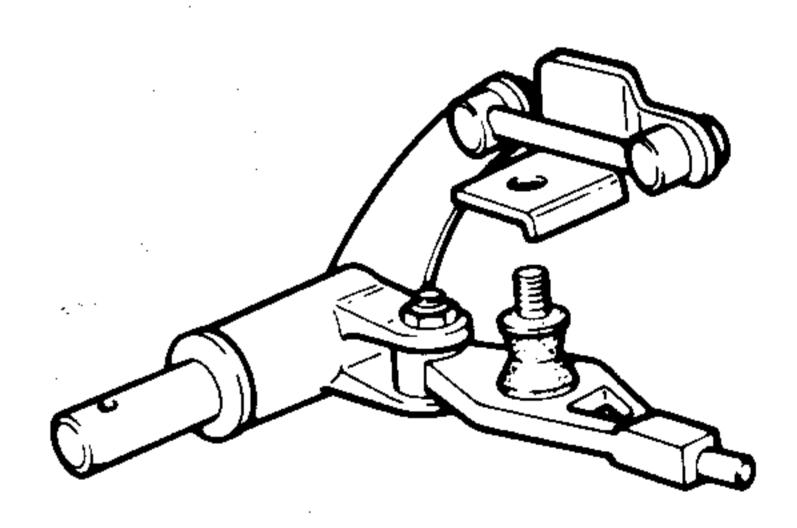
- 1 Speed control rod
- 2 Speed transmission and engagement lev-
- 3 Connection pin

7. Unscrew and remove nut 1 securing lever 5 to lever 2 on speed selection and engagement lever.

Release the speed transmission and engagement lever from lever 2 and remove it by withdrawing pin 3 of lever 5 from boot 4 inner ball joint.



- 1 Nut securing speed transmission and engagement lever to rear lever
- 2 Rear lever on speed selection and engagement rod
- 3 Pin for speed transmission and engagement lever
- 4 Boot
- 5 Speed transmission and engagement lev-

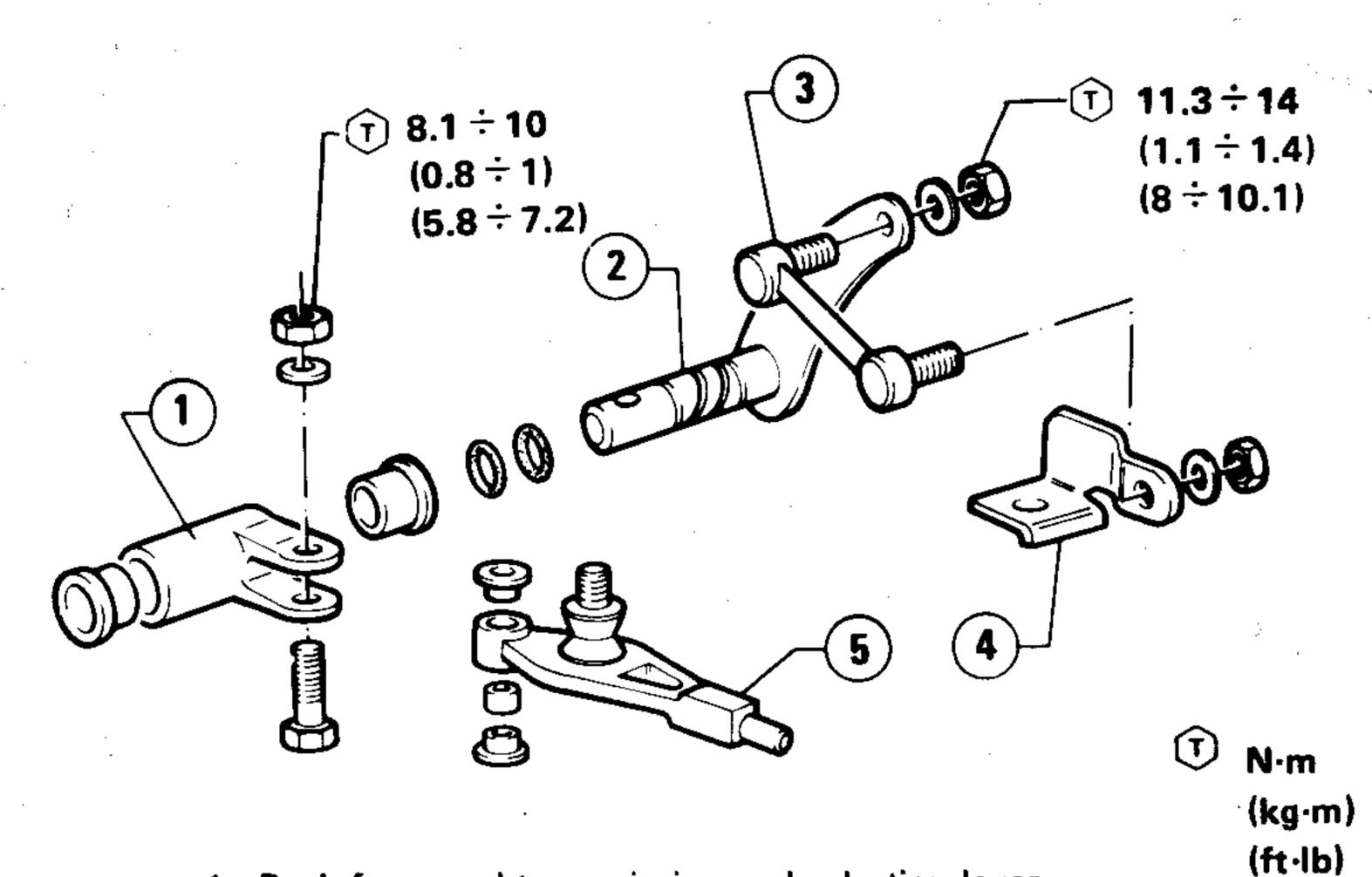


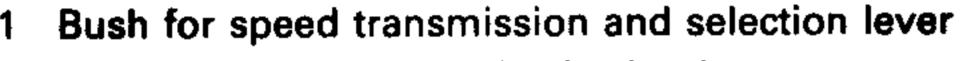
#### **CHECKS AND INSPECTIONS**

- 1. Clean the metal items of outer linkage with alcohol and verify they are in good conditions.
- 2. Check wear degree of bushes on linkage articulated joints.
- 3. Check ball joints of speed transmission and engagement lever and of speed selection tie rod. Replace them in the event of excessive clearance or seizing.
- 4. Check that rubber boot is in good conditions. Replace it if worn or damaged.
- 5. If required, disassemble the isostatic control assembly as shown in the figure.

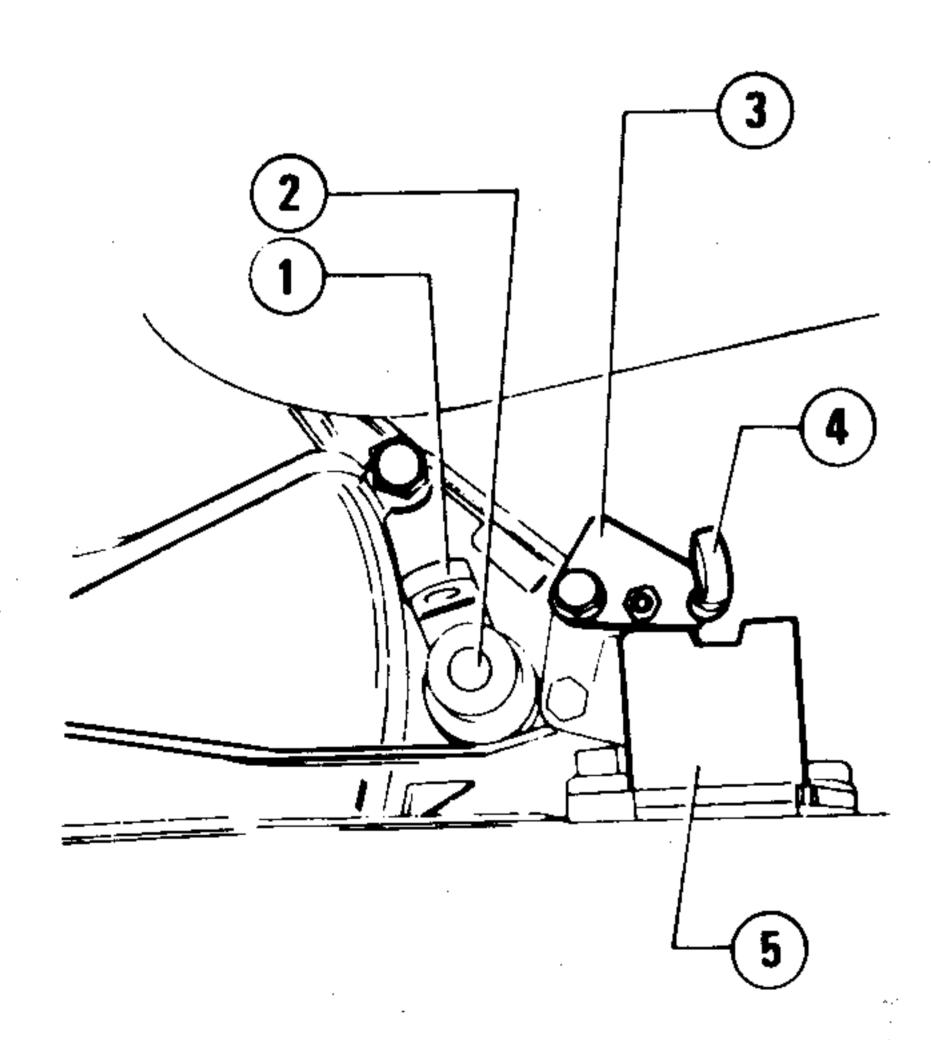
- O-Rings must be replaced at each disassembly.
- Reassemble the unit tightening

screws and nuts to the prescribed torque shown in the figure.





- 2 Speed transmission and selection lever
- 3 Speed selection tie rod
- 4 Bracket
- 5 Speed transmission and engagement lever
- 6. If required, unscrew the two bolts securing bracket 3 to clutch speed gear differential unit and to rubber pad 5. Remove the bracket.



- 1 Rear lever speed selection and engagement rod
- 2 Speed selection and engagement rod
- 3 Securing bracket
- 4 Isostatic control articulated joint
- 5 Rubber pad

#### INSTALLATION

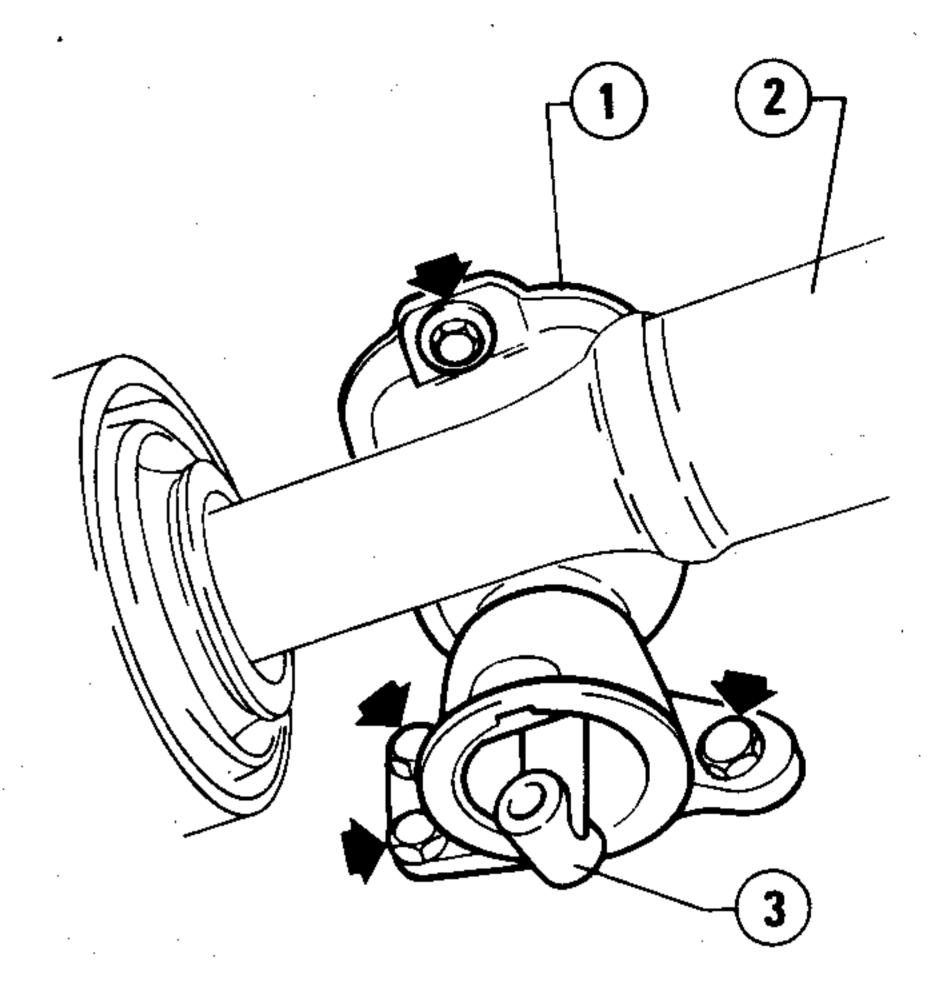
For the installation, reverse the order of removal and comply with the following. Refer to figure of page 13-5.

- 1. Lubricate the below items with the prescribed grease (Molykote Longterm No. 2).
- Bushes for speed transmission and selection lever
- Ball joint for speed transmission and engagement lever
- Innerside of bushes for speed transmission and engagement lever
- 2. Replace the connecting spring pin with a new one.
- 3. Tighten screws and bolts to the torques specified in "Service Data and Specifications Tightening Torques".
- 4. Check proper functioning of isostatic control.

## SPEED GEAR CONTROL LEVER

#### REMOVAL

- 1. Operating from passenger compartment inside, withdraw knob of speed gear lever and rubber boot.
- 2. Carry out steps 1 and 2 of paragraph "Speed Gear Control Assembly Removal".
- 3. Unscrew the four screws securing support 1 to body and remove it with lever 3.



- 1 Speed gear control lever support
- 2 Propeller shaft
- 3 Speed gear control lever

#### **DISASSEMBLY**

With reference to figure of page 13-5 remove retaining ring 7 by means of suitable pliers, and withdraw plate 6, spring 5, cup 4 and lever 1.

#### **CHECKS AND INSPECTIONS**

- 1. Verify components good conditions.
- 2. Verify that spring is not strained.

#### **REASSEMBLY**

To reassemble, reverse the order of disassembly taking care to **lubricate** the ball joint of speed gear control lever with the prescribed grease (ISECO Molykote BR2).

#### INSTALLATION

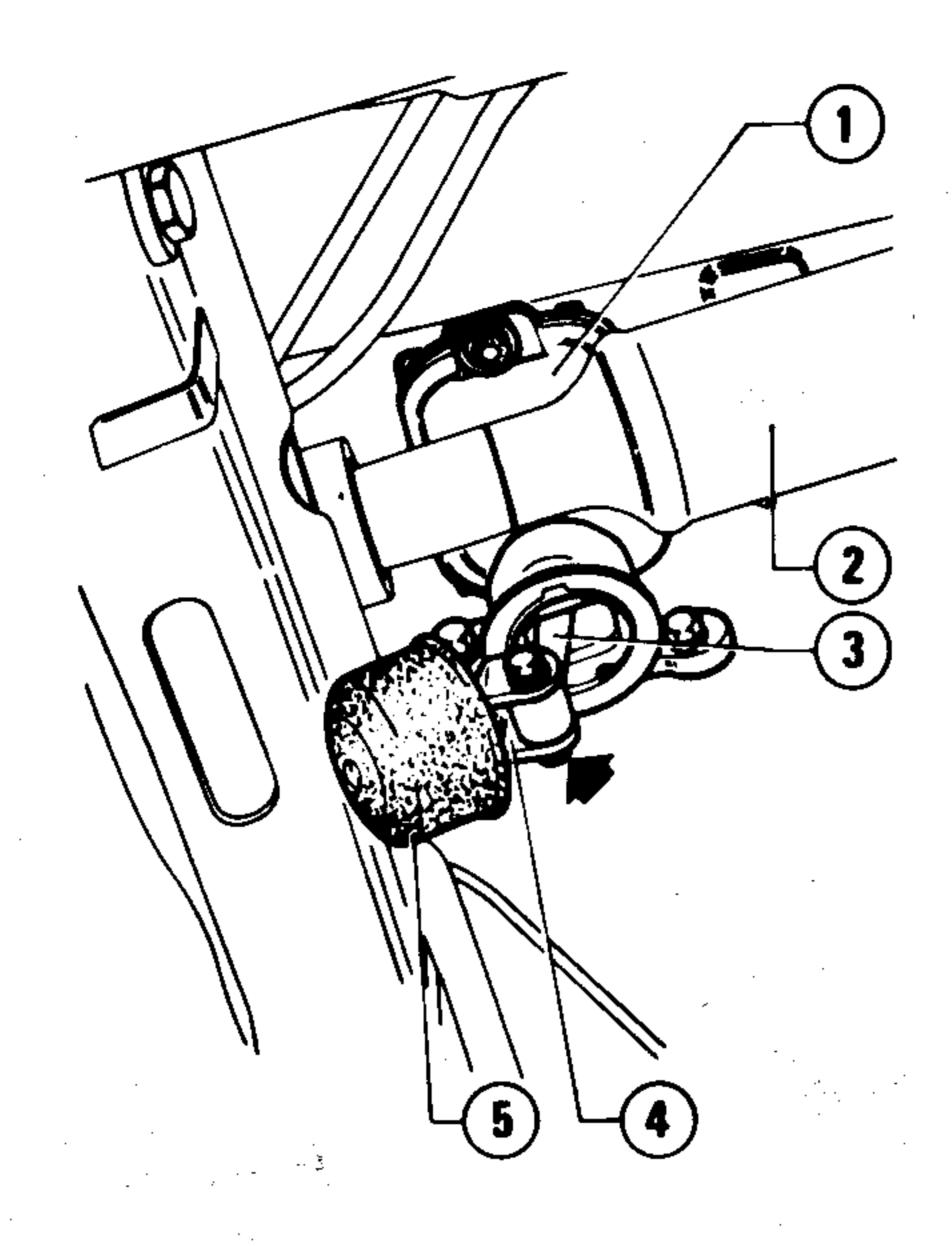
To reinstall lever, reverse the order of removal and comply with the following.

- 1. Take care when inserting lever into dust cover to prevent damaging it.
- 2. Tighten screws and bolts to the prescribed torques indicated in "Service Data and Specifications Tightening Torques".

#### SPEED CONTROL ROD

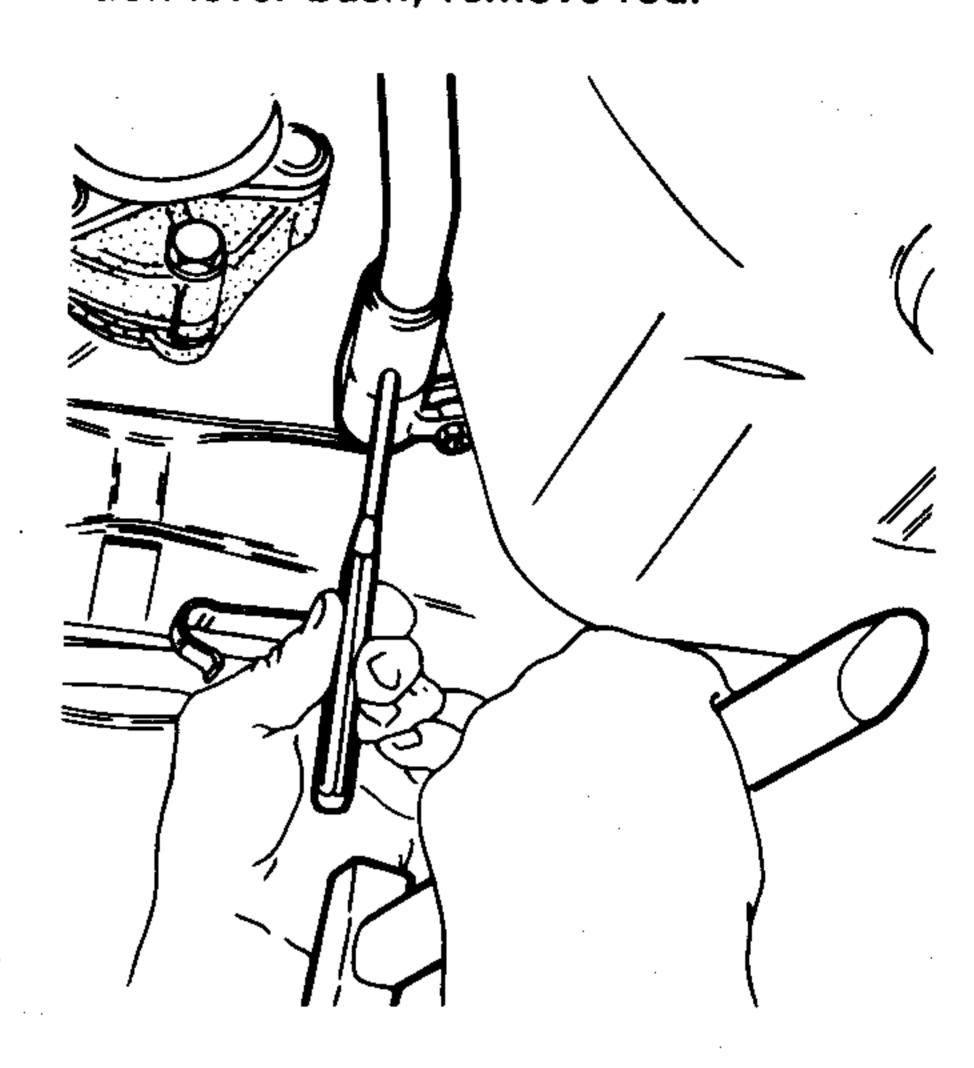
#### **REMOVAL AND INSTALLATION**

- 1. Set vehicle on a lift, remove front and central component of exhaust pipe (Refer to: Group 04: "Exhaust system Removal" of the "WORKSHOP MANUAL Engines").
- 2. Move boot 5 and disconnect rod 4 from the related lever 3 by unscrewing the securing bolt. Recover boot.



- 1 Speed control lever support
- 2 Propeller shaft
- 3 Speed control lever
- 4 Speed control rod
- 5 Boot

3. By means of a suitable punch, remove the speed control rod securing pin from the speed transmission and selection lever bush; remove rod.



4. Reassemble in reverse order to disassembly operations, replacing the connecting spring pin with a new one.

## REMOVAL AND INSTALLATION OF CLUTCH-SPEED GEAR - DIFFERENTIAL UNIT

Refer to Group 17 "Removal and Installation of clutch-speed Gear-Differential Unit".

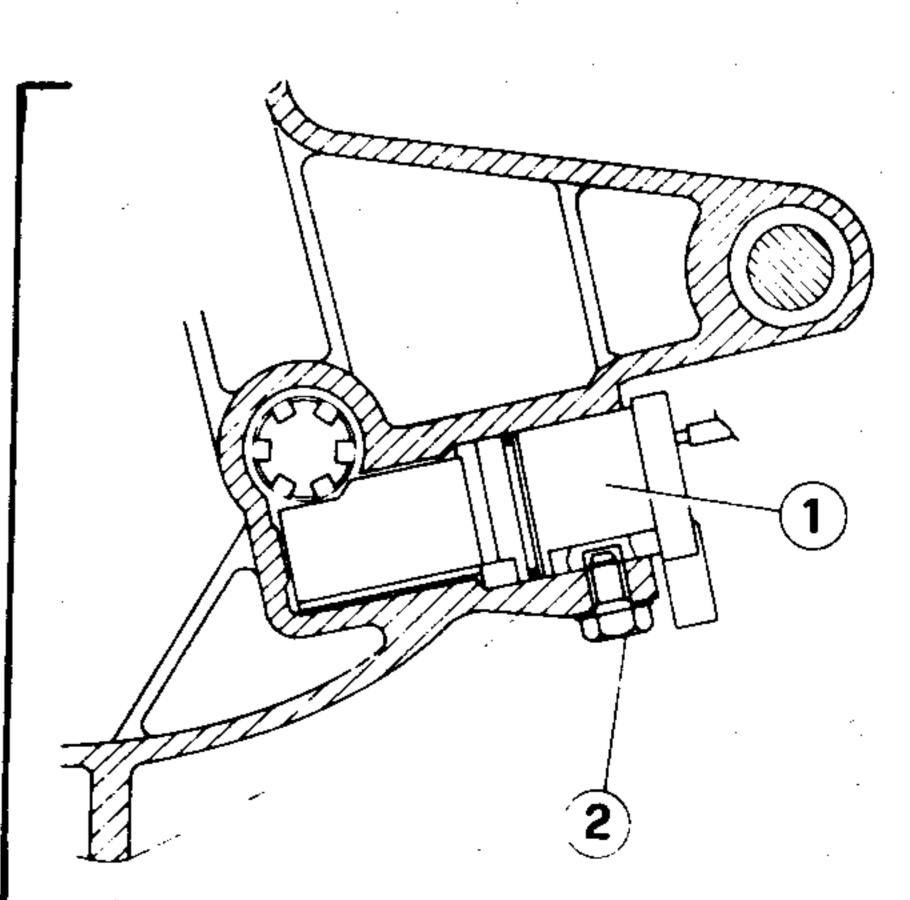
### SEPARATION AND RECONNECTION AT BENCH OF SPEED GEAR UNIT FROM/TO DIFFERENTIAL UNIT

#### SEPARATION

1. Clutch unit separation.

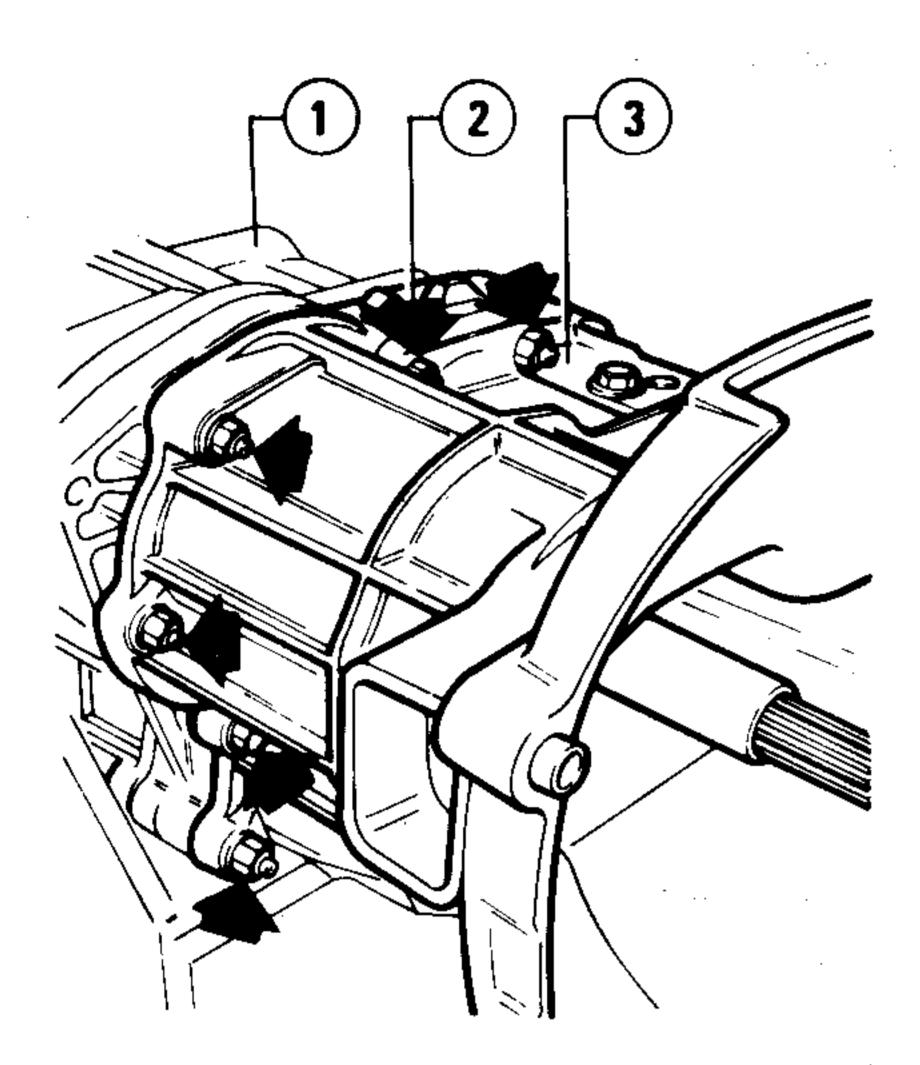
Refer to: Group 12 "Separation and Reconnection at Bench of Clutch Unit from/ to speed Gear and Differential Units - Separation".

- 2. Separation of clutch-speed gear casing.
- a. Drain the oil from unit, if not already done during unit removal from vehicle.
- b. Unscrew the securing screw and remove the odometer electronic pulse transmitter (1).



- 1 Odometer electronic pulse transmitter
- Transmitter securing screw

c. Loosen and remove the nuts with related washers securing casing 3 to flange 2.

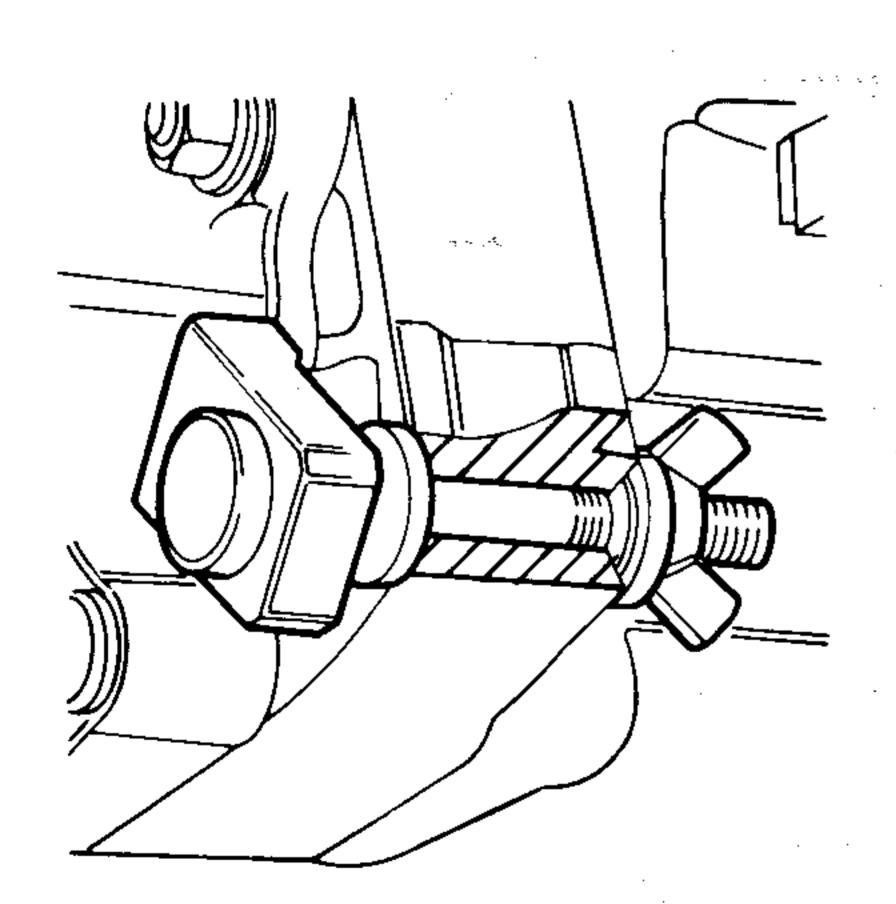


- 1 Speed gear-differential casing
- 2 Intermediate flange
- 3 Speed gear-clutch casing

#### **CAUTION:**

The intermediate flange surfaces mating with clutch-speed gear casing and speed gear-differential casing are fitted with sealant.

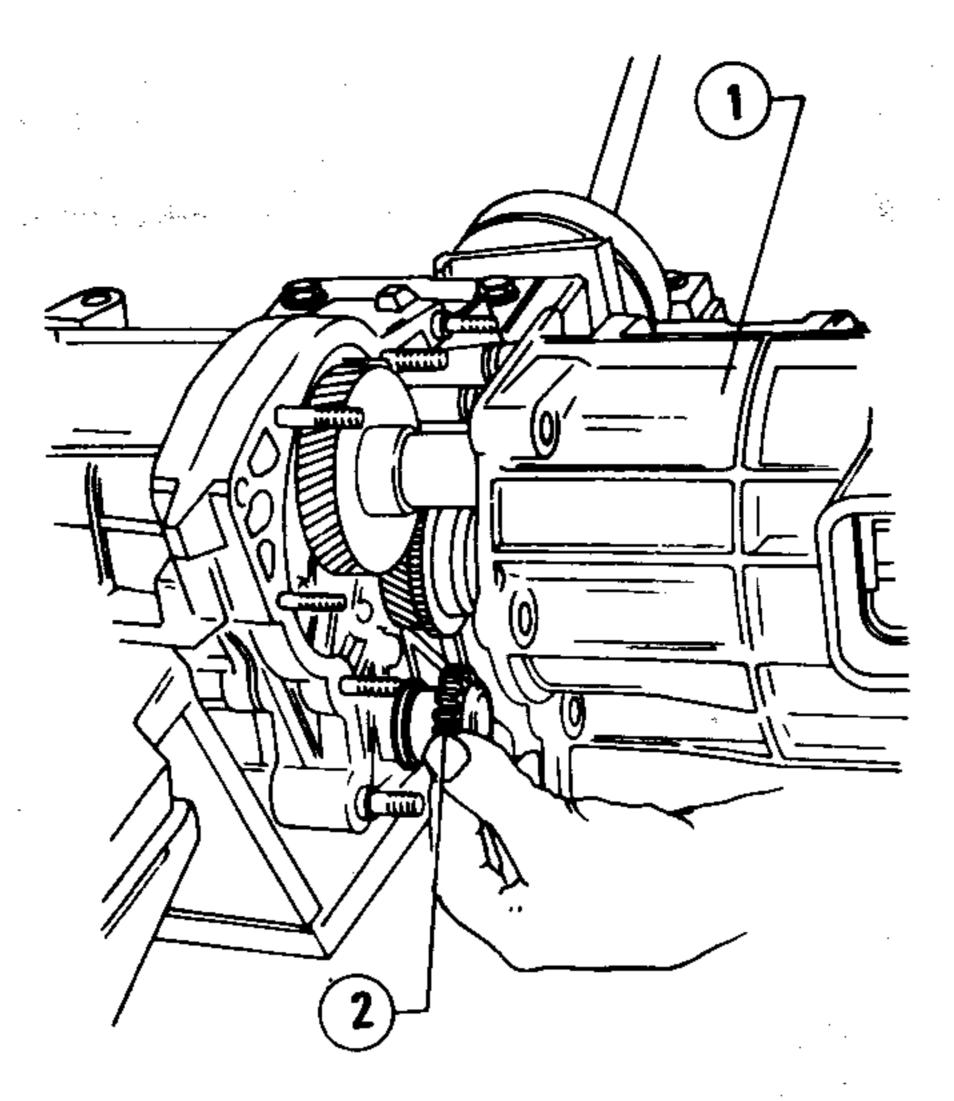
When removing only the clutch-speed gear casing, the intermediate flange can be secured to the speed gear-differential casing not concerned in the disassembly, by means of suitable clamps.



d. Withdraw casing 1 and, at the same time, recover gear 2.

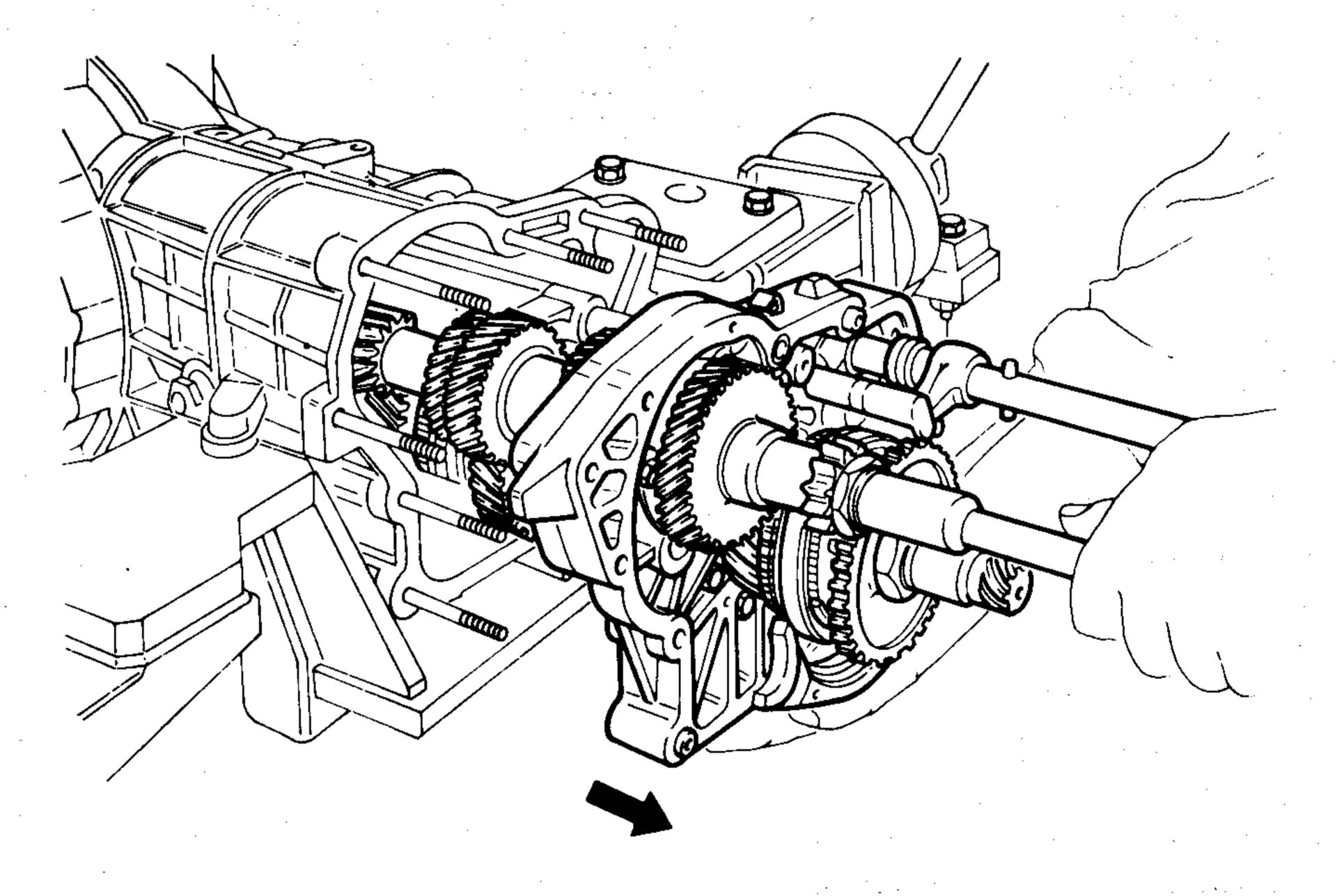
#### **CAUTION:**

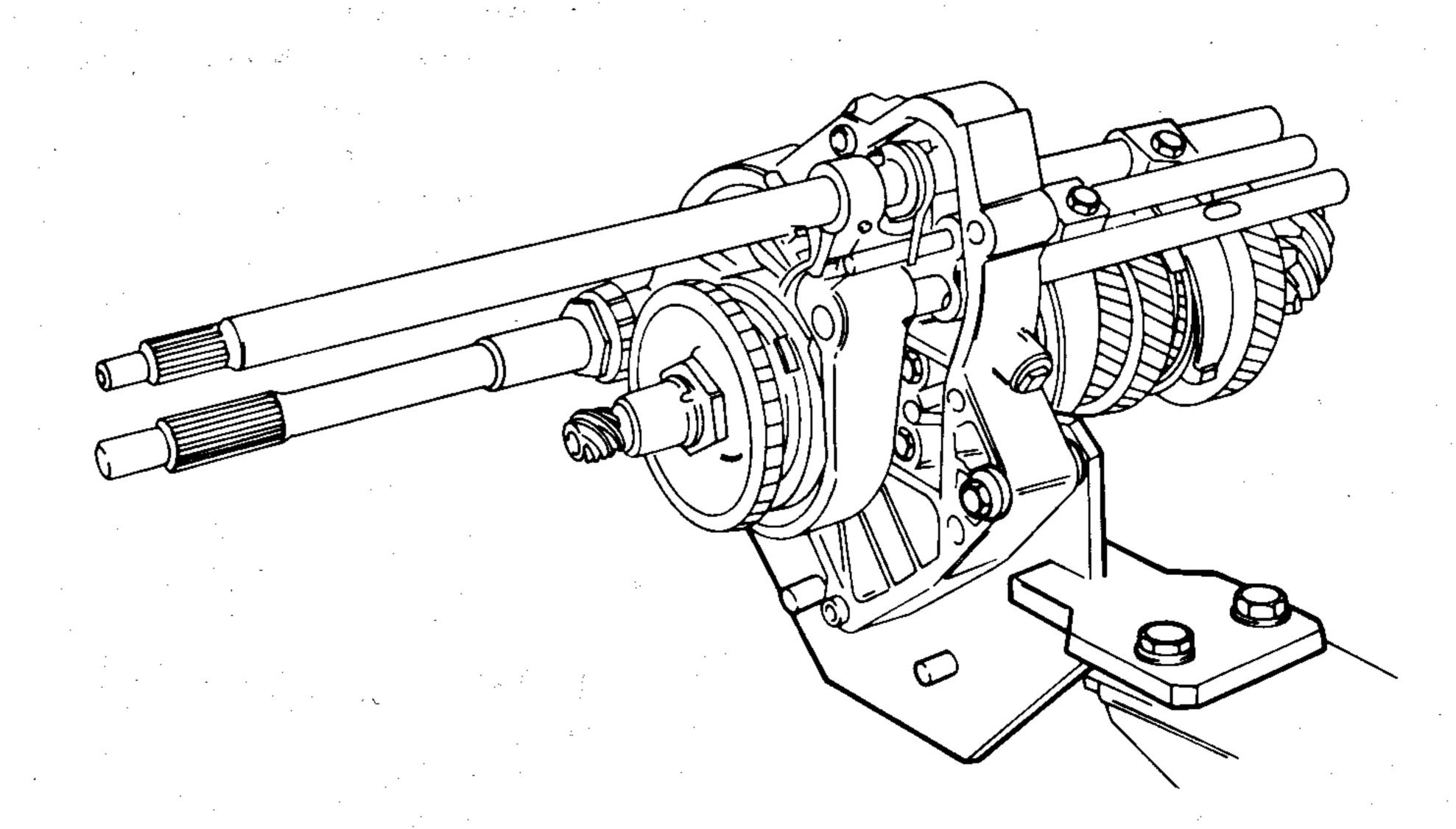
Take care not to drop the Reverse transmission gear.



- 1 Clutch-speed gear casing
- 2 Reverse sliding gear

- 3. Intermediate flange positioning on overhaul stand.
- a. Withdraw intermediate flange complete with primary and pinion shafts and rods and forks from differential-speed gear casing.
- b. Apply the special support to intermediate flange, complete with the related shafts and control devices, then secure flange to an overhaul stand fitted with connection brackets.





#### RECONNECTION

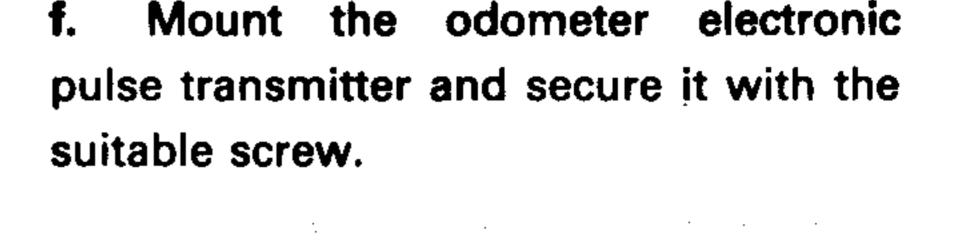
- Intermediate flange connection to differential-speed gear casing
- Clean the intermediate flange surfaces mating with clutch-speed gear casing and differential-speed gear casing with denatured ethyl alcohol.

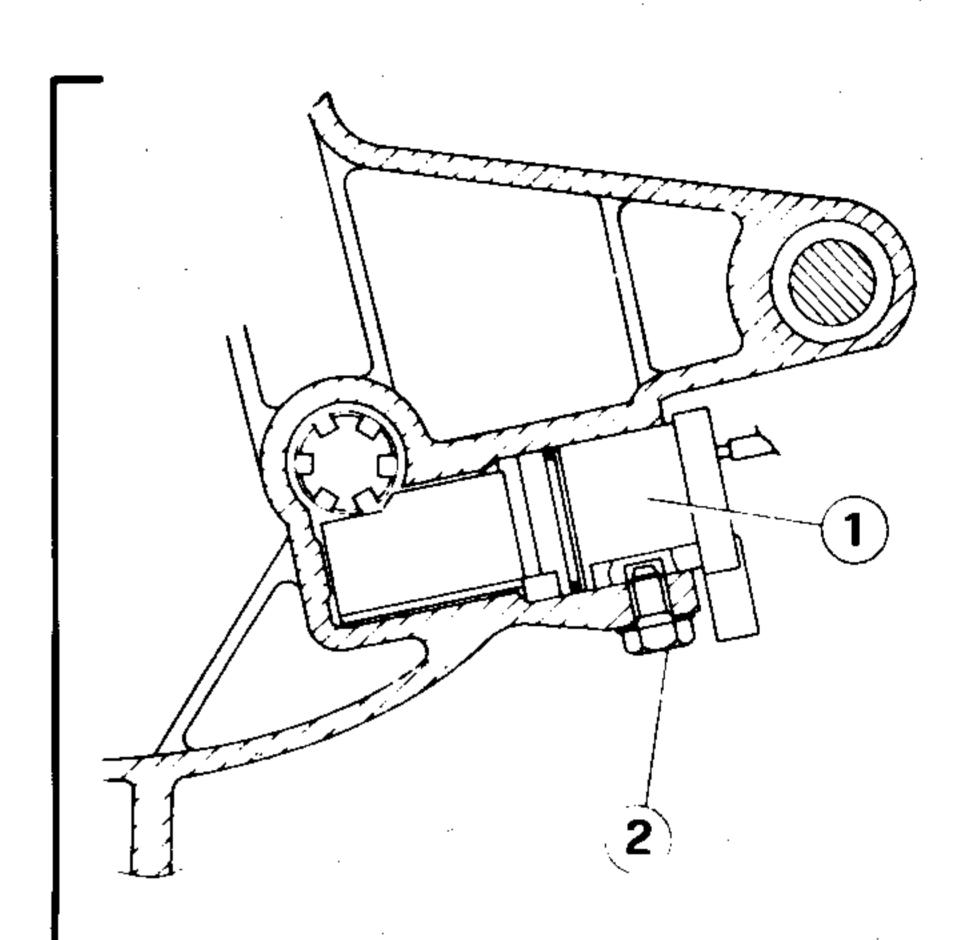
Apply a coat of sealant to the mentioned seal surfaces.

#### Sealant:

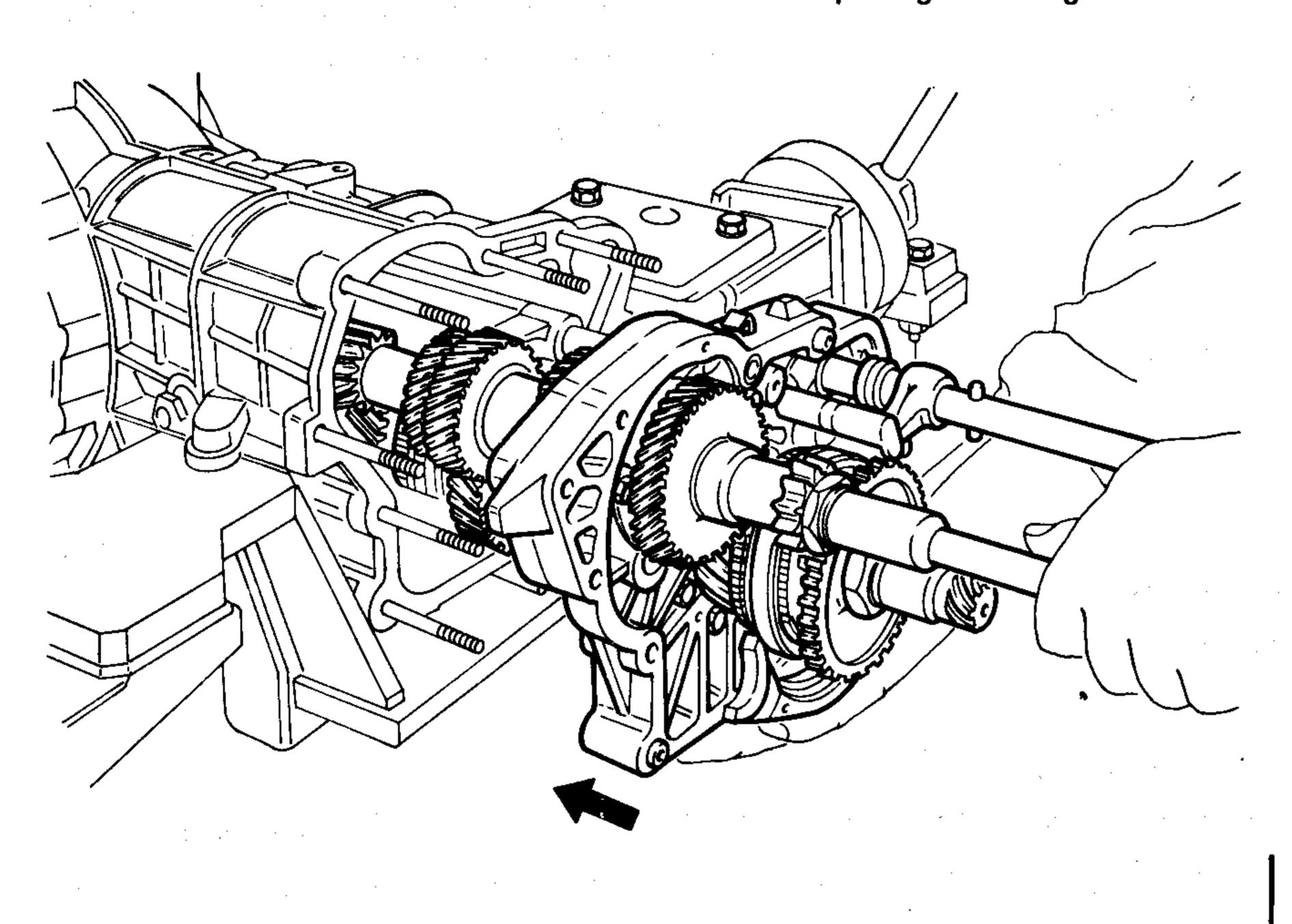
#### Sealing compound LOWAC Perfect Seal

Mount intermediate flange, complete with shafts, rods and forks on differential-speed gear casing.





- Odometer electronic pulse transmitter
- Transmitter securing screw



- Lubricate pin of the reverse speed sliding gear housed in the clutch-speed gear casing.
- Apply the clutch-speed gear casing to intermediate flange taking care to position the reverse speed gear on the 5th and reverse speeds control fork, subsequentely centering it in the related pin.
- cribed torque.
- Screw the nuts securing clutchspeed gear casing to intermediate flange and tighten them crosswise (refer to figure for the tightening order) to the pres-

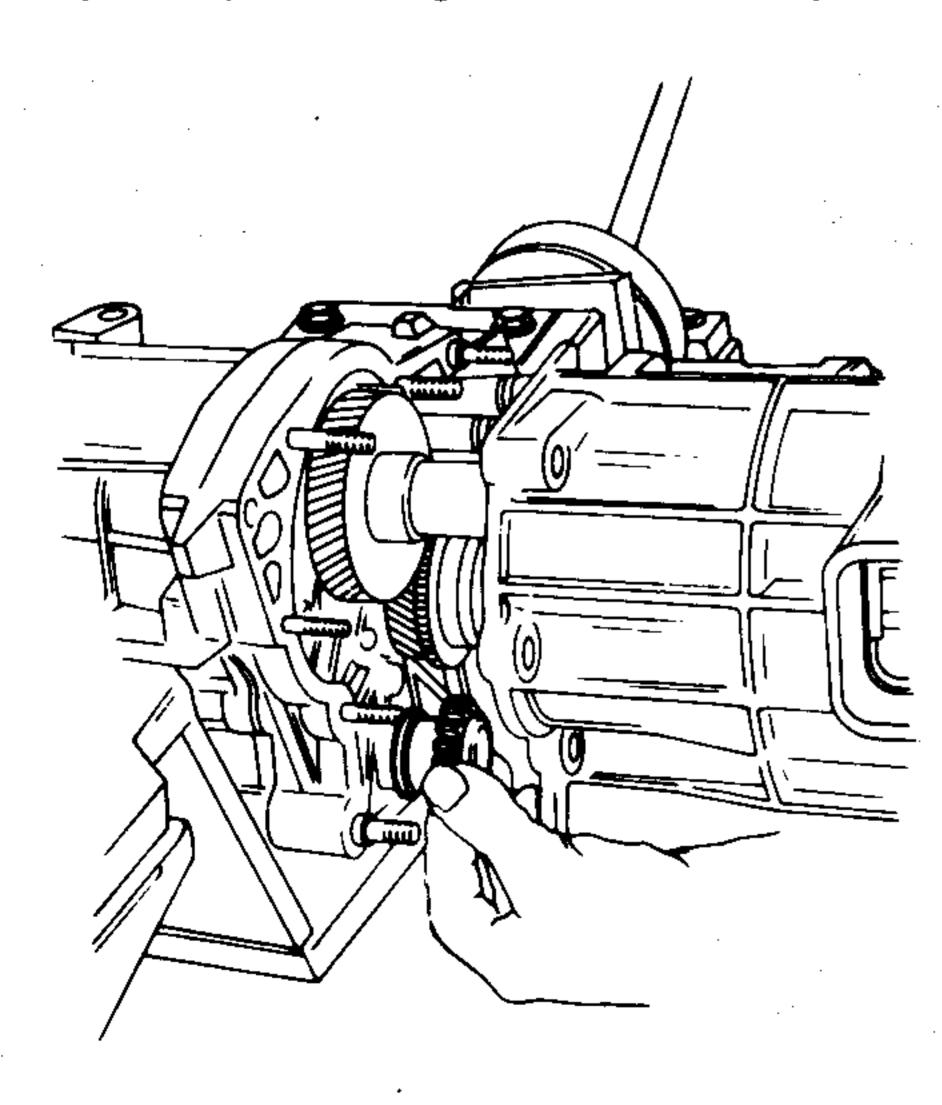
Clutch unit installation

- Reconnect clutch unit to differential-speed gear unit (refer to: Group 12 -"Separation and Reconnection at Bench of Clutch Unit from/to speed Gear and Differential Units - Reconnection")
- Fill the differential-speed gear casing with the prescribed quantity of suggested oil.

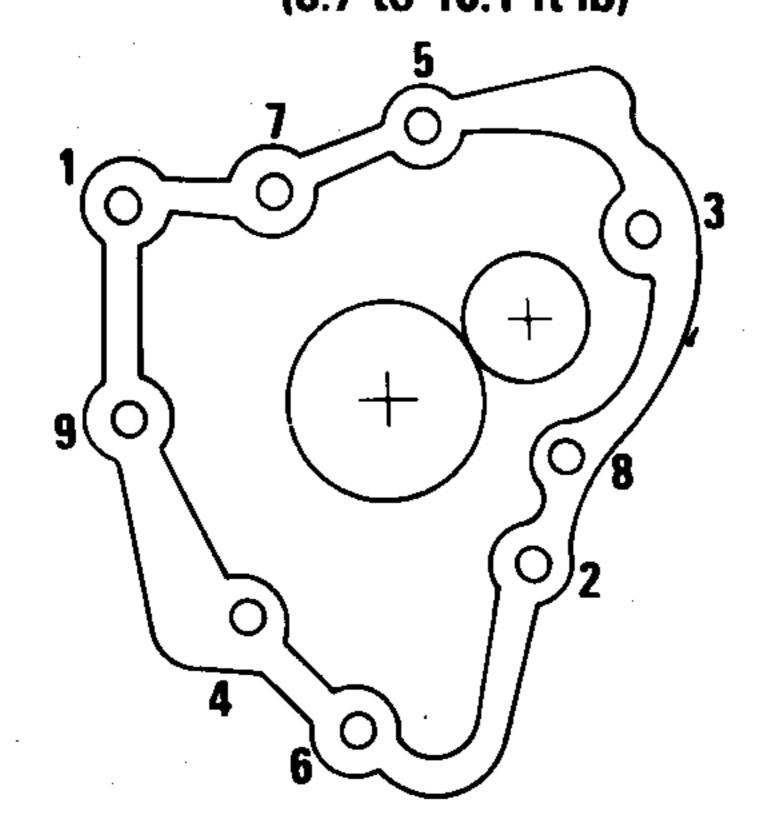
#### Differential-speed gear refilling

Oil:

AGIP Rotra SX 75W90 IP Pontiax HDS 75W90



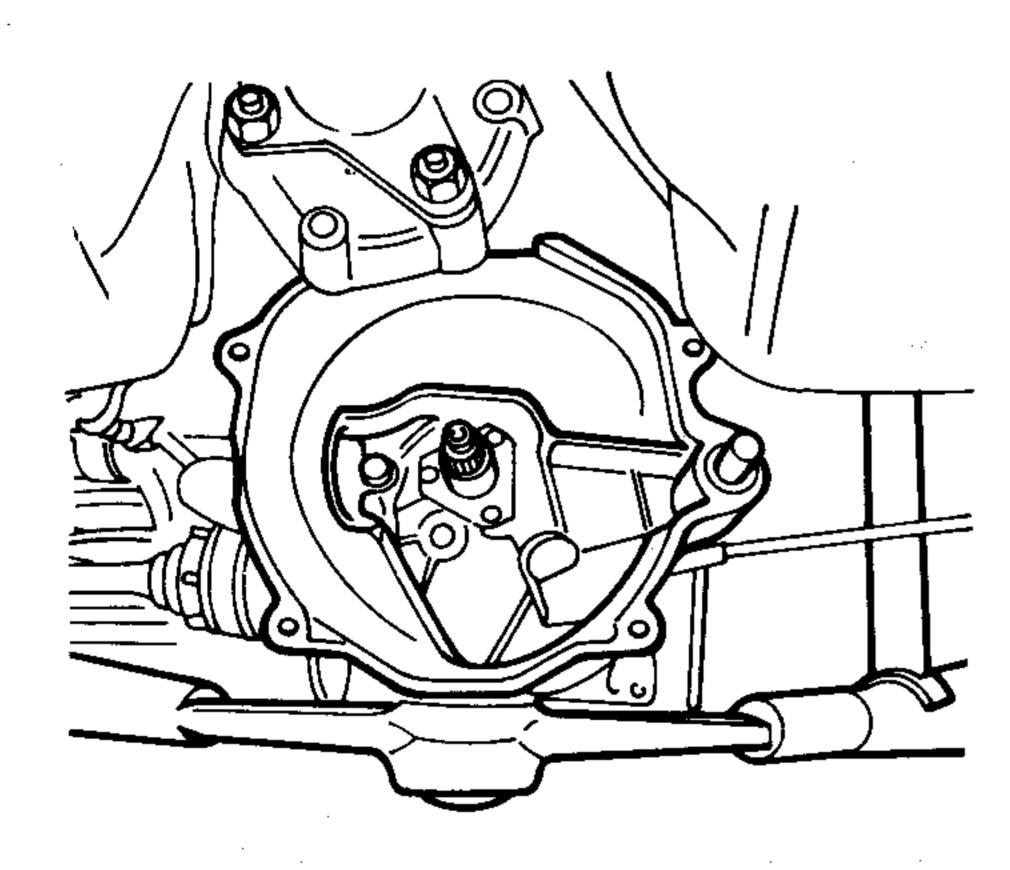
T: Tightening torque Nuts securing clutch-speed geer casing to intermediate flange 12 to 13 N·m (1.2 to 1.4 kg·m) (8.7 to 10.1 ft·lb)



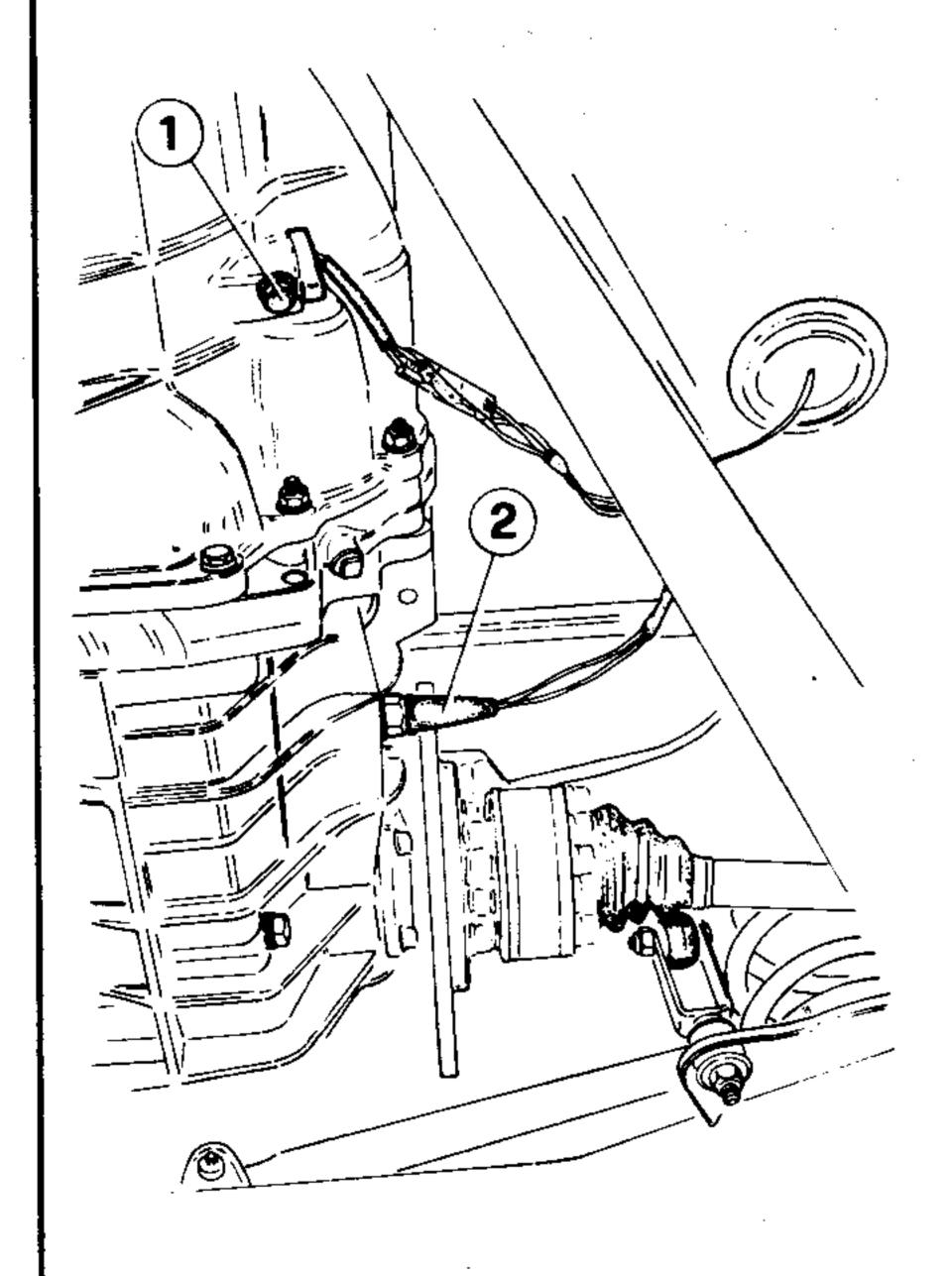
# REMOVAL AND INSTALLATION OF SPEED GEAR UNIT (Intervention on vehicle)

#### **REMOVAL**

- 1. Set vehicle on lift and lock front wheels with suitable safety chocks.
- 2. Raise vehicle and drain oil from differential-speed gear casing.
- 3. Detach clutch unit (refer to Group
- 12 "Clutch Unit Removal and Installation (Intervention on vehicle) Removal")



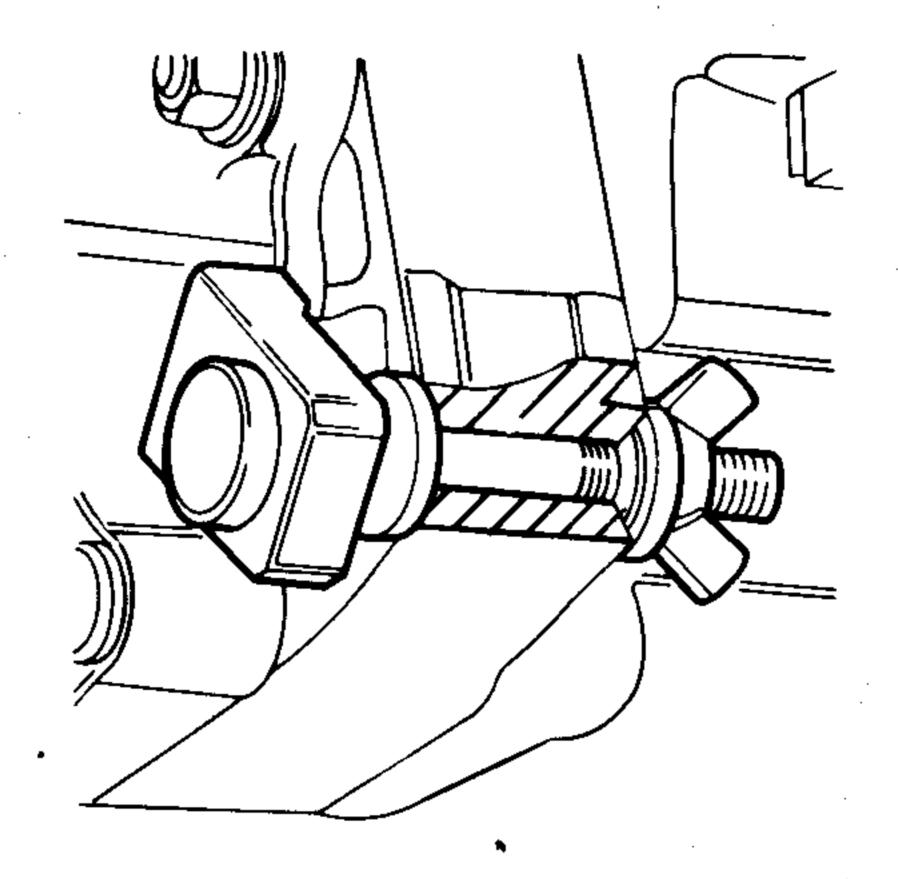
4. Disconnect connection 2, unscrew screw 1 and remove odometer pulse transmitter.



- Screw securing odometer pulse transmitter to gearbox
- 2 Connection for reverse lights switch cable

5. By means of suitable clamps, secure intermediate flange to differential-speed gear casing.

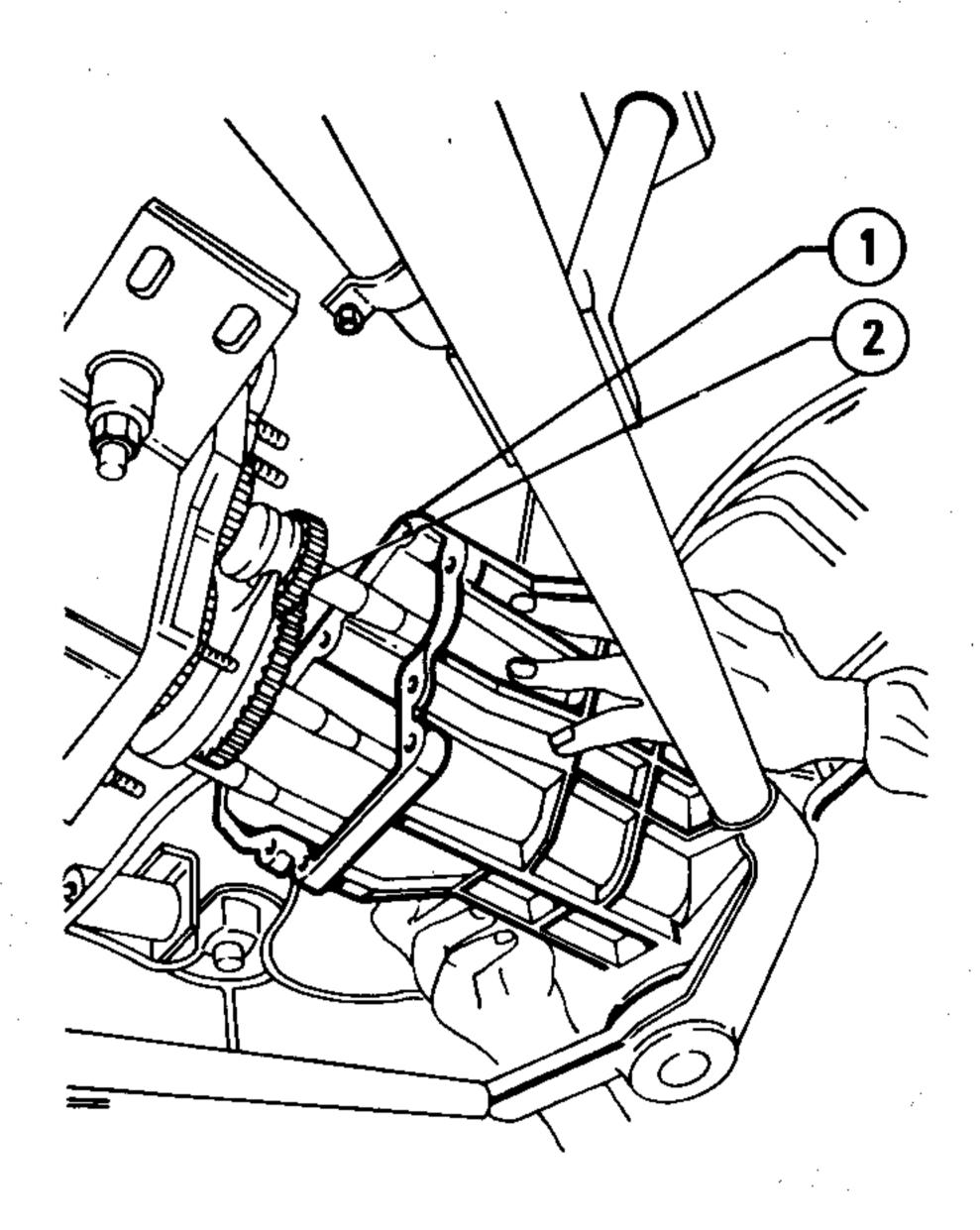
Set a column lift under speed gear unit, in the vicinity of intermediate flange, the column lift must be fitted with a support with clamps to secure support itself to gearbox.



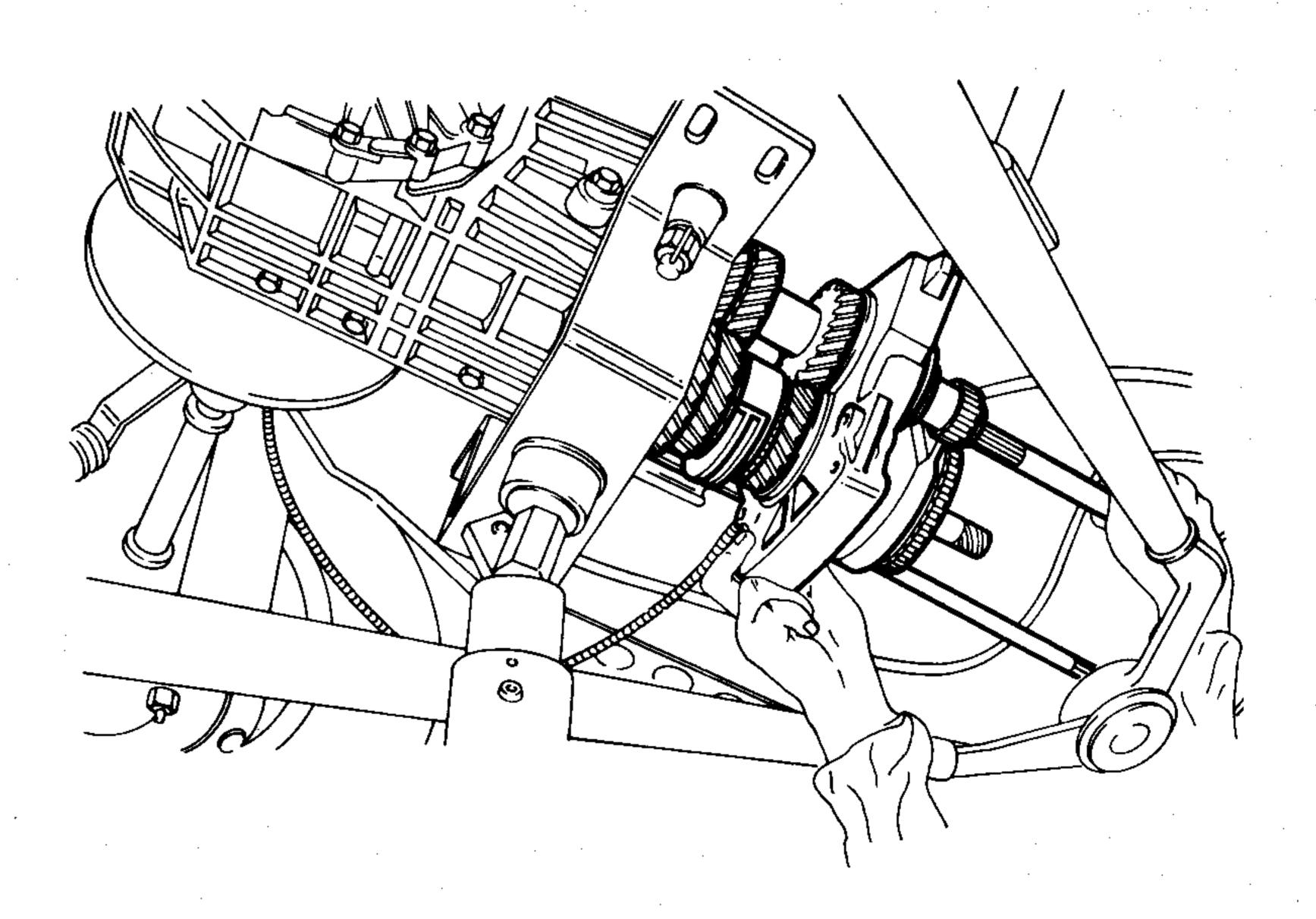
Unscrew screws and nuts connecting clutch-speed gear and differential-speed gear casings.

Remove clutch-speed gear casing 1; if necessary, tap by means of a resin mallet; then recover gear 2.

Take care not to drop the reverse speed transmission gear.



- 1 Clutch-speed gear casing
- 2 Reverse speed transmission gear
- 6. If required, disconnect the intermediate flange previously secured to differential-speed gear casing and remove it, complete with shafts, gears and speed engagement devices.



#### INSTALLATION

For installation, reverse the order of removal and comply with teh following.

 Clean the flange surfaces mating with differential-speed gear and clutch-speed gear casings with denatured ethyl alcohol, then lay a coat of the prescribed sealant.

#### Sealant:

Sealing compound LOWAC Perfect Seal

 Lubricate clutch fork spherical pin and the thrust bearing seat with the prescribed grease.

#### Grease:

AGIP Grease 33 FD IP Autogrease FD

• Lubricate the seat of propeller shaft rear joint with 5 cm<sup>3</sup> (0.30 cu.in) of the prescribed grease.

#### Grease:

#### ISECO Molykote BR2

- Comply with the following tightening torques
  - T: Tightening torques
    - Nuts securing clutch-speed gear casing to differentialspeed gear casing

Perform tightening crosswise
12 to 13 N·m
(1.2 to 1.4 kg·m)
(8.7 to 10.1 ft·lb)

 Screws securing clutch unit to differential-speed gear casing

> 29 to 32 N·m (2.9 to 3.2 kg·m) (21 to 23.1 ft·lb)

Screws securing propeller shaft joint to clutch shaft fork

Solution with intermediate skew ball bearings
40 to 50 N·m
(4 to 5 kg·m)
(28.9 to 36.1 ft·lb)

Solution with intermediate roller/ball bearings 55 to 57 N·m (5.6 to 5.8 kg·m) (40.5 to 41.9 ft·lb)

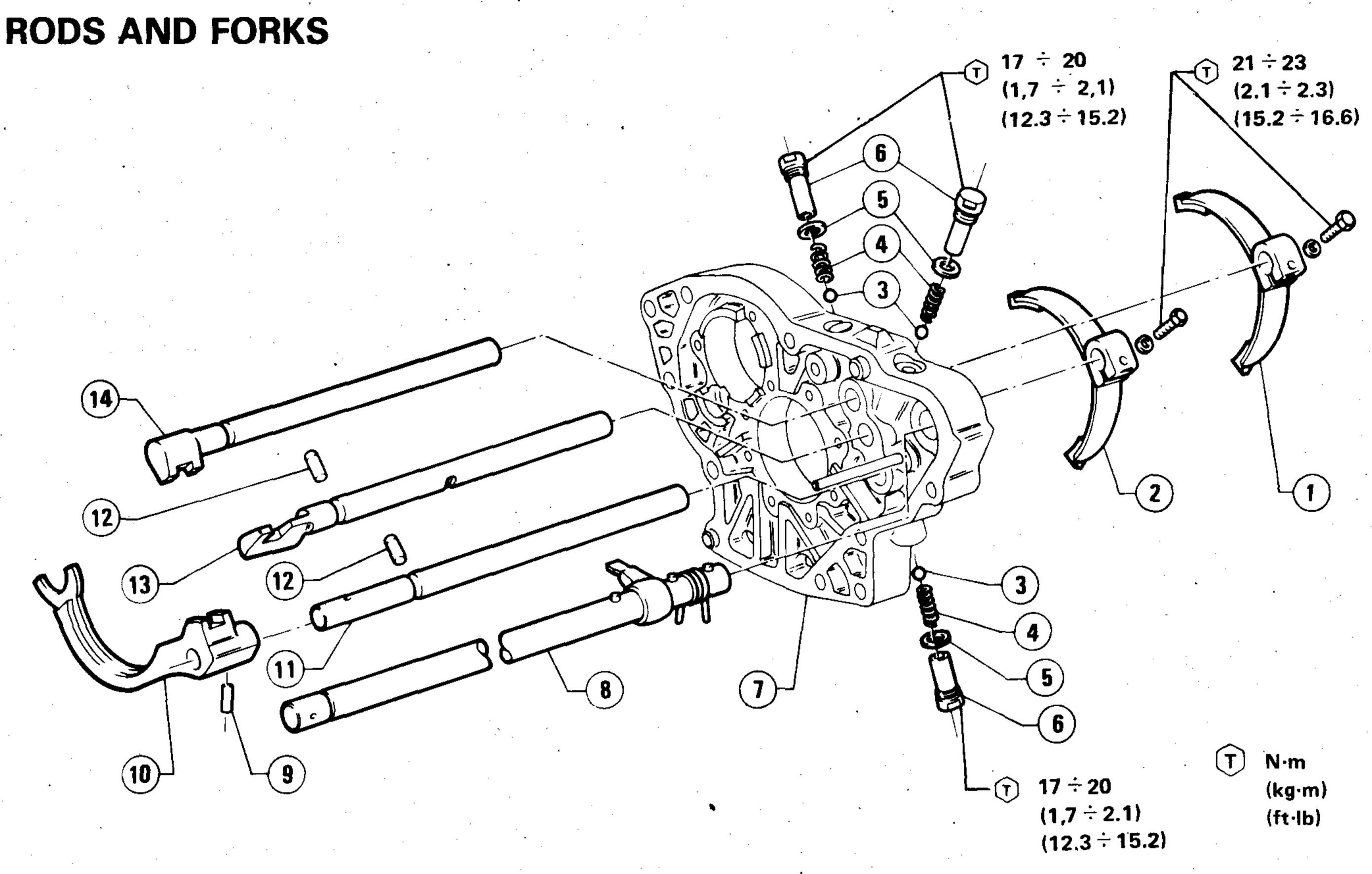
- Unions of clutch hydraulic system pipes
  8 to 10 N·m
  (0.8 to 1 kg·m)
  (5.8 to 7.2 ft·lb)
- Unions of clutch hydraulic system hoses
  10 to 15 N·m
  (1 to 1.5 kg·m)
  (7.2 to 10.8 ft·lb)
- Refill the differential-speed gear casing with the prescribed oil up to reaching filler hole level.

Oil:

AGIP Rotra SX 75W90 or IP Pontiax HDS 75W90

Bleed air from clutch system

### OVERHAUL AT BENCH OF SPEED GEAR UNIT



- 1 1st 2nd speeds fork
- 2 3rd 4th speeds fork
- 3 Ball
- 4 Spring
- 5 Washer
- 6 Plug-container
- 7 Intermediate flange

- 8 Speed selection and engagement control rod
- 9 Spring pin
- 10 5th and reverse speeds fork
- 11 5th and reverse speeds rod
- 12 Detent ball
- 13 3rd and 4th speeds rod
- 14 1st and 2nd speeds rod

#### DISASSEMBLY

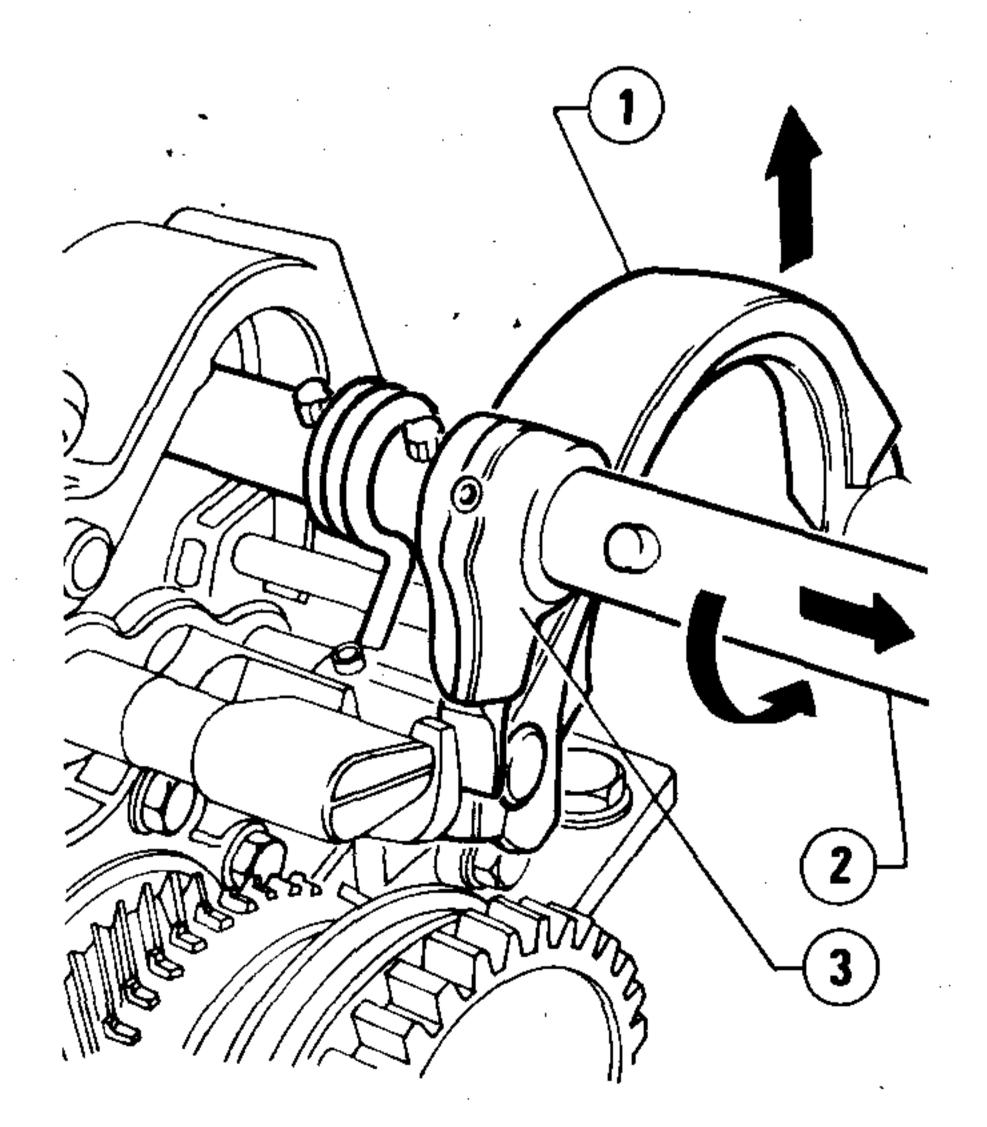
Set the intermediate flange on an overhaul stand (Refer to: "Separation and Reconnection at Bench of Speed Gear Unit from/to Differential Unit") then disassemble rods and forks operating as follows.

### 1. Disassembly of speed selection and engagement rod

a. Rotate rod 2 counterclockwise to win reaction of spring thus obtaining the rotation of lever 3 tooth; at the same time rotate counterclockwise fork 1, then withdraw rod 2.

To rotate rod, temporarily insertion is

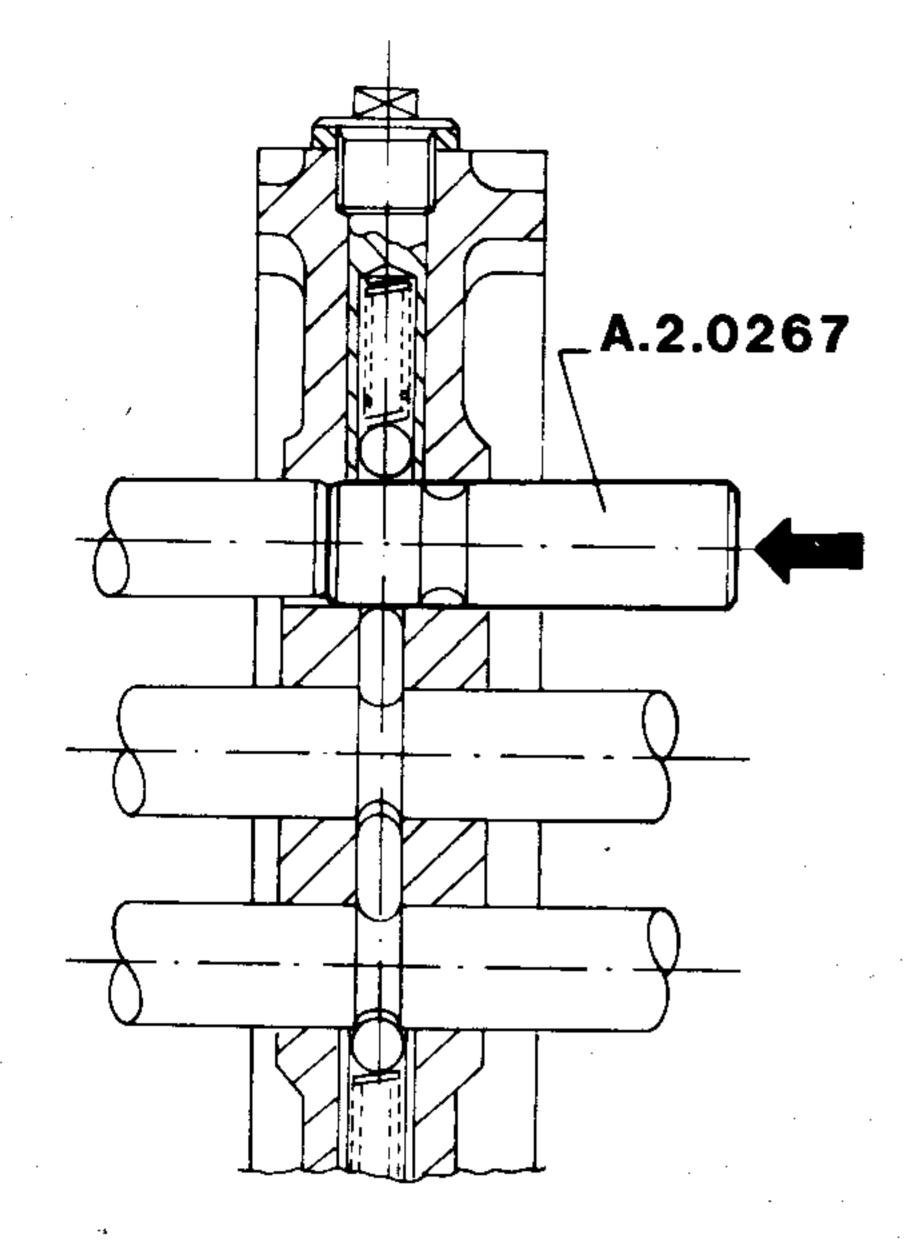
recommended of the related lever with securing pin.



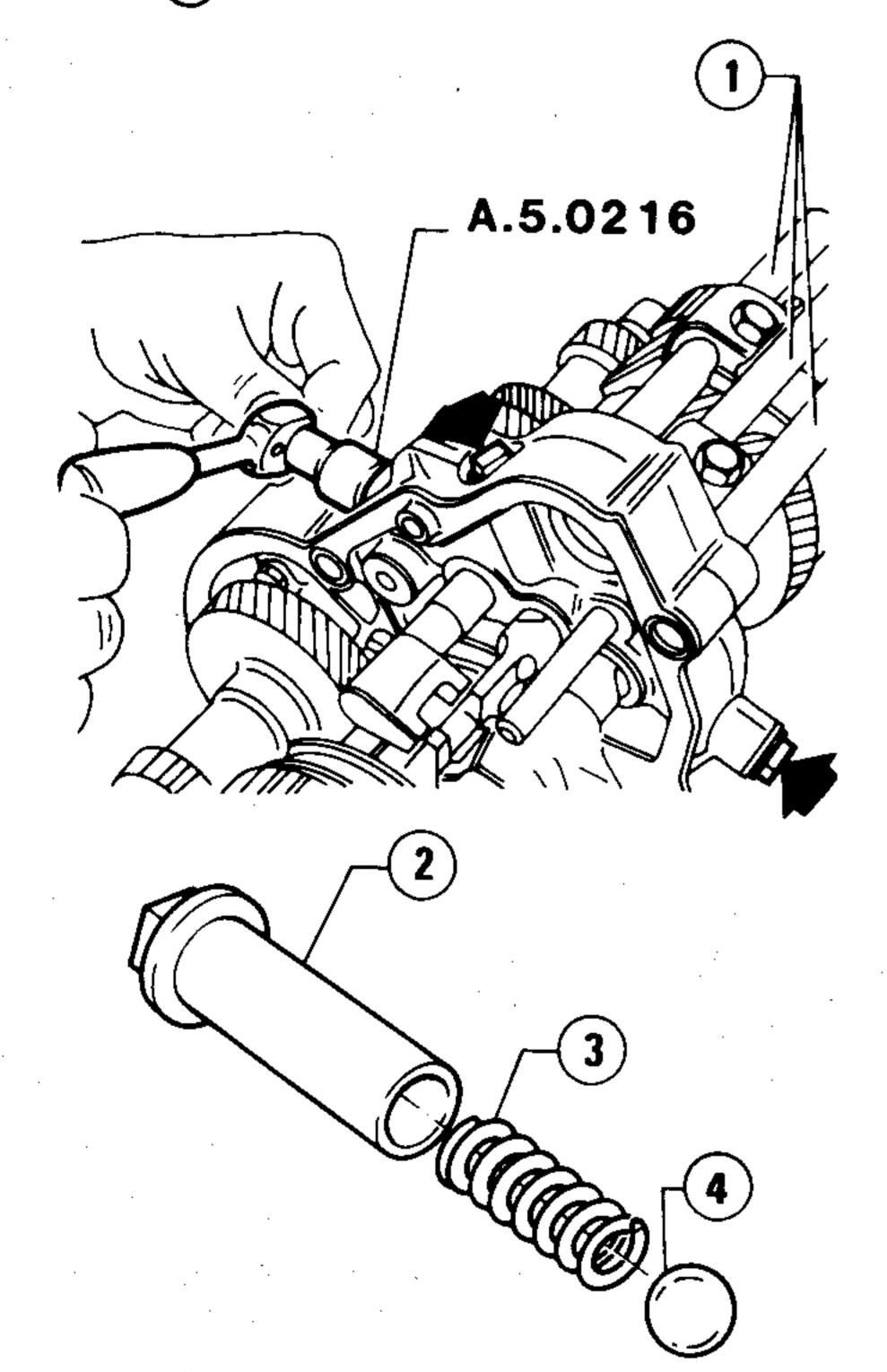
- 1 5th Reverse speeds fork
- 2 Speed selection and engagement lever
- 3 Speed selection lever

### 2. Disassembly of speed engagement rods

Should removal of one rod only, or no check related to rods detent ball unit and speed engagement interlock plungers be required, interlock plungers must be secured by means of dummy rods A.2.0267 to be inserted, at the same time, at the opposite side with respect to withdrawal of speed engagement rods.



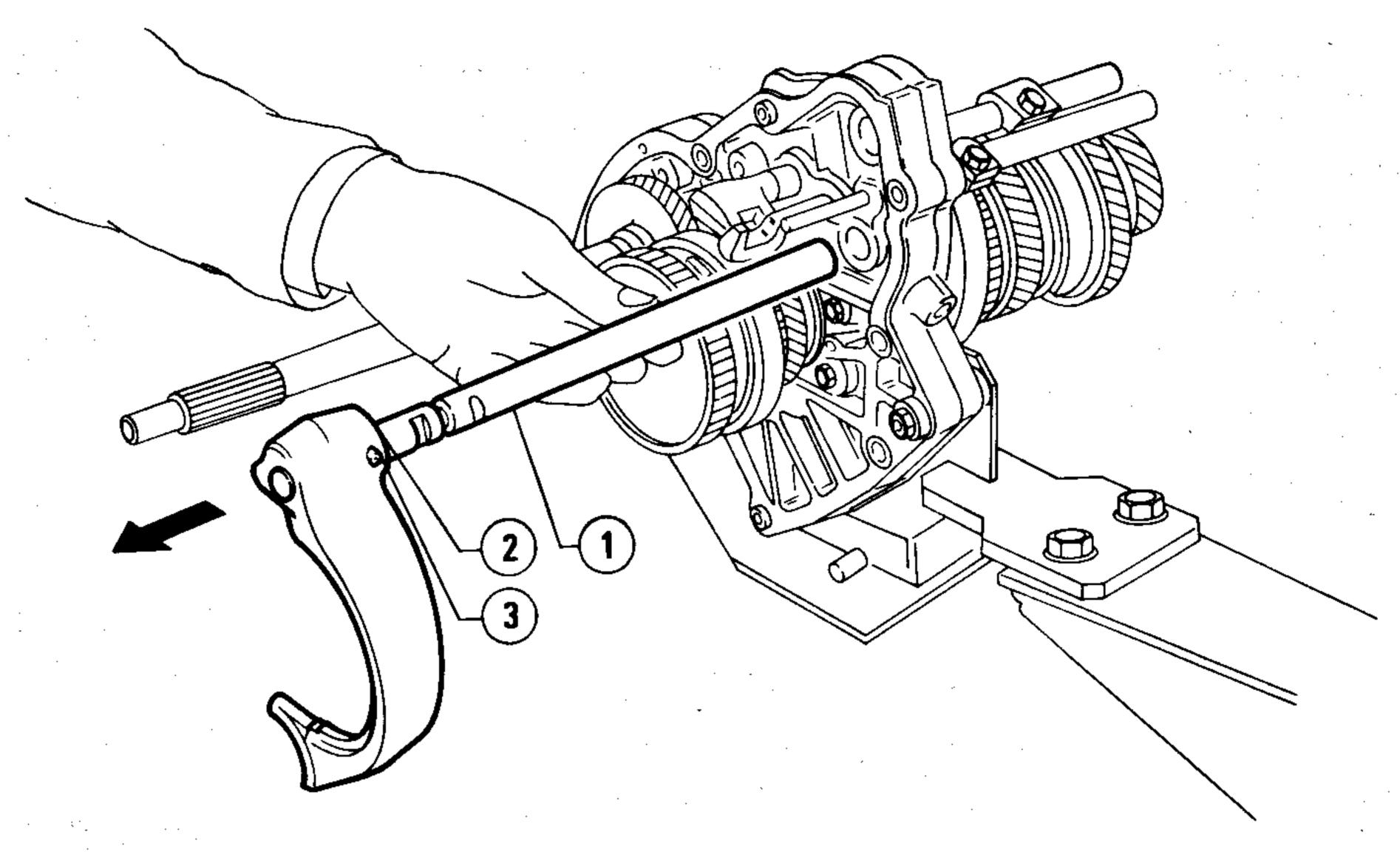
a. By means of spanner A.5.0216, unscrew and remove the three containers 2, shown in the figure, with the related springs 3 and rods 1 positioning balls 4.



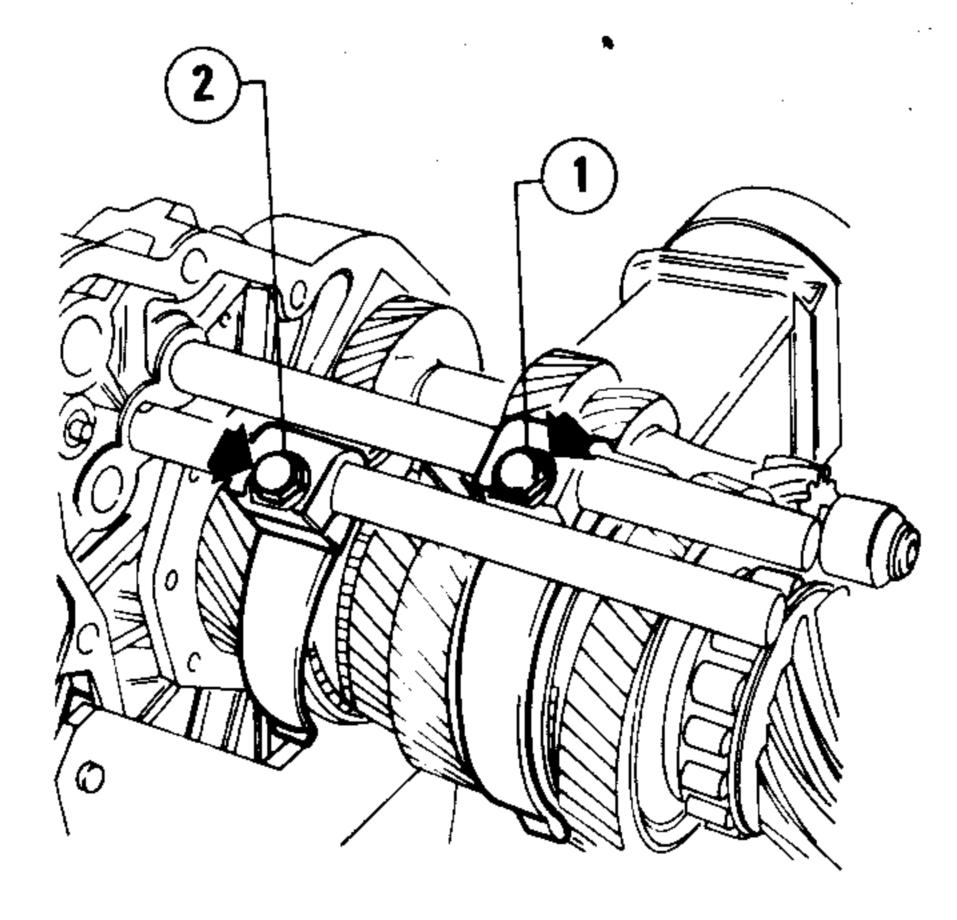
- 1 Speed engagement rods
- 2 Container
- 3 Thrust spring
- 4 Detent ball
- b. Remove rod 1 with fork 2 for 5th and reverse speeds engagement control and, if required, disassemble them by removing pin 3 by means of a punch.

Mark the position related to rod-fork so that correct position can be restored when reassembling.

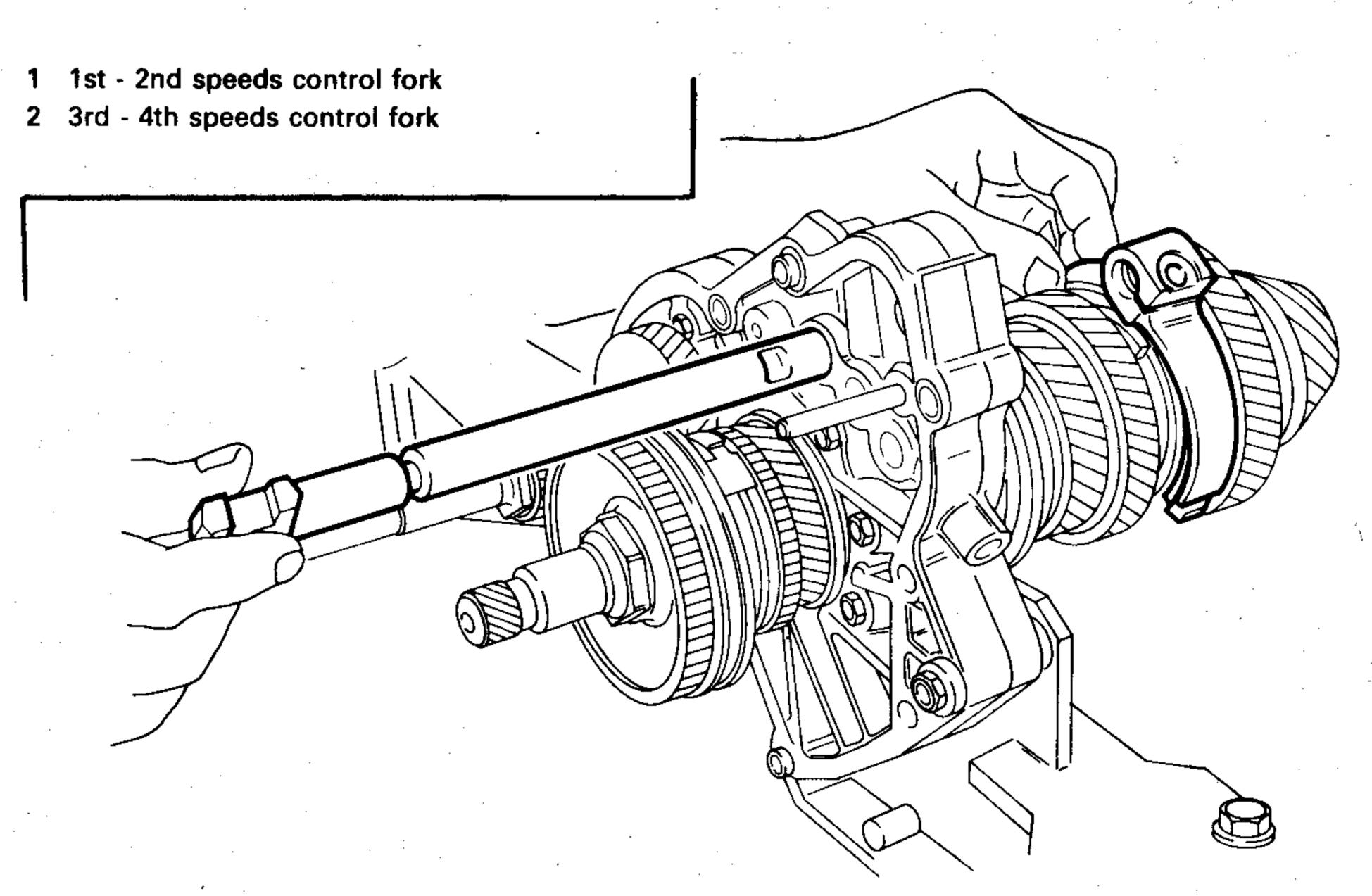
September 1984



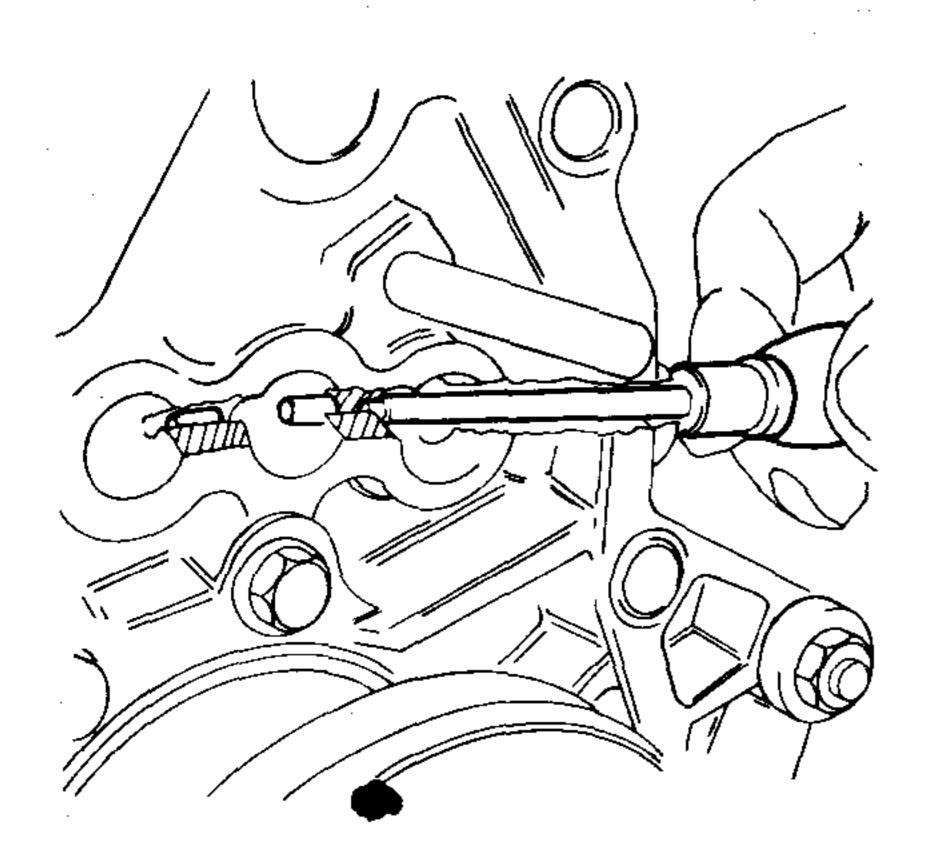
- 1 5th and Reverse speeds rod
- 2 5th and Reverse speeds fork
- 3 Securing pin
- c. Unscrew and remove the screws securing forks 1 and 2 to the related rods.



d. Withdraw the 1st-2nd speeds engagement control rod and subsequently that related to 3rd-4th speeds engagement control by removing, at the same time, the related forks.



e. Remove the speed engagement interlock plungers from intermediate flange.



#### **CHECKS AND INSPECTIONS**

Before carrying out the check-operations, carefully wash the components. This allow the superficial defects, wear degree and efficiency of a few items to be better identified.

#### 1. Springs, balls, pawls.

a. Verify good conditions of rods detent ball thrust springs; in the event of suspected strain, replace them.

If required, check spring stiffness.

#### Test load

C = 90 to 97.6 N (9.18 to 9.95 kg)

Unloaded spring length L = 30.6 mm (1.2 in)

### Loaded spring length $L_c = 18.8 \text{ mm} (0.74 \text{ in})$

b. Verify that rods detent balls and interlock plungers are free from scratches or seizing.

#### 2. Rods and forks

- a. Verify that rods are free from deformations and that no sign of scratch or seizing is present on control rod slots.
- b. Verify that speed control forks are not deformed or too worn.
- c. Verify that rods slide freely in their seats without excessive clearance.

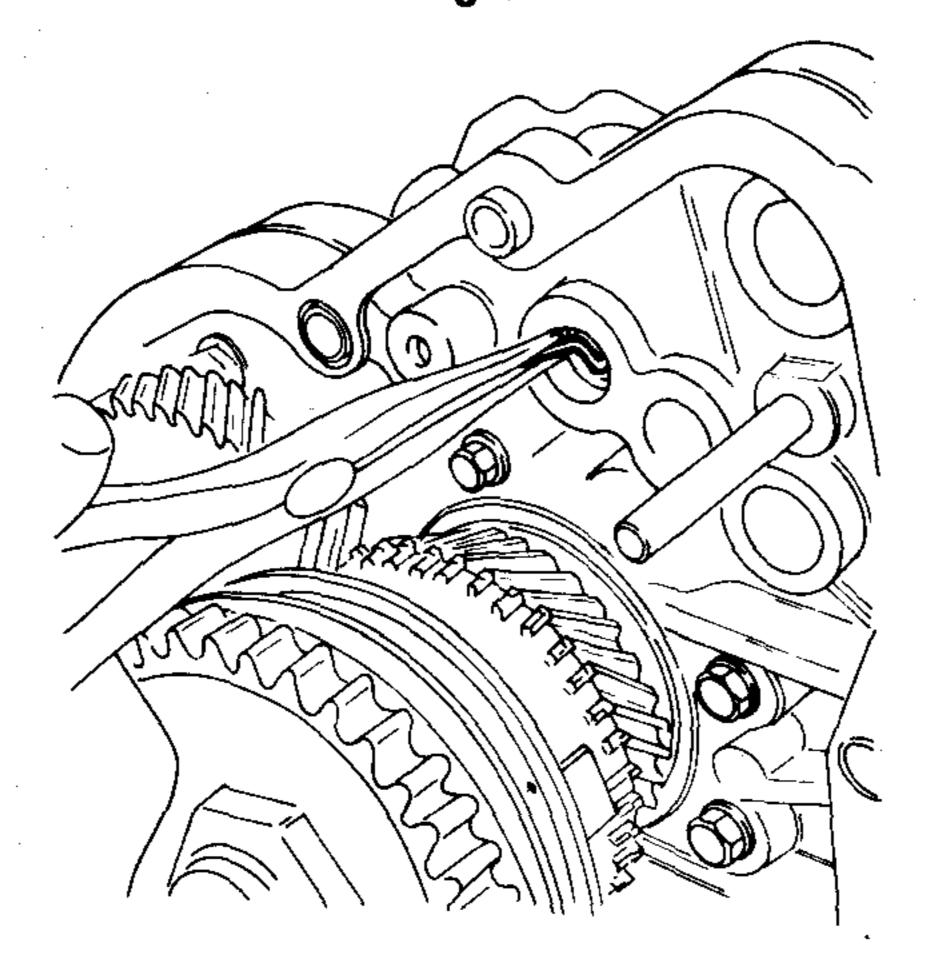
#### REASSEMBLY

- 1. Reassembly of speed engagement rods.
- a. Lubricate the speed engagement interlock plungers with the prescribed grease, then insert them into the related seats on intermediate flange.

Speed engagement and anti-slipping devices

#### Grease:

AGIP F1 Grease 33 FD IP Autogrease FD

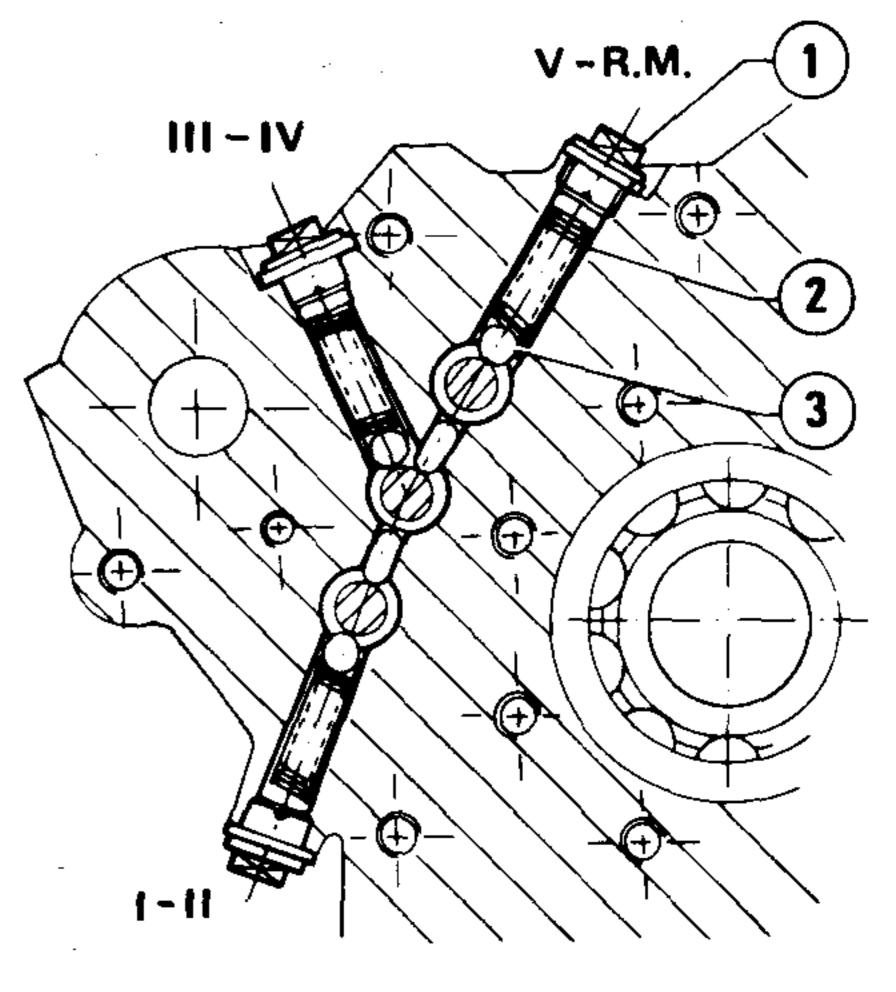


- b. Position fork on 1st-2nd speed sleeve. Lubricate the working surfaces and insert the related red into intermediate flange inserting if on fork.
- c. Carry out same procedure to reassemble rod and fork of 3rd-4th speed.
- d. If previously detached, reconnect 5th. Reverse speeds control fork on the related rod by means of a new pin, then insert the unit into intermediate flange.

When reassembling fork, align the marks carried out during disassembly.

- e. Lubricate detent balls 3 with the prescribed grease (Grease: AGIP F1 Grease 33 FD or IP Autogrease FD) then insert them into the related seats on intermediate flange, together with springs 2. Screw plugs 1 and tighten them with spanner A.5.0216 to the prescribed torque.
- T: Tightening torque
  Containers securing springs and rods detent balls

17 to 20 N·m
(1.7 to 2.1 kg·m)
(12.3 to 15.2 ft·lb)



- 1 Plug
- 2 Thrust spring
- 3 Speed engagement rods detent ball

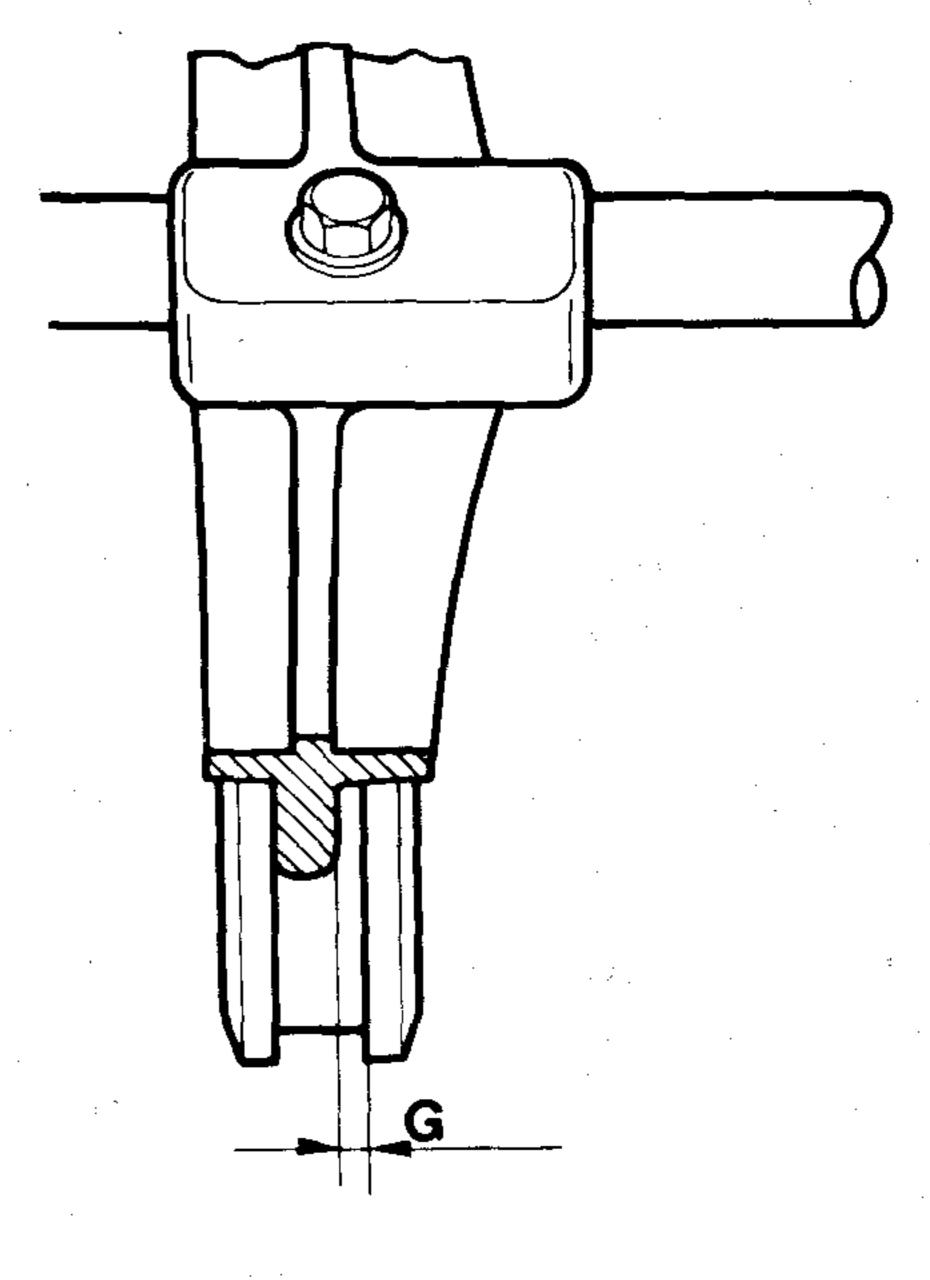
### 2. Securing of speed engagement forks.

To correctly secure the 1st-2nd and 3rd-4th speeds control forks follow the below procedures.

- a. Set speed gear unit to neutral position.
- b. Center the synchronizers sleeves, related to the mentioned speeds, on the related hubs and tighten the forks securing screws.
- c. Engage the 1st speed, then the 2nd verifying each time that sleeve axial clearance "G" is that prescribed.

#### Sleeve axial clearance

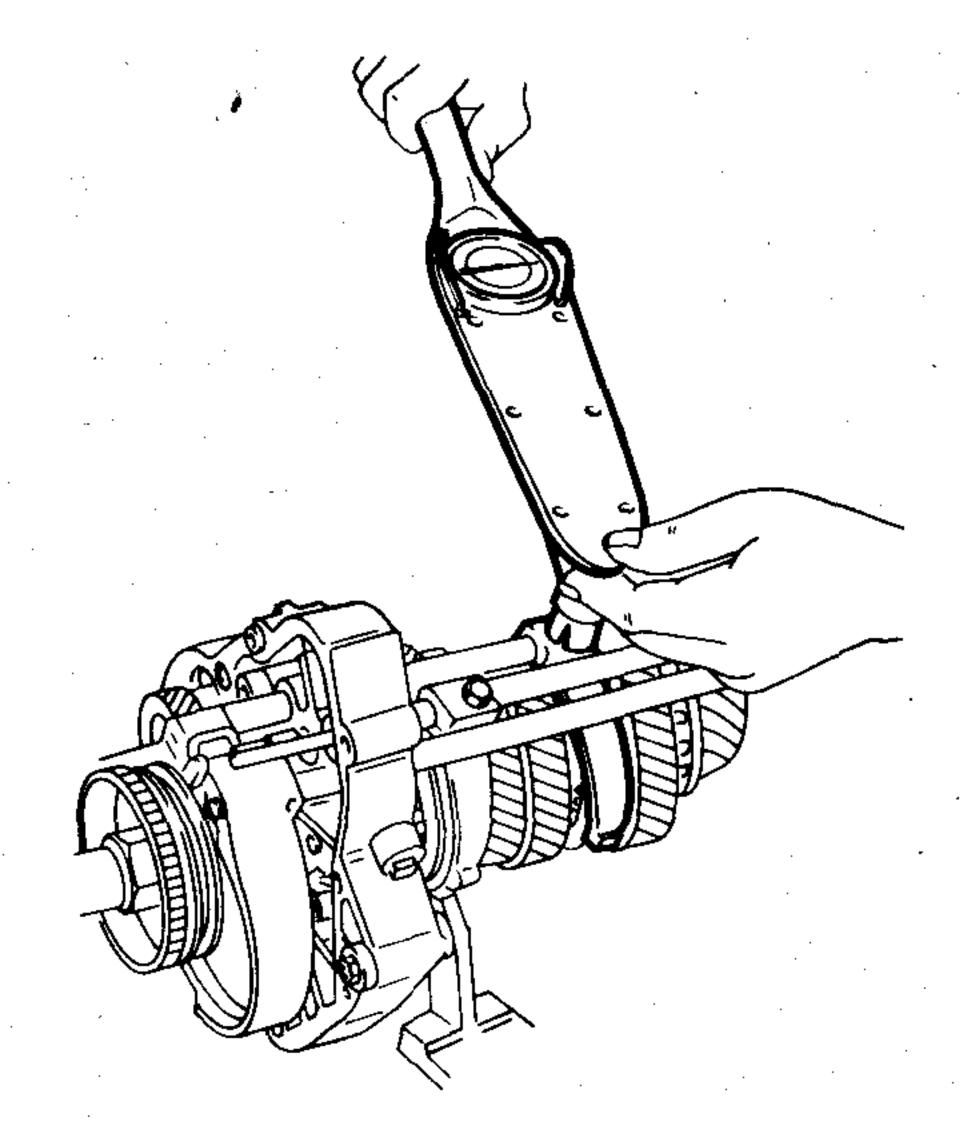
G = 0.7 to 0.9 mm {0.0275 to 0.0354 in}



- d. Repeat same operation for the 4th and 5th speeds.
- e. If necessary, carry out the suitable adjustments, then tighten to the prescribed torque.
- T: Tightening torque

  Screws securing 1st-2nd and 3rd
  4th speeds forks

21 to 23 N·m (2.1 to 2.3 kg·m) (15.2 to 16.6 ft·lb)



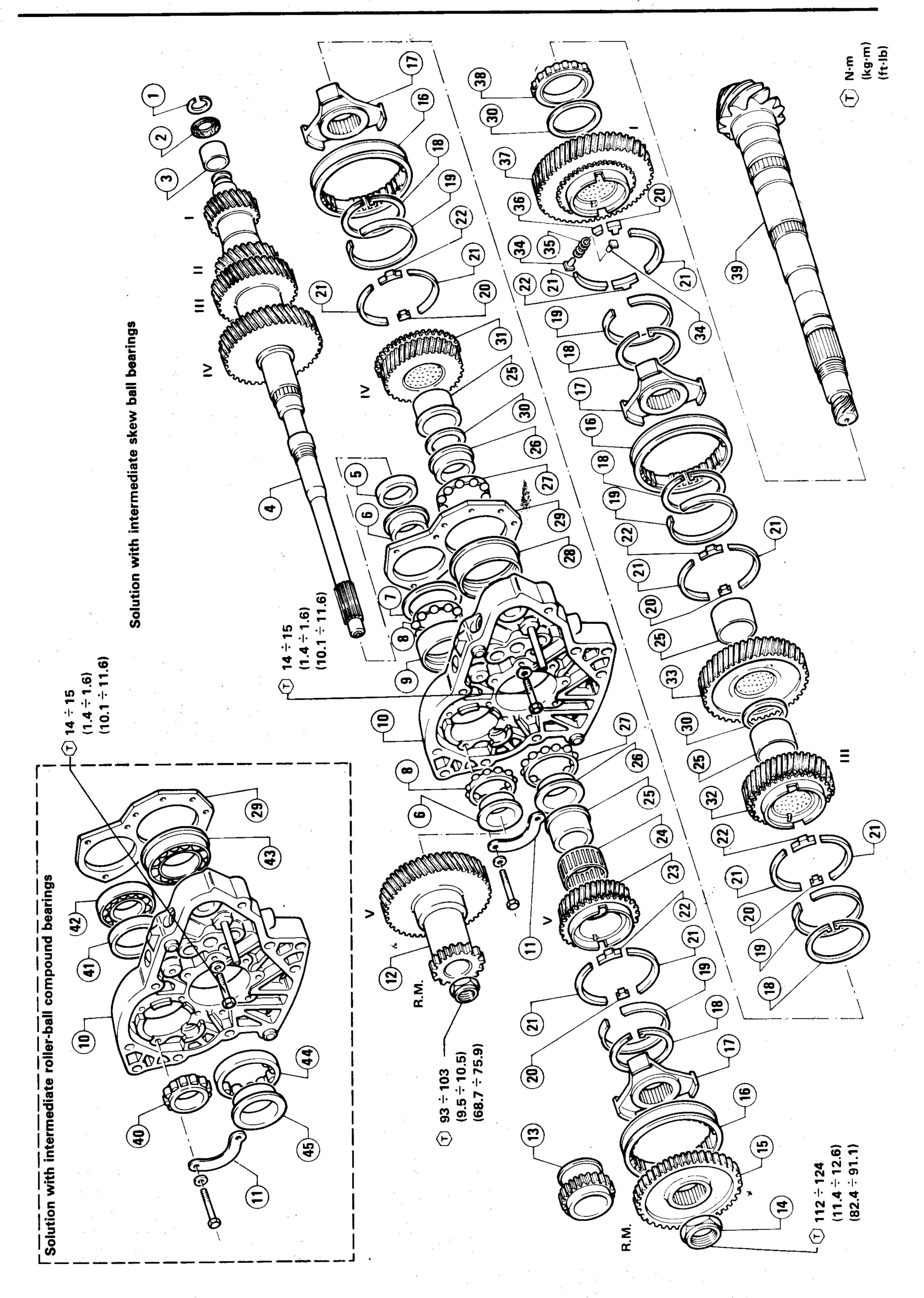
### 3. Reassembly of speed selection and engagement rod.

Install the speed selection and engagement rod taking care to centre tooth of the related lever on the slots of the speed control devices for 1st-2nd and 3rd-4th speed rods.

Correctly bed the return spring on stud.

#### SHAFTS AND GEARS

- 1 Retaining ring
- 2 Plastic bevel bush
- 3 Inner ring for main shaft rear needle bearing
- 4 Main shaft
- 5 Spacer
- 6 Inner ring for main shaft intermediate flange bearing
- 7 Spacer
- 8 Cage with balls for mainshaft intermediate flange
- 9 Outer ring for main shaft intermediate flange bearing
- 10 Intermediate flange
- 11 Fastener for main shaft intermediate flange bearings outer ring
- 12 5th and reverse speeds driving gear
- 13 Reverse speed idle gear
- 14 Nut
- 15 Reverse speed driven gear
- 16 Sleeve
- 17 Hub
- 18 Retaining ring
- 19 Synchronizer ring
- 20 Guide sector
- 21 Retainer
- 22 Locking sector
- 23 5th speed driven gear
- 24 Pinion shaft cage with needles
- 25 Bush
- 26 Internal ring for pinion shaft intermediate flange bearing
- 27 Cage with balls for pinion shaft intermediate flange
- 28 Outer ring for pinion shaft intermediate flange bearing
- 9 Shoulder plate
- 30 Shim
- 31 4th speed driven gear
- 32 3rd speed drive gear
- 33 2nd speed driven gear
- 34 Strikers
- 35 Spring
- 36 Pawl
- 37 1st speed driven gear
- 38 Pinion shaft roller bearing
- 39 Pinion shaft
- 40 Roller bearing for main shatf intermediate flange
- 41 Outer ring for main shaft intermediate flange roller bearing
- 42 Main shaft intermediate flange ball bearing
- 43 Pinion shaft intermediate flange ball bearing
- 44 Outer ring for pinion shaft intermediate flange roller bearing
- 45 Inner ring for pinion shaft intermediate flange roller bearing
- 46 Ring nut



#### DISASSEMBLY

#### 1. Rods and forks disassembly.

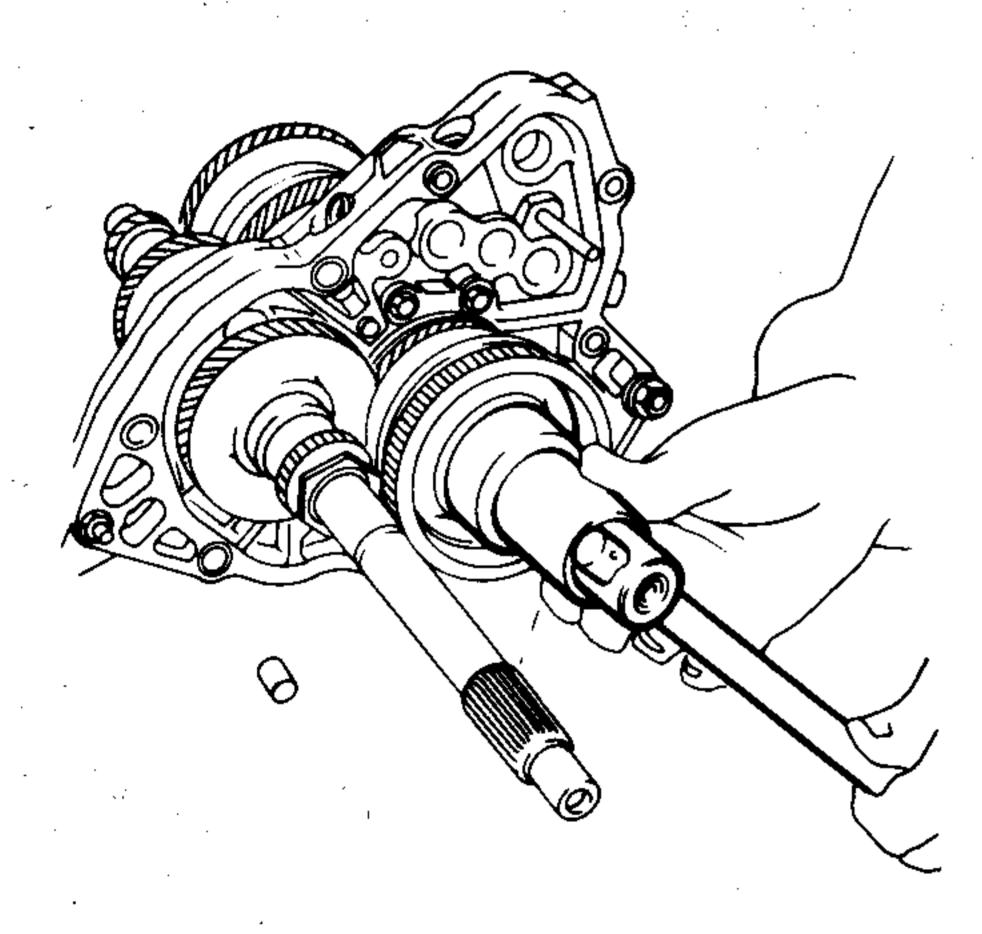
Refer to: "Rods and forks - Disassembly".

2. Measurement of pinion shaft dimensions.

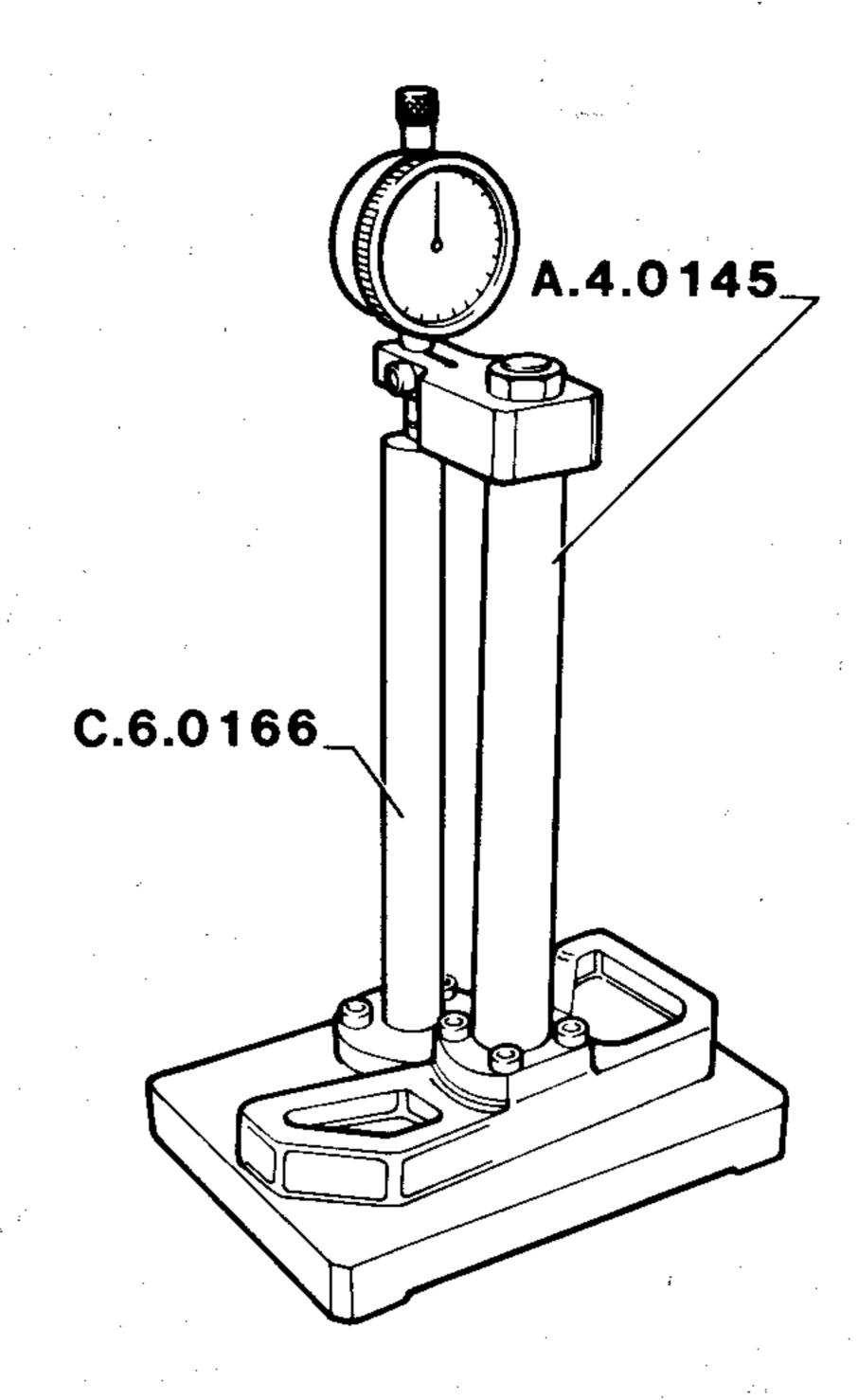
Should the speed gear only be overhauled without interventions on differential unit, the "A" dimension must be measured between intermediate flange inner plane and pinion head outer plane.

This measurement is indispensable to restore the initial working conditions of bevel pinion.

- a. Remove the traces of old sealant from intermediate flange planes using denatured ethyl alcohol.
- b. Operate on control sleeves related to 1st-2nd and 3rd-4th speeds to engage two speeds in order to block shafts rotation.
- c. Remove calking from pinion shaft securing nut, then release pinion shaft.

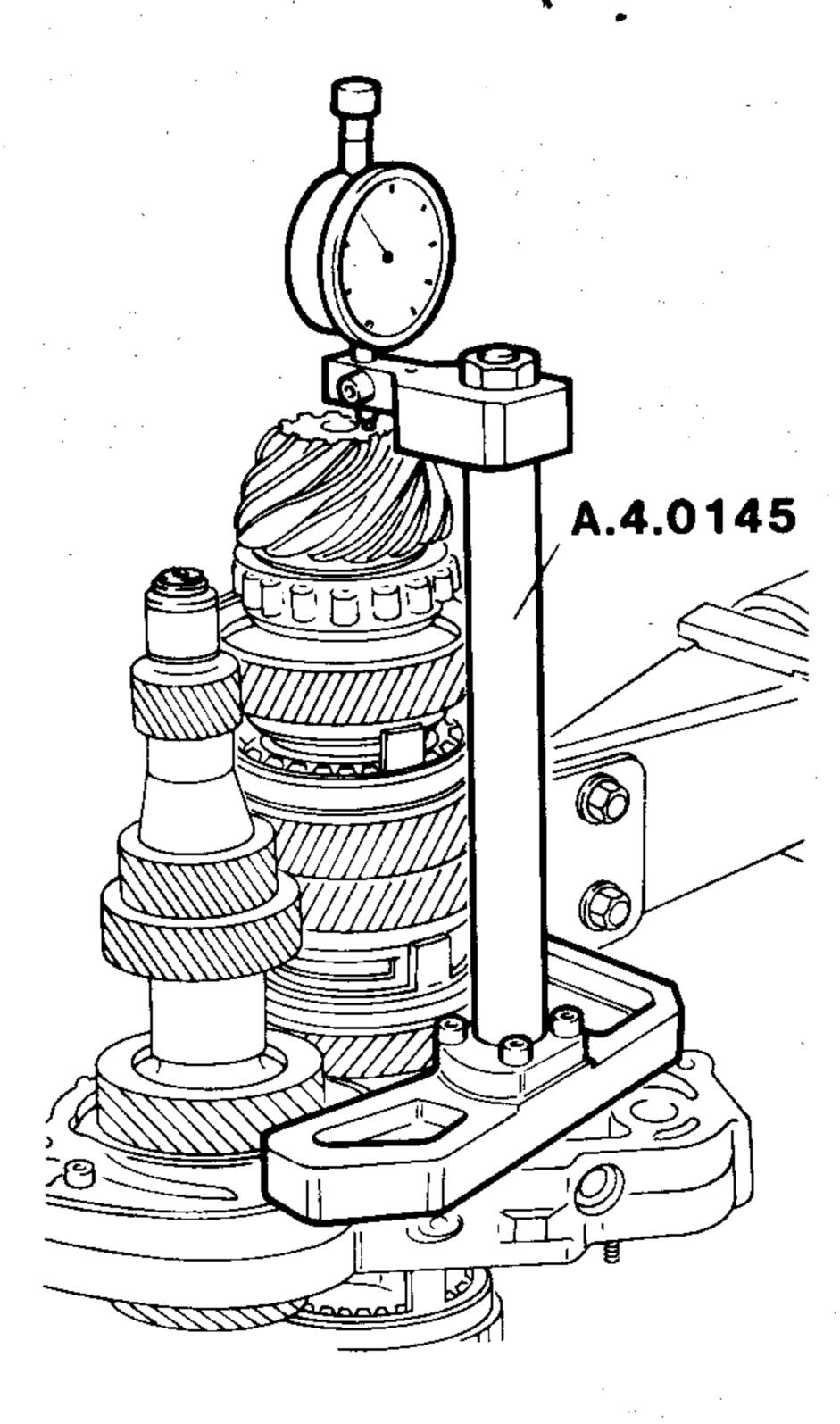


- d. Retighten nut to the prescribed torque.
- T: Tightening torque
  Pinion shaft securing nut
  112 to 124 N·m
  (11.4 to 12.6 kg·m.)
  (82.4 to 91.1 ft·lb)
- e. Install a centesimal gauge on support A.4.0145, the reset gauge on reference gauge C.6.0166 to the nominal dimension "A".

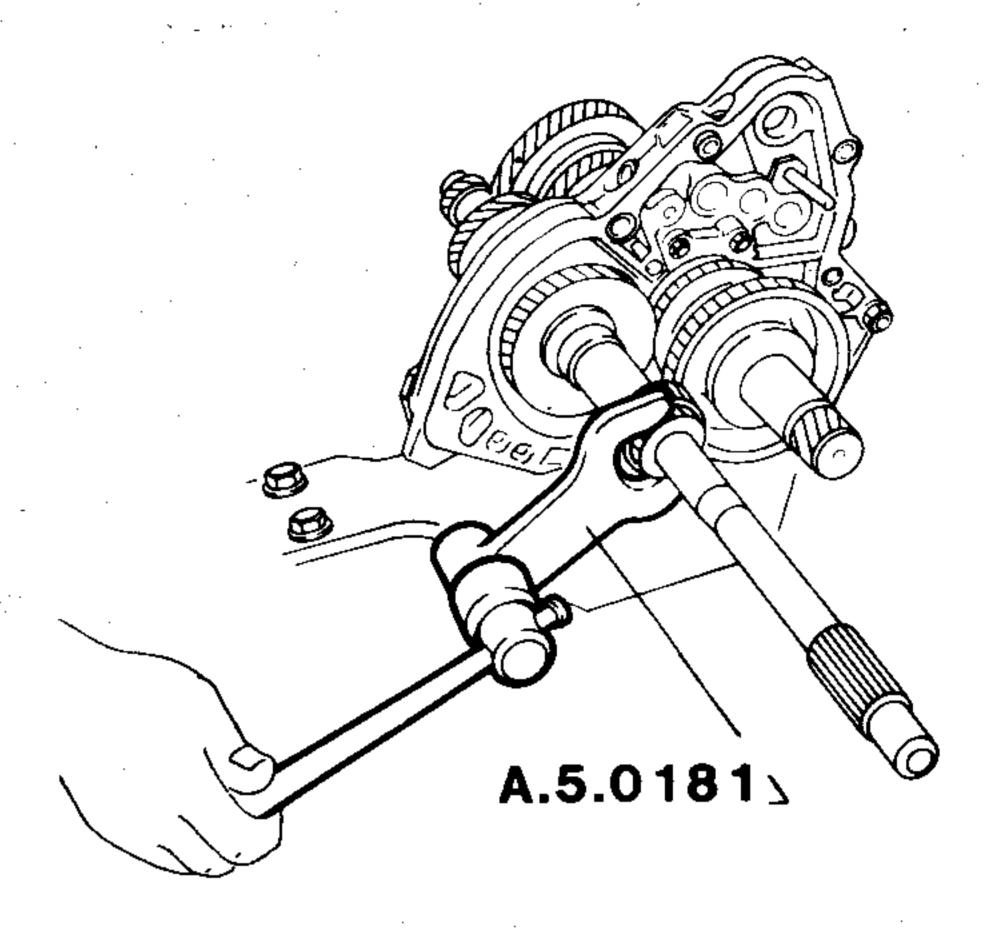


f. Rest the centesimal gauge support on intermediate flange inner plane and gauge probe on pinion head plane.

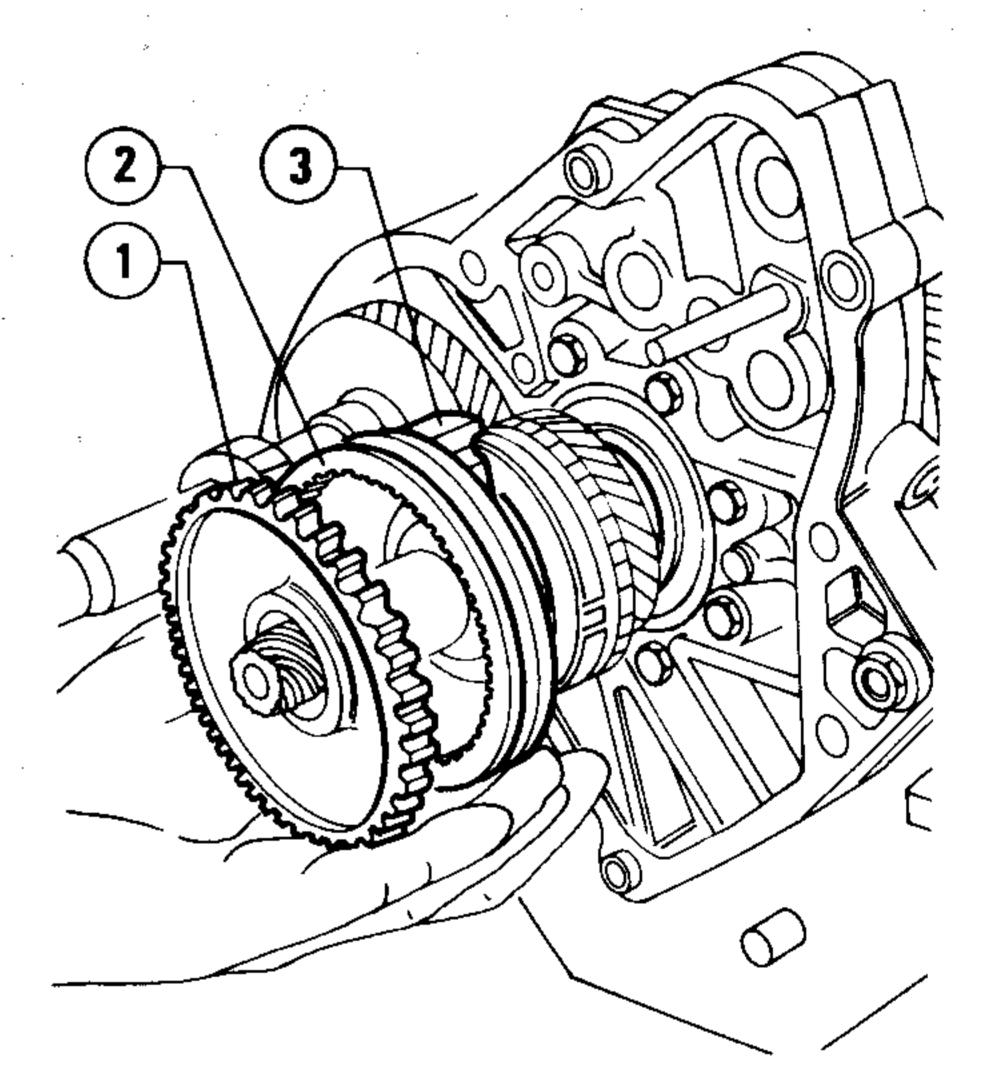
Measure and note down the read value.

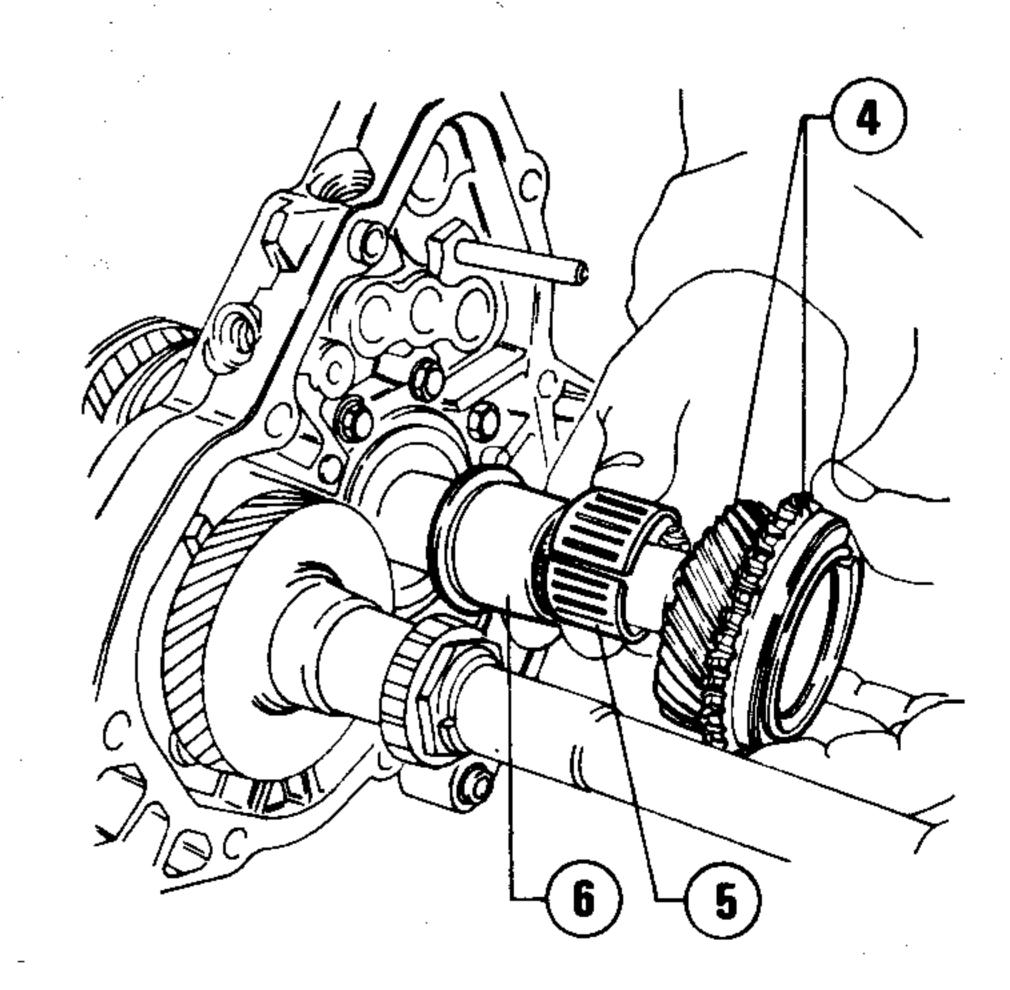


- 3. Shafts disassembly
- a. By means of a suitable spanner, unscrew the pinion shaft securing nut.
- b. Remove calking from main shaft securing nut, then release it by means of spanner A.5.0181.



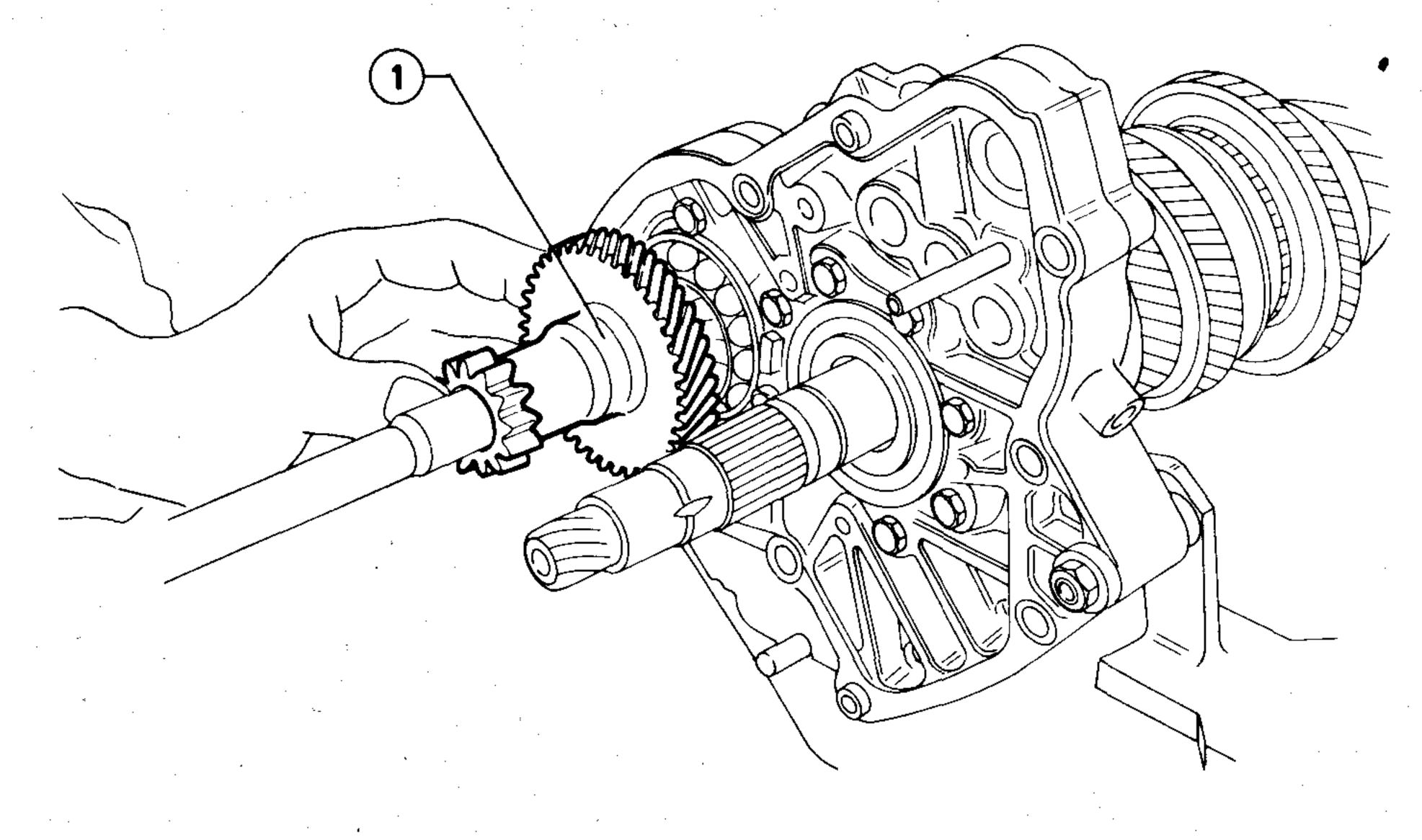
c. Remove the following items from pinion shaft: the nut previously loosened, gear 1, sleeve 2 with the hub 3 located underneath, gear 4, cage 5 with related bush 6.





- 1 Reverse speed driven gear
- 2 5th Reverse speeds sleeve
- 3 5th Reverse speeds hub
- 4 5th speed driven gear
- 5 Cage with needles for 5th and Reverse speeds
- 6 5th Reverse speeds bush

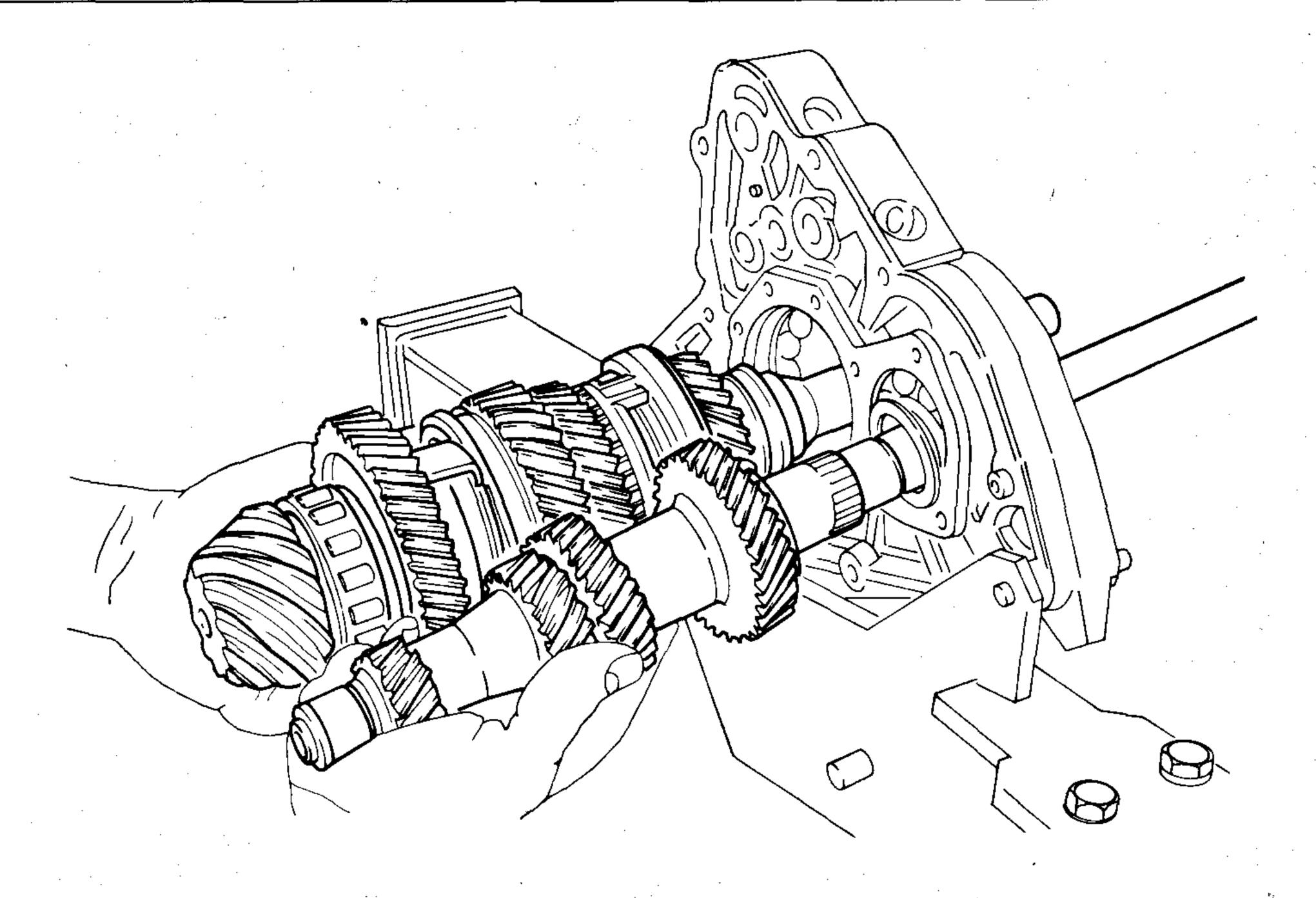
d. Remove the previously loosened nut and gear 1 from main shaft.



1 5th - Reverse speeds driving gear

e. By means of a resin mallet, tap on tangs of main and pinion shafts then withdraw them at the same time from intermediate flange. The rear inner races of intermediate flange ball bearings must be removed at the same time of shafts removal.

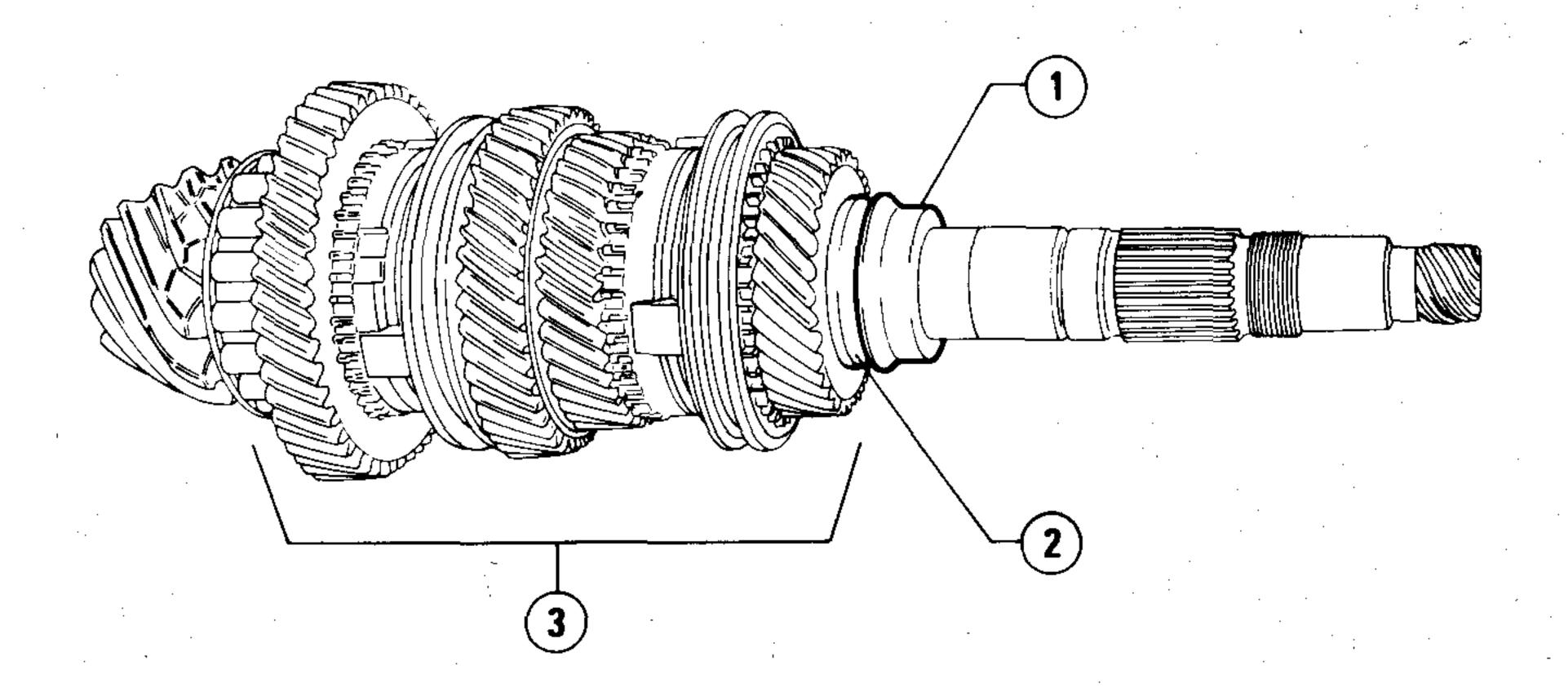
Take care not to drop front inner halfraces of bearings.



f. Remove front inner half-races from intermediate flange.

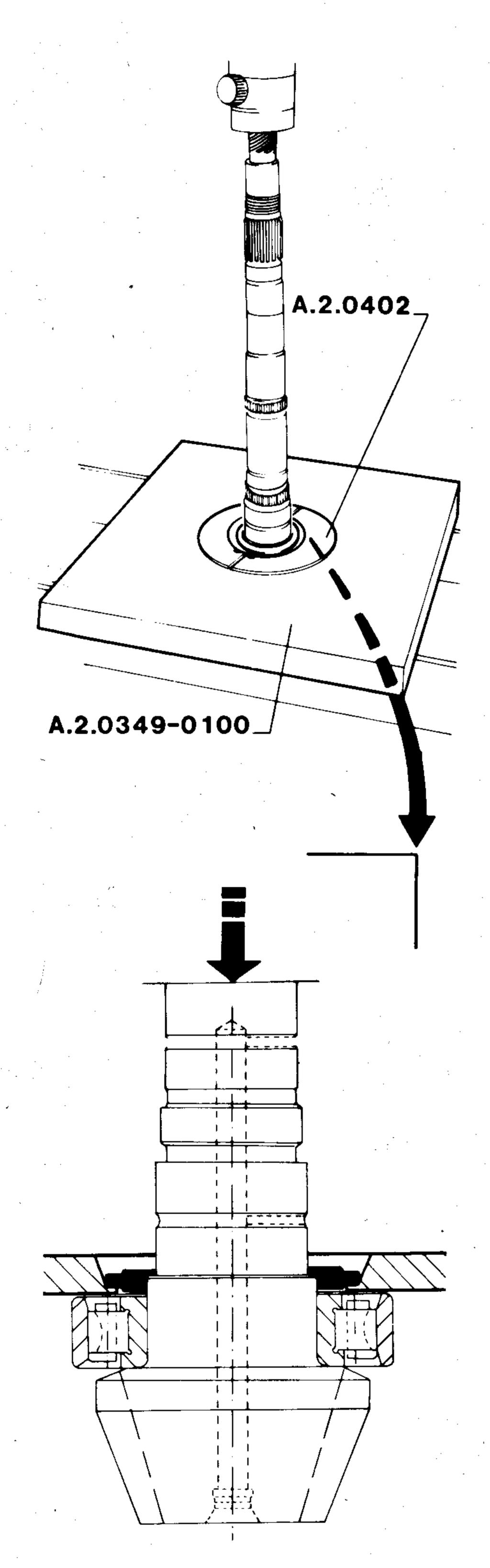
#### 4. Pinion shaft disassembly

a. Remove inner half-race 1, shim ring 2 and then the whole gear package 3 composing shaft itself from pinion shaft.

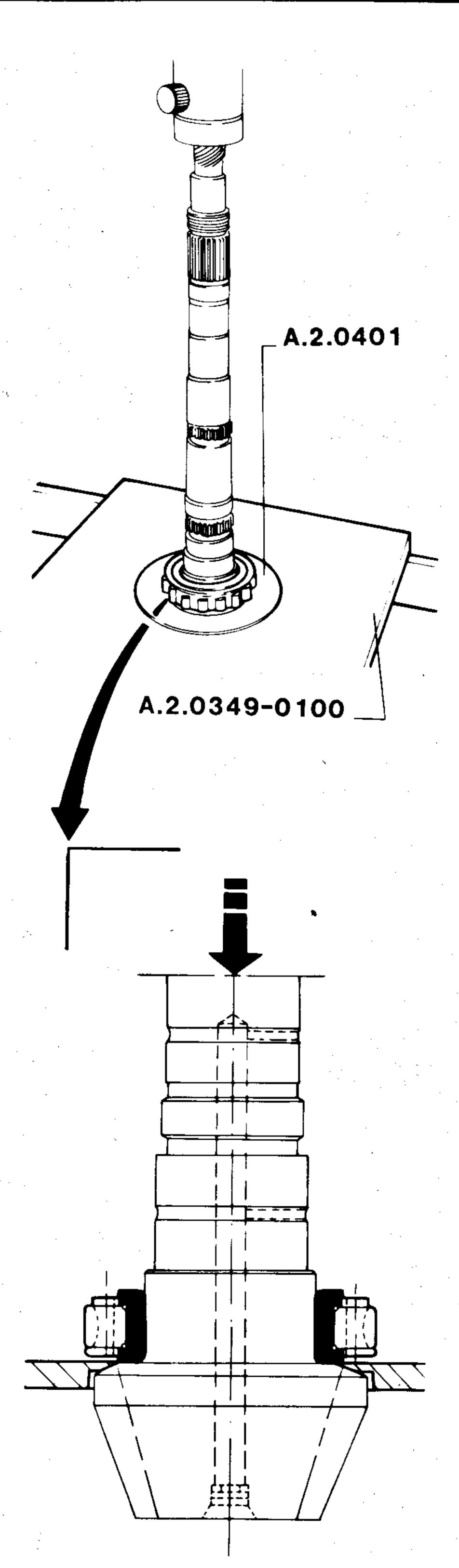


- 1 Intermediate flange bearing inner half-race
- 2 Shim ring for pinion-ring bevel gear distance adjustment
- 3 Driven gear package

b. Withdraw rear roller bearing ring nut from pinion shaft operating at press and making use of plate A.2.0349-0100 with tool A.2.0402.

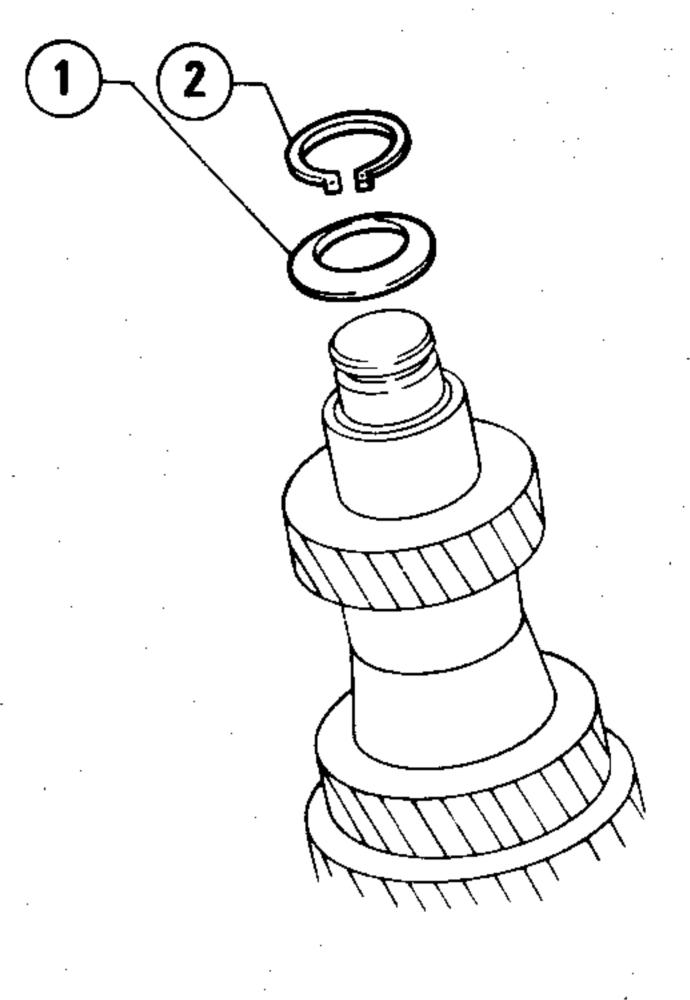


c. Withdraw rear roller bearing inner race from pinoin shaft always operating at press with plate A.2.0349-0100 and tool A.2.0401.

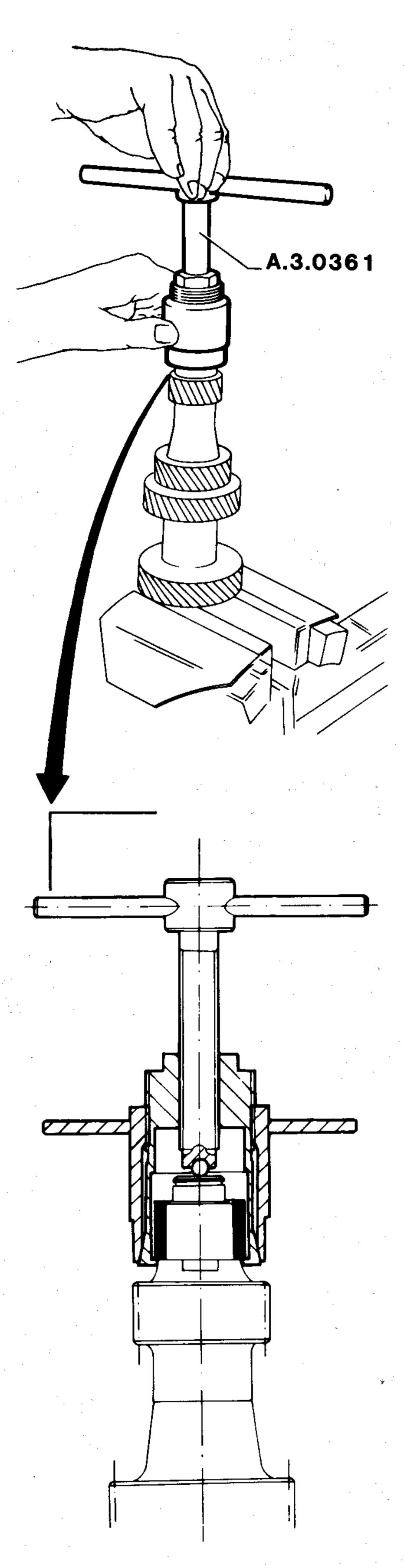


5. Main shaft disassembly

- a. Withdraw inner half-race oif intermediate flange bearing from main shaft.
- **b.** Secure main shaft to rice fitted with protective jaws, then remove retaining ring 1 and bush 2.



- 1 Retaining ring
- 2 Plastic bevel bush
- c. Withdraw inner race of rear needle bearing from main shaft, by means of puller A.3.0361.

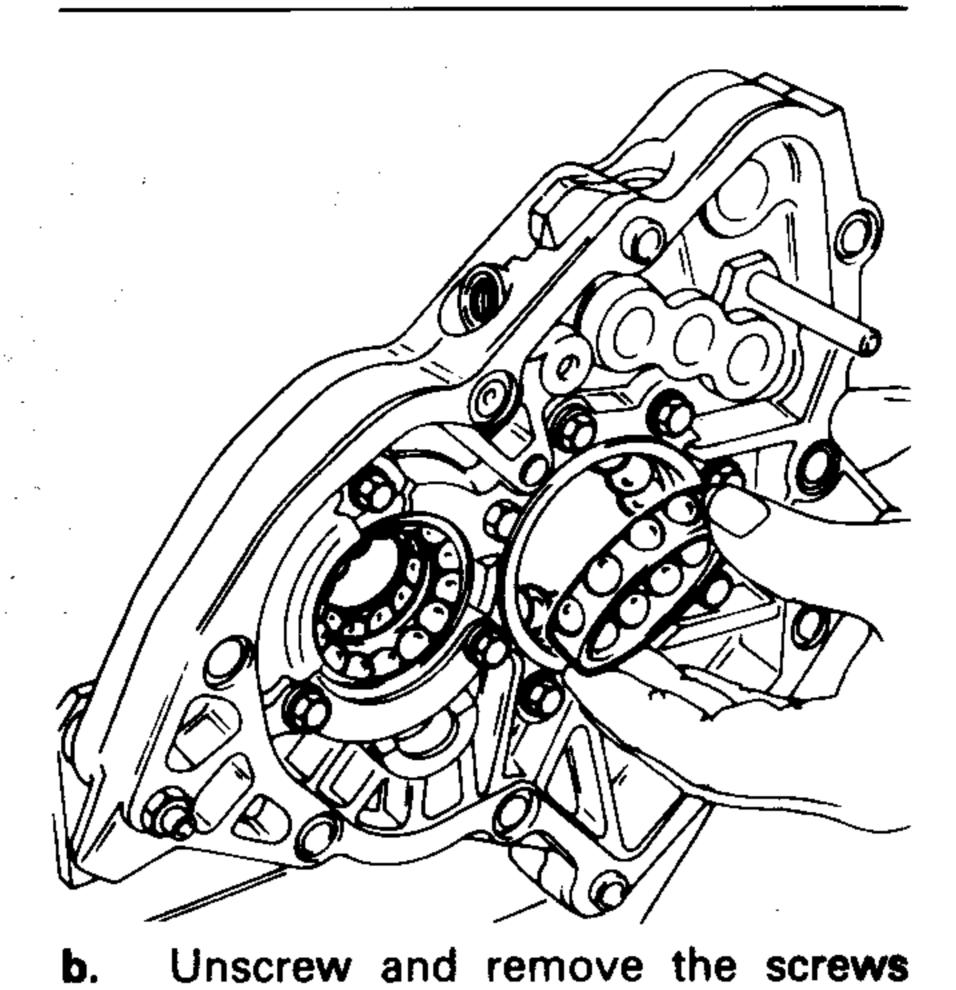


# 6. Intermediate flange disassembly Solution with intermediate skew ball bearings.

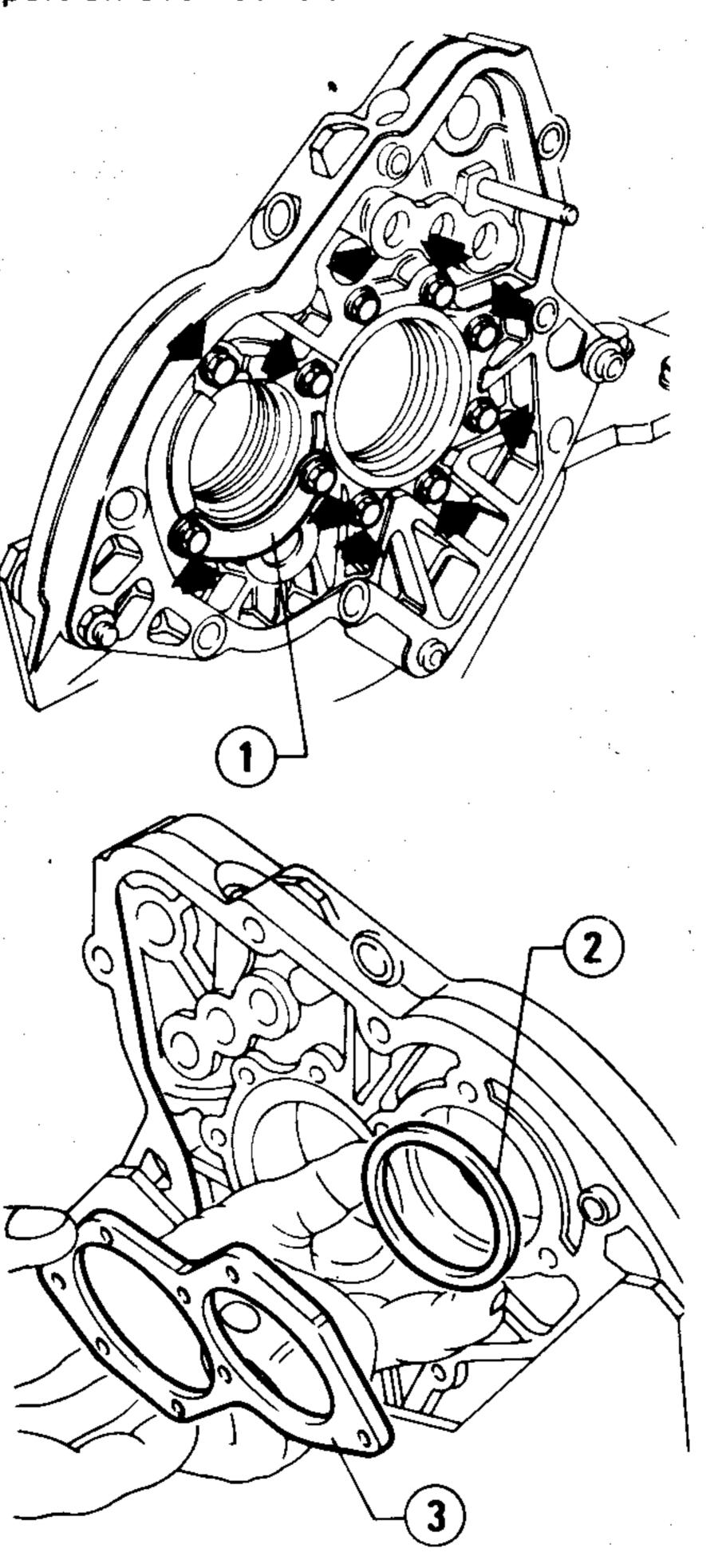
a. Withdraw rolling elements (balls with cages) from outer races of intermediate flange bearings.

#### **CAUTION:**

If bearings are not to be replaced, mark them so that original position can be restored during reassembly.

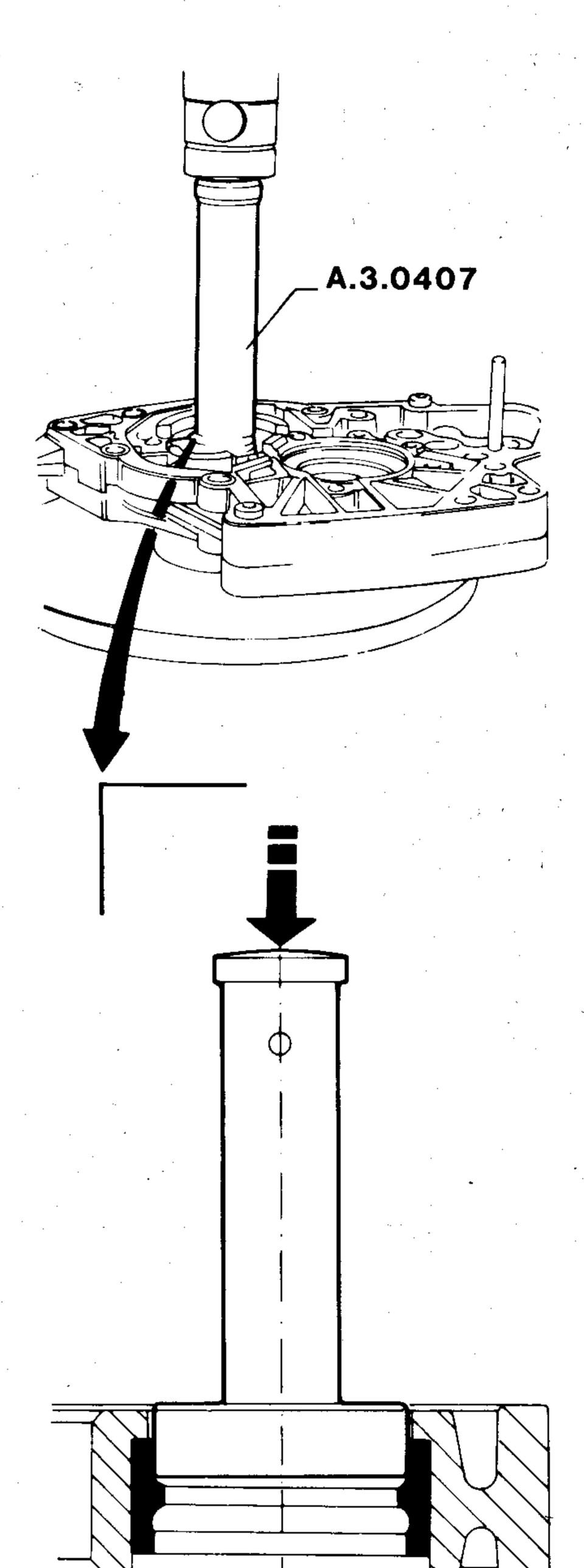


with related washers securing plate 3 to intermediate flange. Recover clamp 1, plate itself and spacer 2. Remove intermediate flange from support on overhaul stand.

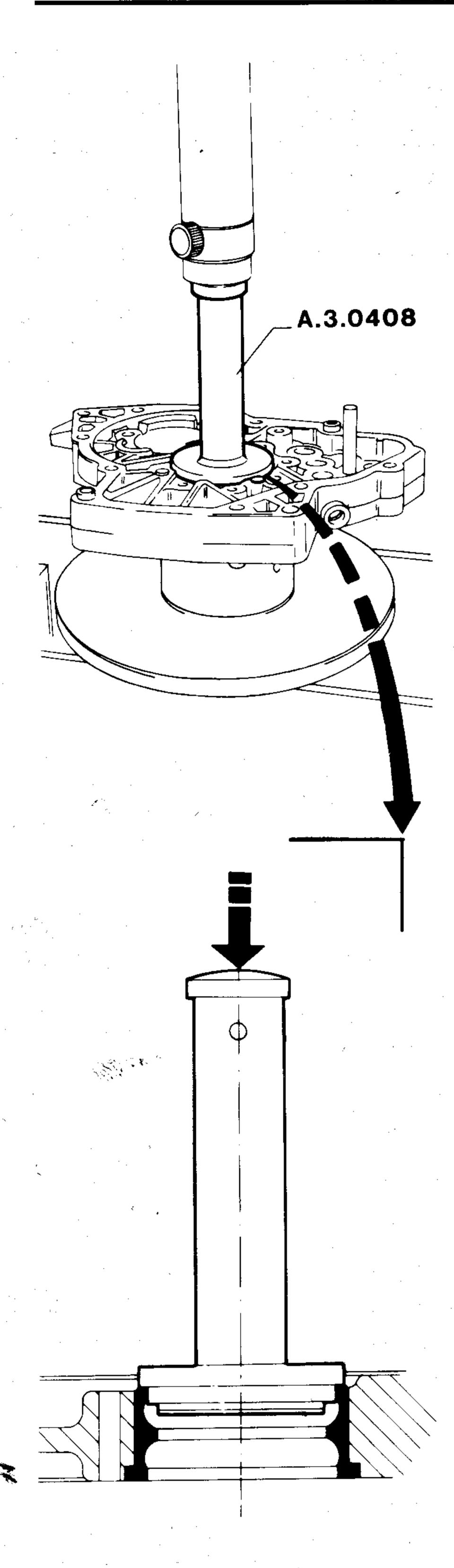


- 1 Bearing outer race clamp
- 2 Shoulder spacer
- 3 Shoulder plate for bearing outer races

c. Withdraw main shaft bearing outer ring from intermediate flange operating at press, with suitable base and puller A.3.0407.

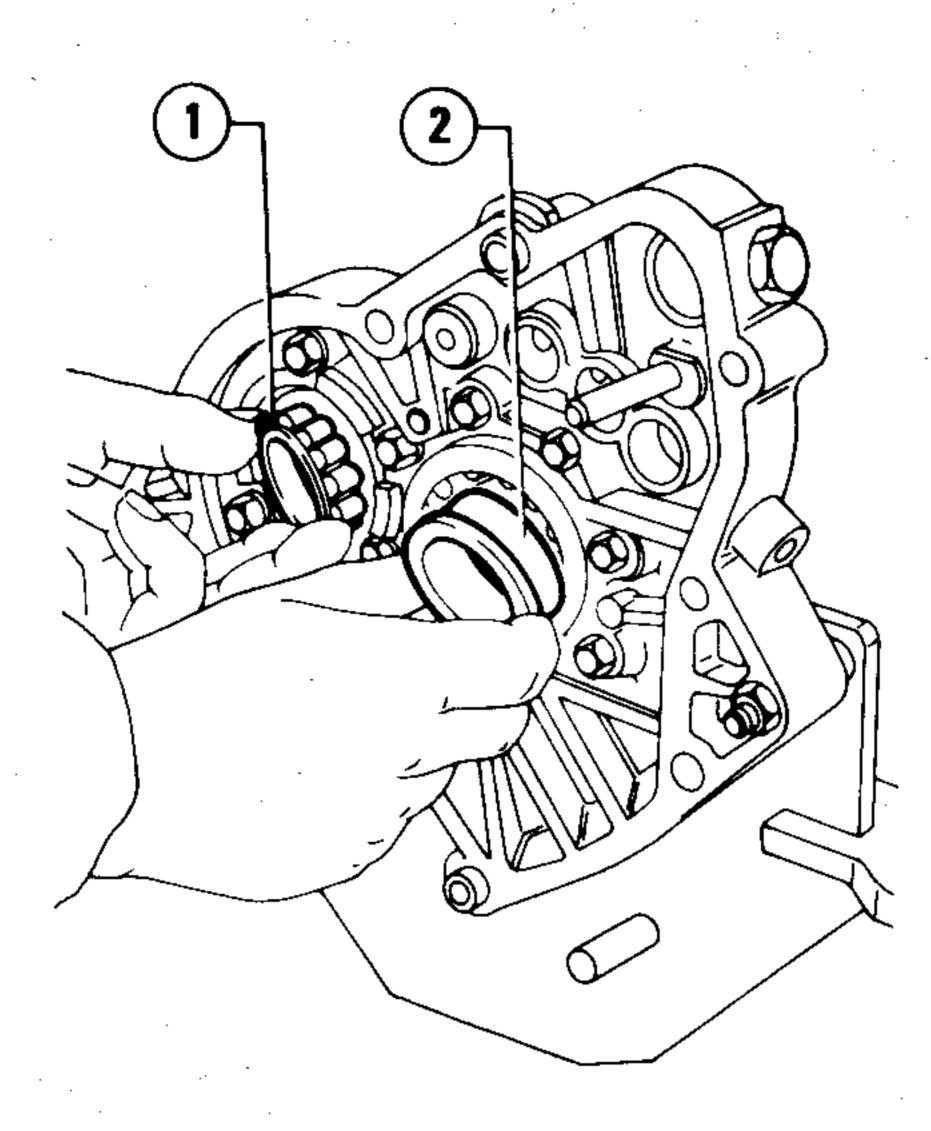


d. Withdraw pinion shaft bearing outer ring from intermediate flange always operating at press, with suitable base and puller A.3.0408.

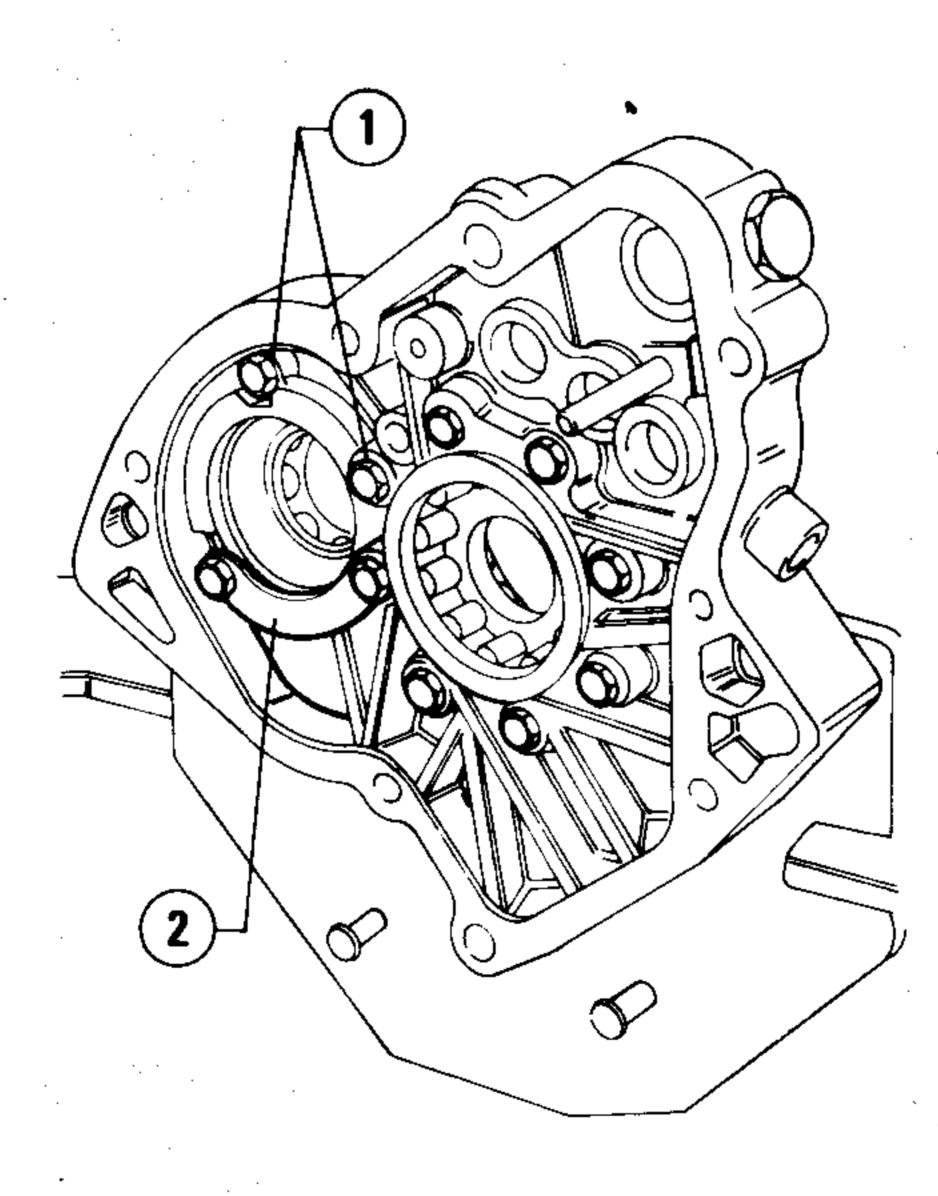


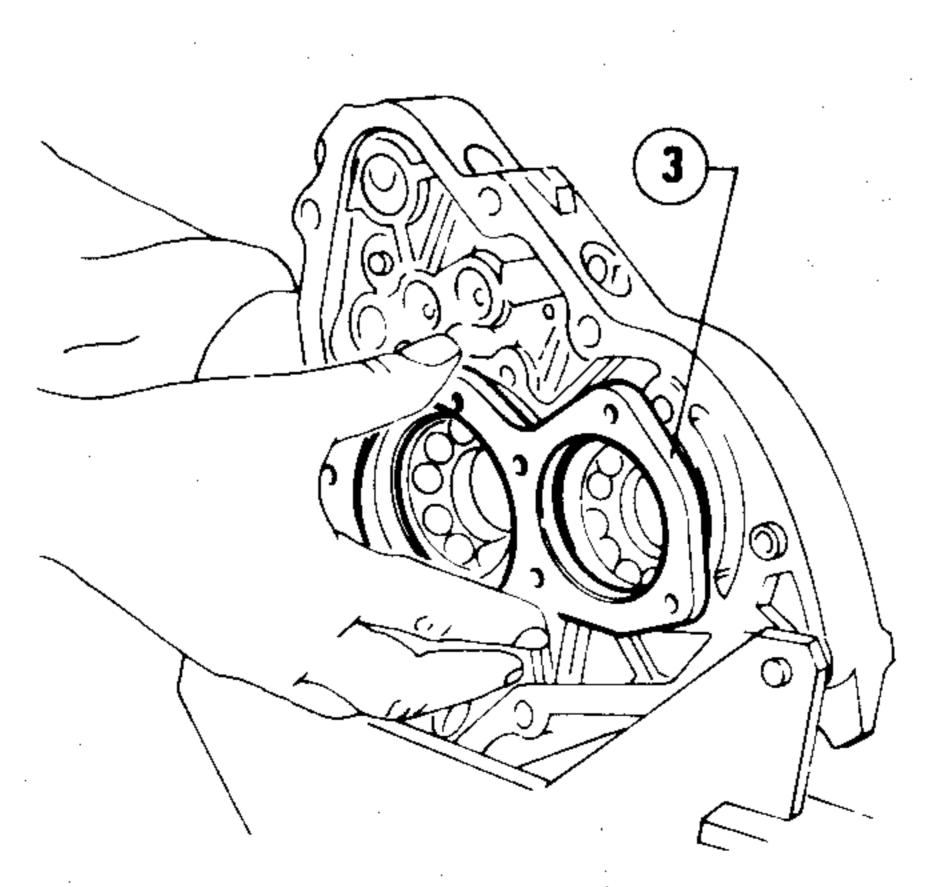
Solution with intermediate roller/ball bearings

a. Disassemble inner races 1 and 2 of roller bearings related to main and pinion shaft.



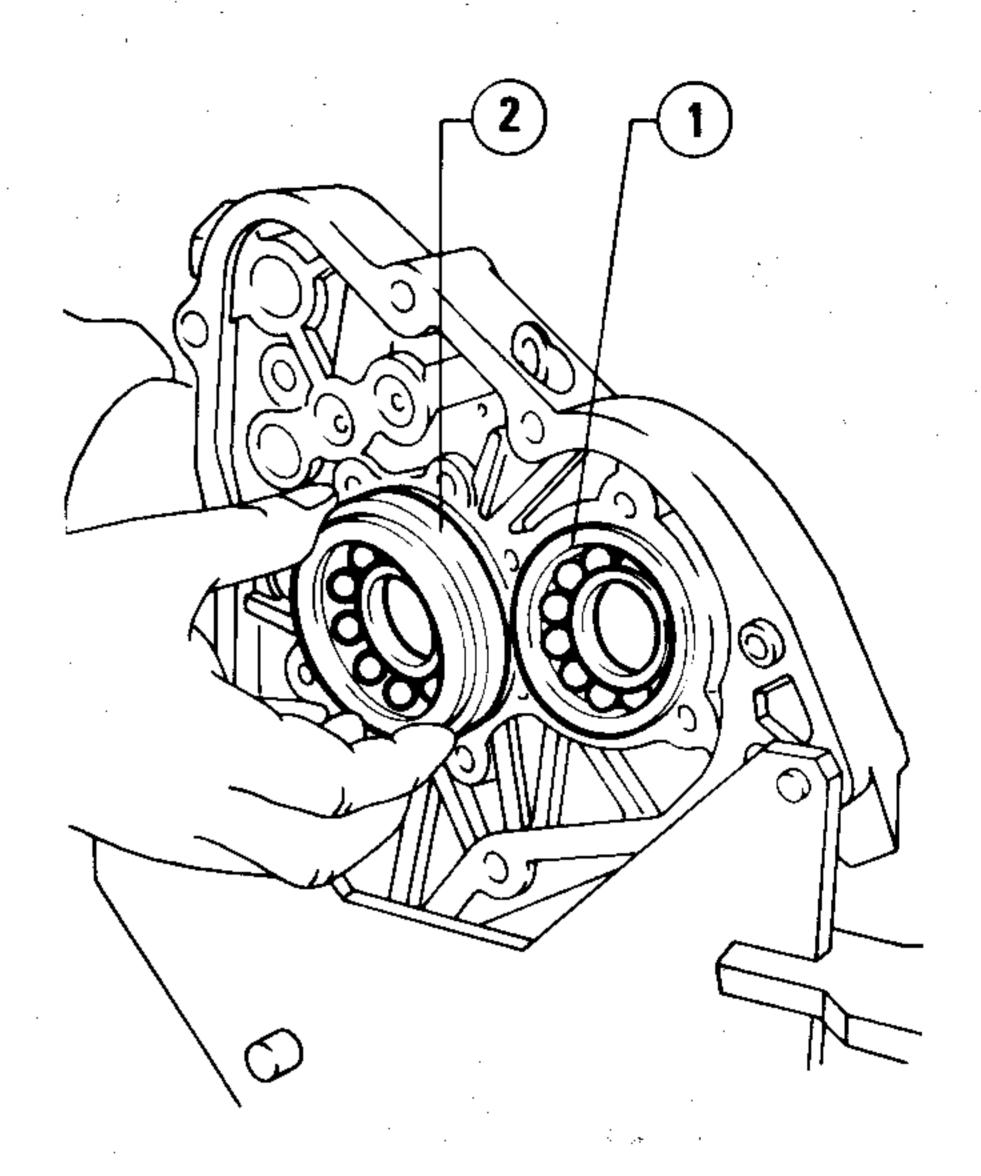
- 1 Main shaft bearing inner race
- 2 Pinion shaft bearing inner race
- b. Unscrew and remove screws 1 with related washers securing plate 3. Recover retainer 2 and plate itself.



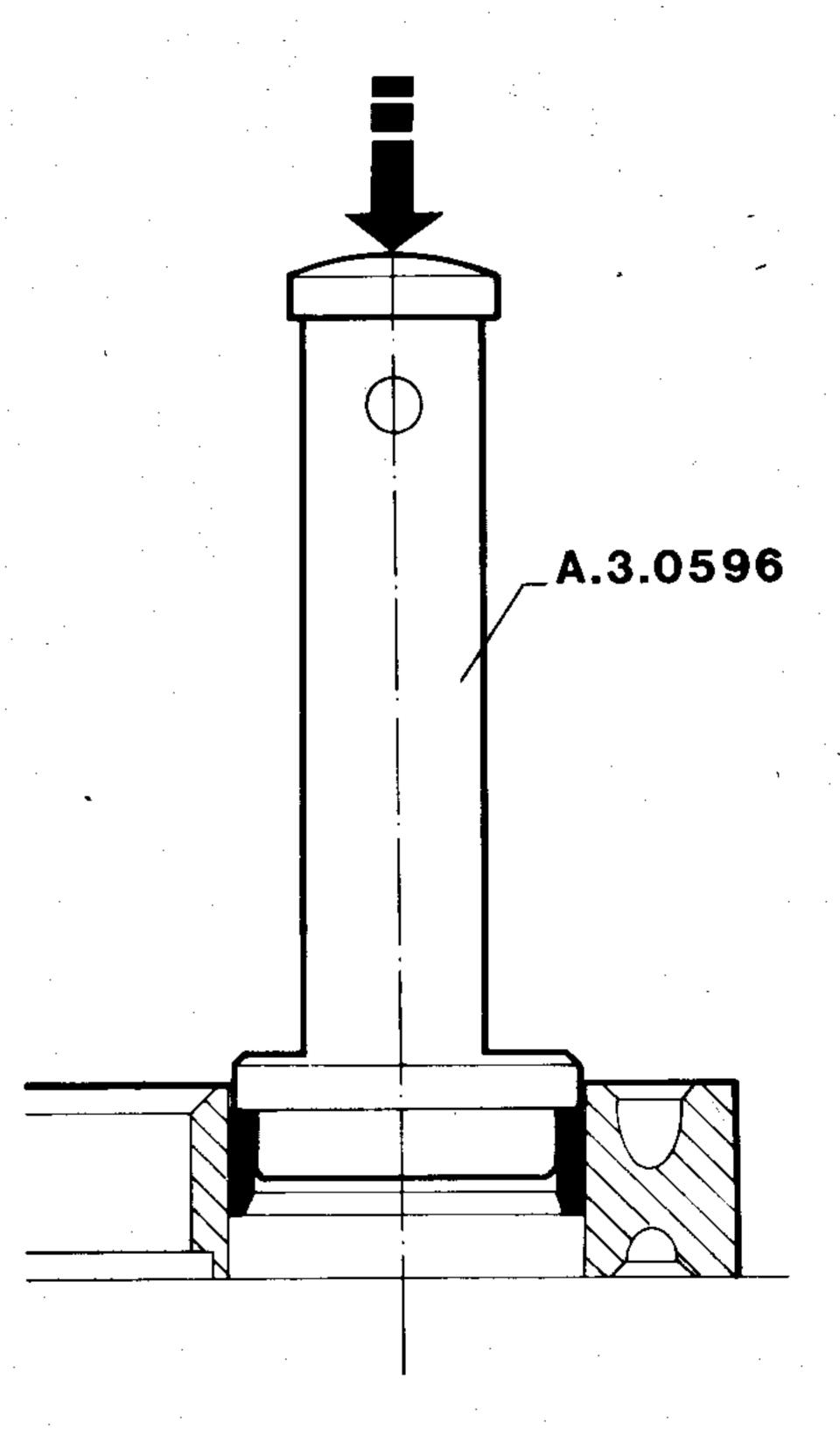


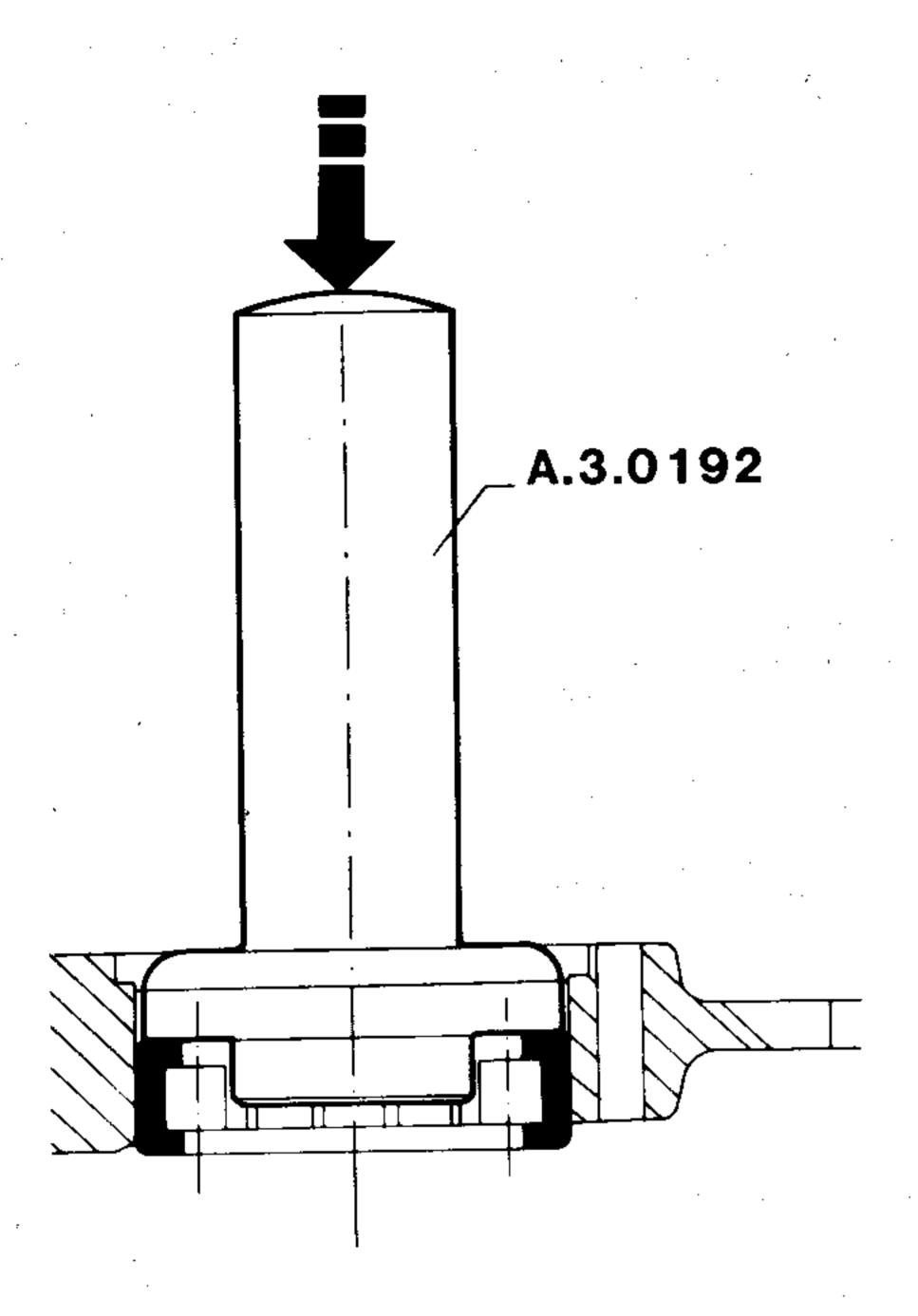
- 1 Plate securing screws
- 2 Bearing retainer
- 3 Bearing retaining plate

c. Withdraw ball bearings of main (1) and pinion (2) shafts.



- 1 Main shaft ball bearing
- Pinion shaft ball bearing
- d. Operating at press with suitable base and puller A.3.0596, withdraw outer ring of main shaft bearing from intermediate flange.
- e. Always operating at press with suitable base and puller A.3.0192 withdraw outer ring of pinion shaft bearing from intermediate flange.

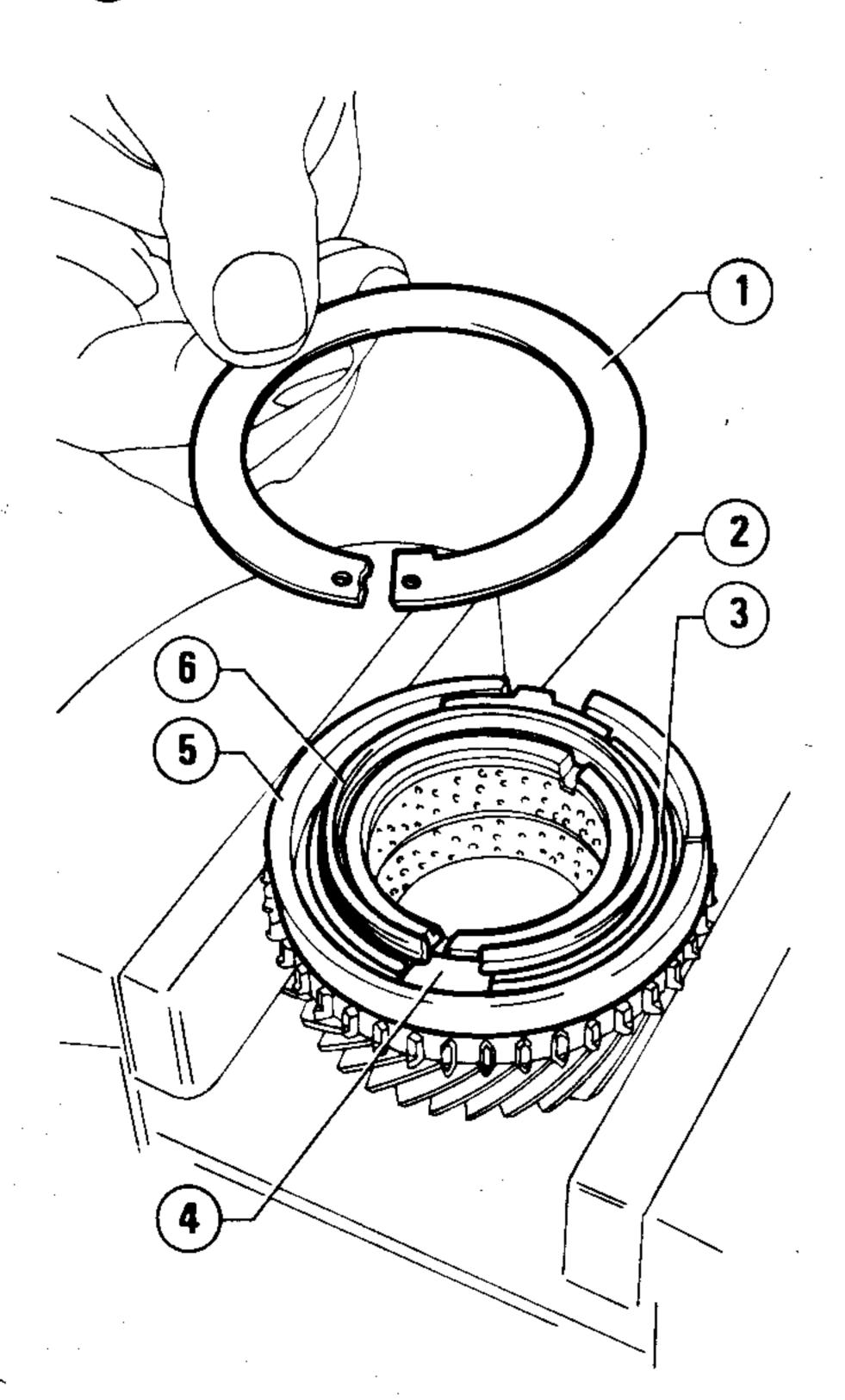




#### 7. Synchronizers disassembly

a. Synchronizers for 1st, 2nd, 3rd, 4th, 5th speeds.

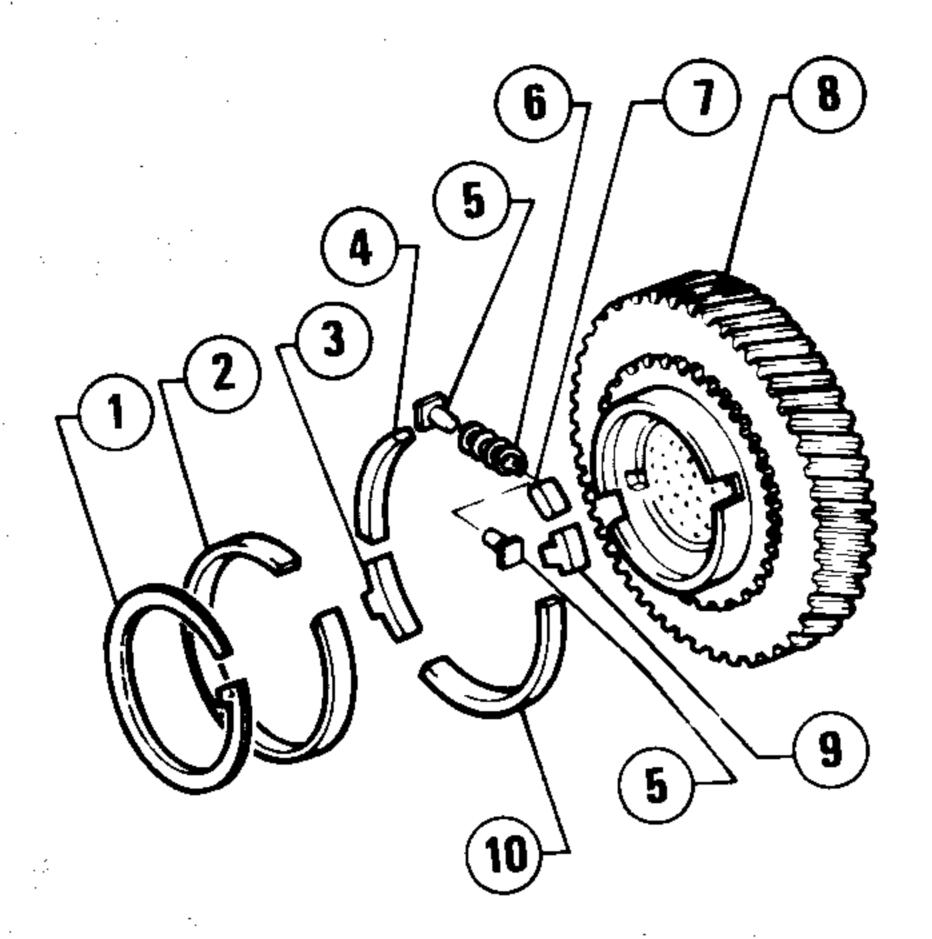
Secure the gear concerned on a vice fitted with protective jaws and, by means of a plier, remove retaining ring 1. Then, withdraw ring 5, sectors 2 and 4 and retainers 3.



- 1 Retaining ring
- 2 Locking sector
- 3 Retainers
- 4 Guide sector
- 5 Synchronizing ring

#### b. 1st speed synchronizer

Operating as per the previous step, remove retaining ring 1, then withdraw ring 2, sectors 3 and 9, retainers 4 and 10, spring 6 with the two strikers 5 and pawl 7.



- 1 Retaining ring
- 2 Synchronizing ring
- 3 Locking sector
- 4 Retainer
- 5 Strikers
- 6 Spring
- 7 Pawl
- 8 Gear
- 9 Guide sector
- 10 Retainer

#### CHECKS AND INSPECTIONS

Before carrying out the checks, carefully wash the items, then blow them with compressed air. This permits a better identification of superficial defects, wear and efficiency of a few components.

#### a. Gears and splined sections

Verify gears teeth. If irregular wear or spalled teeth are found on gears, replace the gears and verify that gears they mate with are not spalled.

Verify also the threaded and splined surfaces of shafts and, particularly, the housings fo bearings inner races.

Gear axial and radial clearance
0.10 to 0.15 mm
(0.00394 to 0.00591 in)

#### b. Bearings

Verify conditions of surfaces related to rings and rolling elements making sure they are free from scratches, imprintings, grinding caused by scoring due to foreign matters.

#### c. Synchronizers

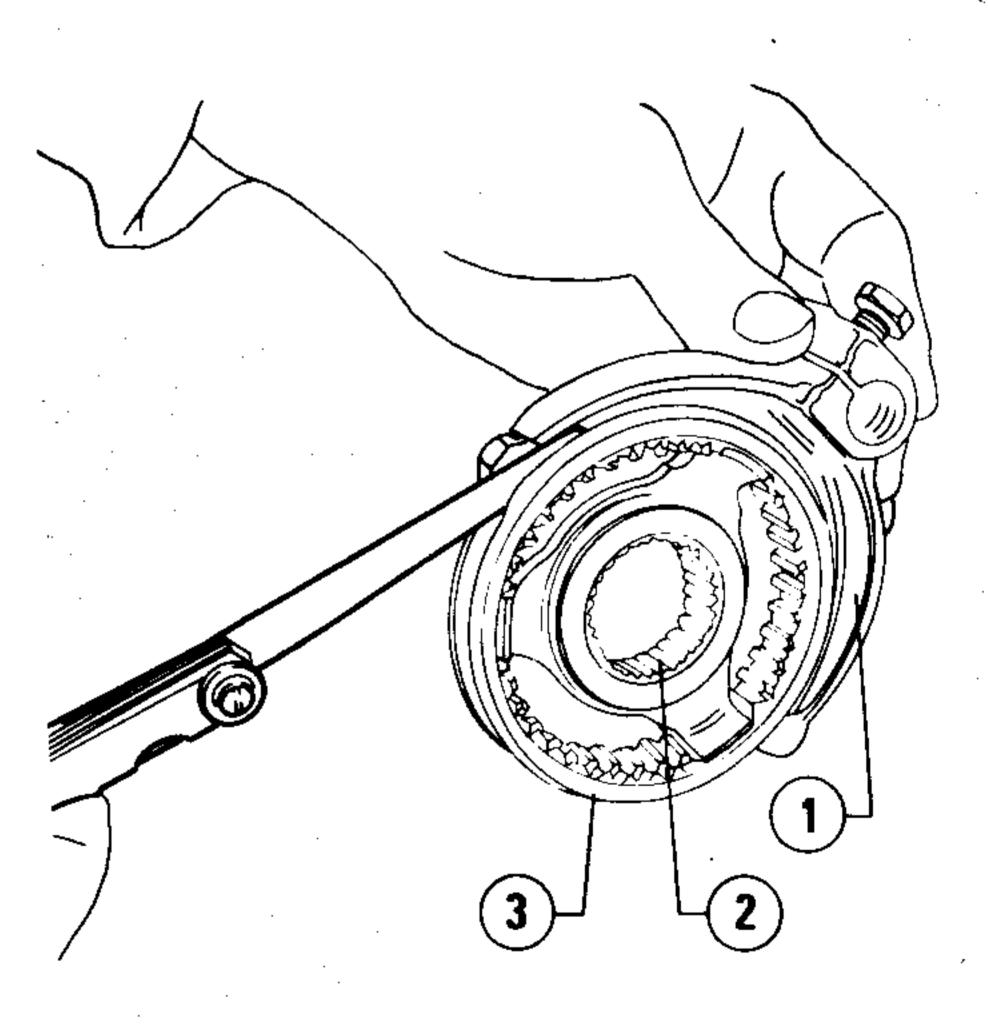
#### Verify that:

- Synchronizer rings are free from excessive wear.
- Retainers are free from overheating signs in the working points.
- Locking and guide sectors are not excessively scratched in the working points.
- Synchronizer sleeves slide freely on the related hubs.
- Engagement front toothing on sleeves and the corresponding toothing on gears are free from seizing and excessive wear.

#### d. Forks and sleeves

Check working surfaces of forks 1 and slinding sleeves 3 verifying they are free from seizing and that axial clearance is within the prescribed values.

Sleeve fork axial clearance 0.7 to 0.9 mm (0.0275 to 0.0354 in)

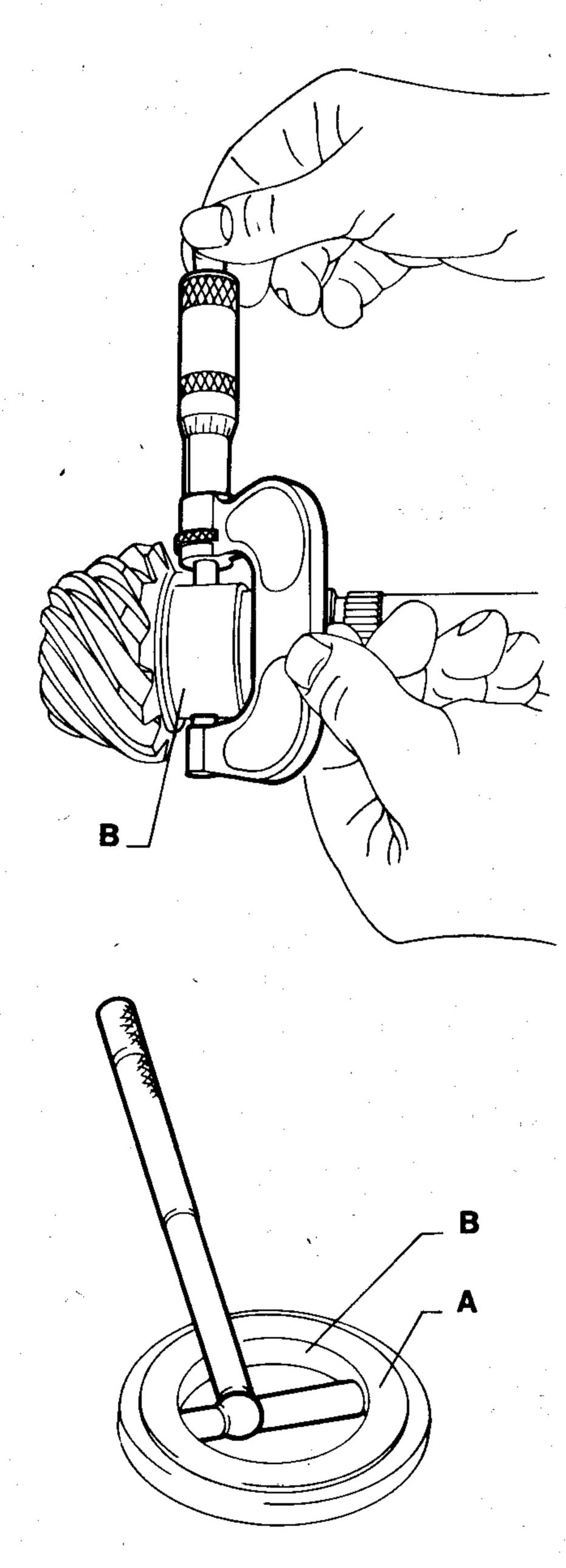


- Control fork
- 2 Hub
- 3 Sleeve

#### e. Pinion shaft and rear spacer

Verify that squareness deviation of ring nut support plane A of pinion shaft rear roller bearing does not exceed 0.02 mm (0.000787 in) and that installation interference fit between seats B of pinion shaft and ring nut is within the prescribed values, i.e.:

0.019 to 0.060 mm (0.000748 to 0.0024 in)

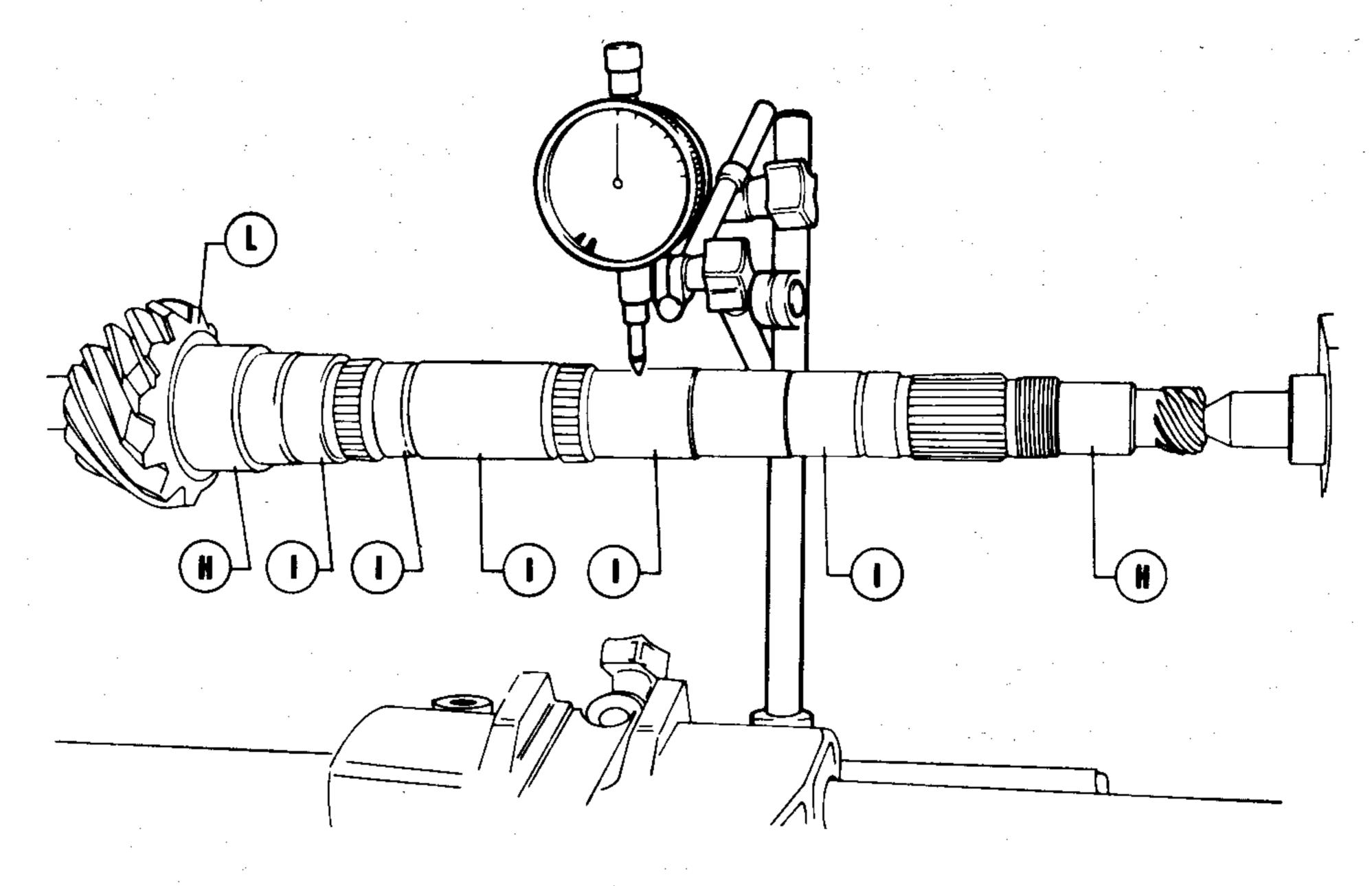


By means of gauge, verify that:

H of front needle bearing and rear roller bearing with respect to seats I of bushes related to gears and intermediate bearings does not exceed 0.02 mm. (0.000787 in).

 Squareness deviation of abutment plane L related to rear bearing inner race with respect to seats H of bear-

ings must not exceed: 0.02 mm (0.000787 in)



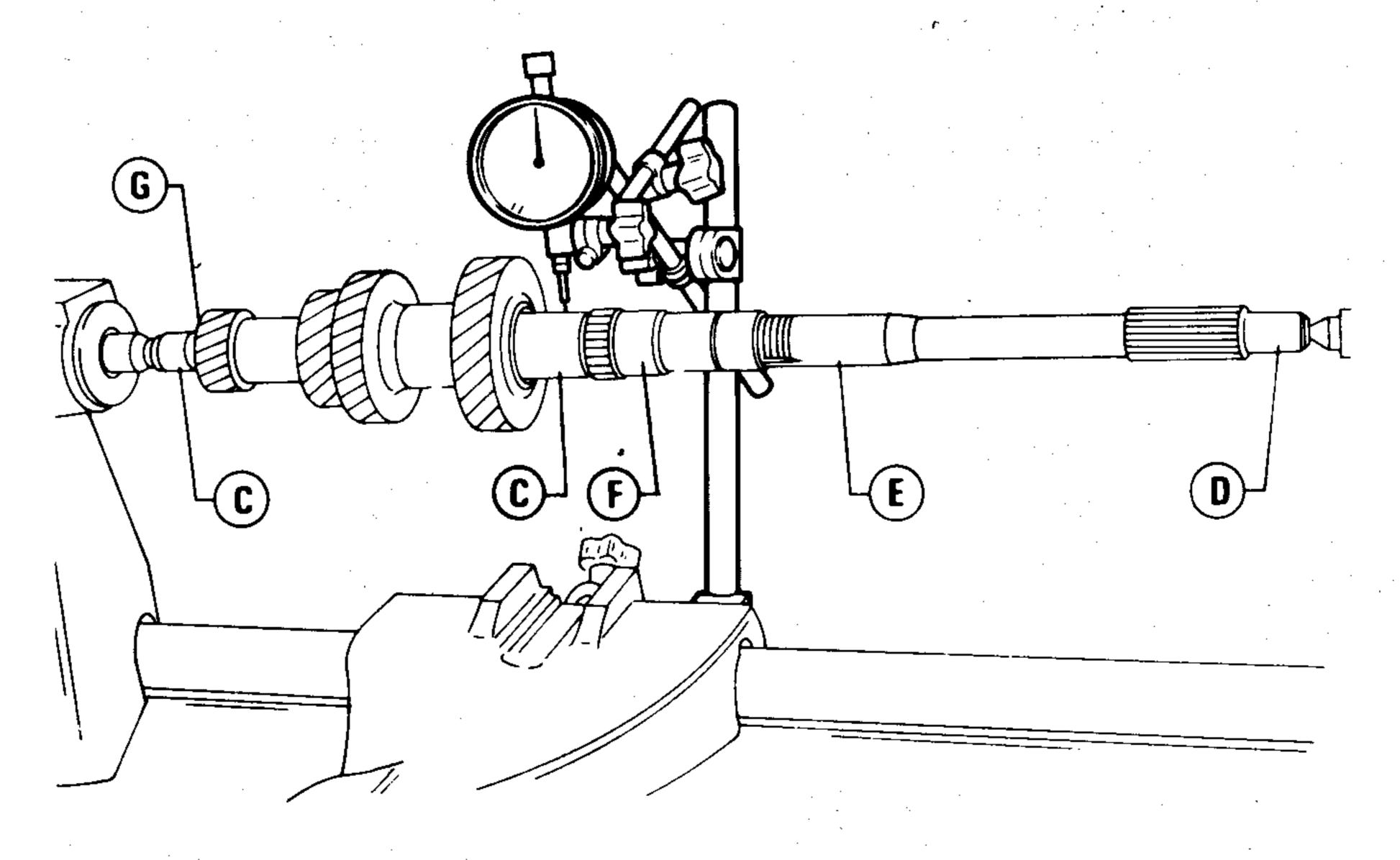
#### f. Main shaft

By means of gauge, verify that:

main shaft eccentricity in the seats C of bearings related to differential-speed gear casing and of intermediate flange with respect to clutch shaft centering seat D, seat E of differential-speed gear casing bearing and to seat F of 5th speed gear does not exceed 0.03 mm (0.00118 in) tolerance.

 Squareness deviation of abutment plane G related to rear bearing inner race with respect to seats C of bearings does not exceed:

0.03 mm (0.00118 in).



#### **REASSEMBLY**

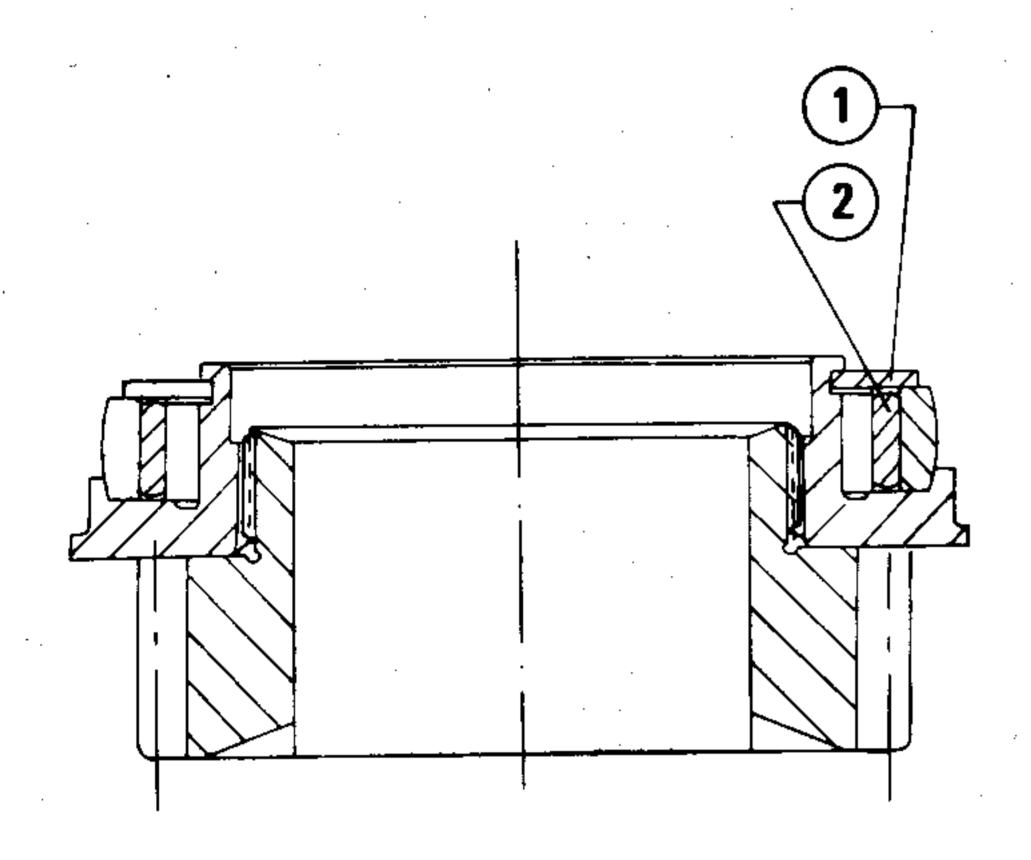
#### Synchronizers reassembly

Synchronizers for 2nd, 3rd, 4th, 5th speeds.

Reassemble synchronizers on gears, starting with the positioning of locking and guide sectors followed by retainers, synchronizing ring and retaining ring.

#### **CAUTION:**

At the end of reassembly, make sure that ring (1) is correctly mounted in its seat and that ring (2) can move freely.



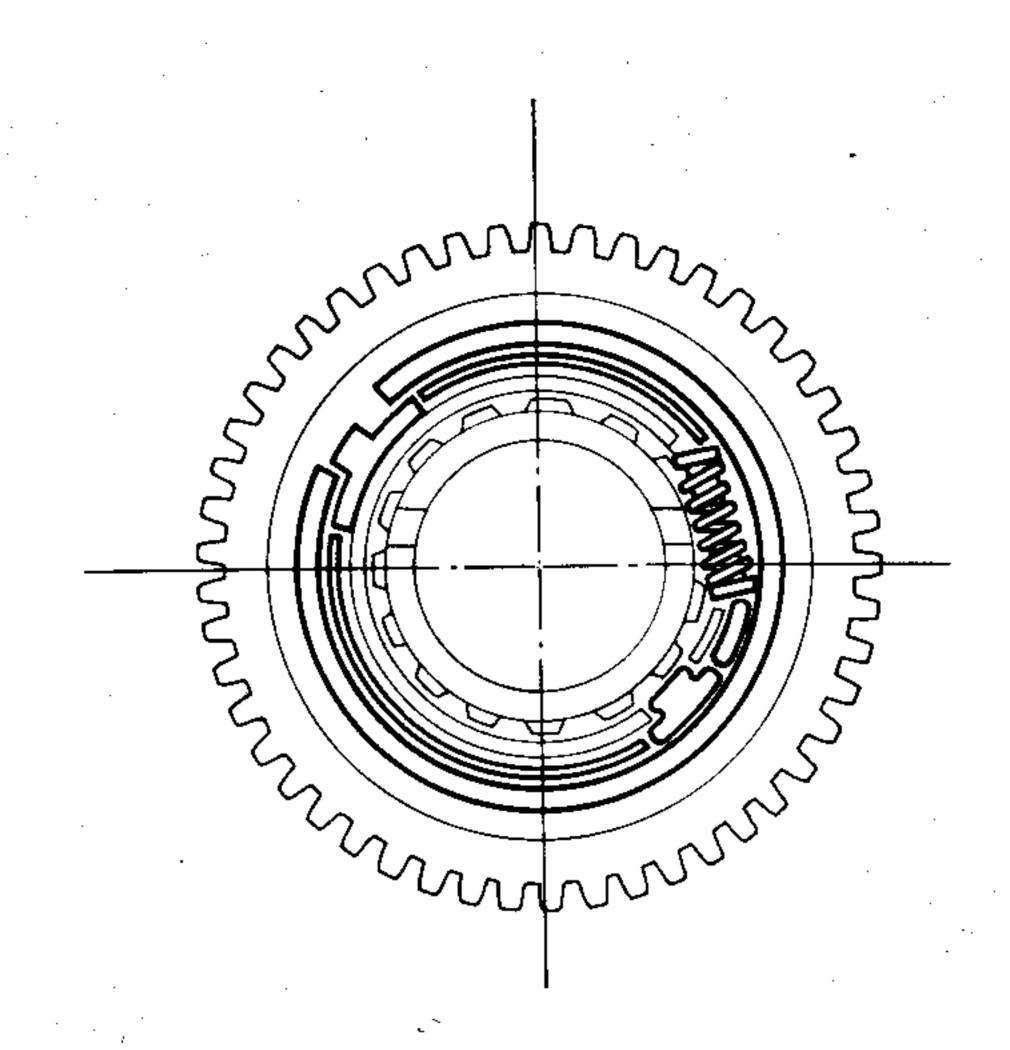
- Retaining ring
- 2 Synchronizing ring

#### Ist speed synchronizer

Reassemble synchronizer operating as per the previous step and by correctly positioning the spring with the related strikers and the pawl.

#### **CAUTION:**

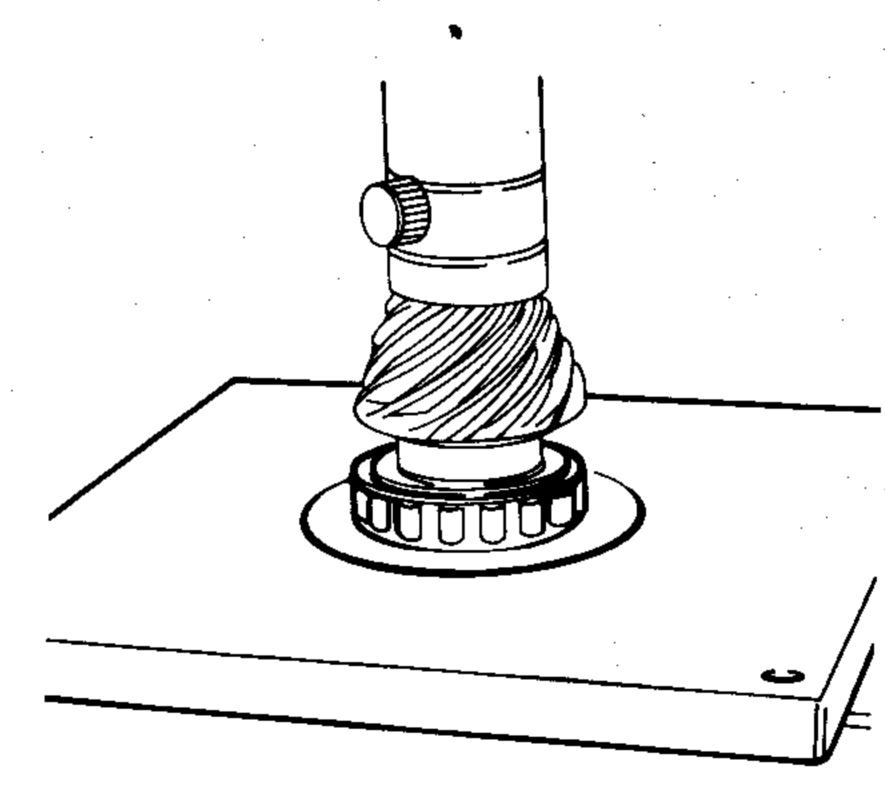
The retainers are of different length, as a consequence, they must be mounted just as per figure.



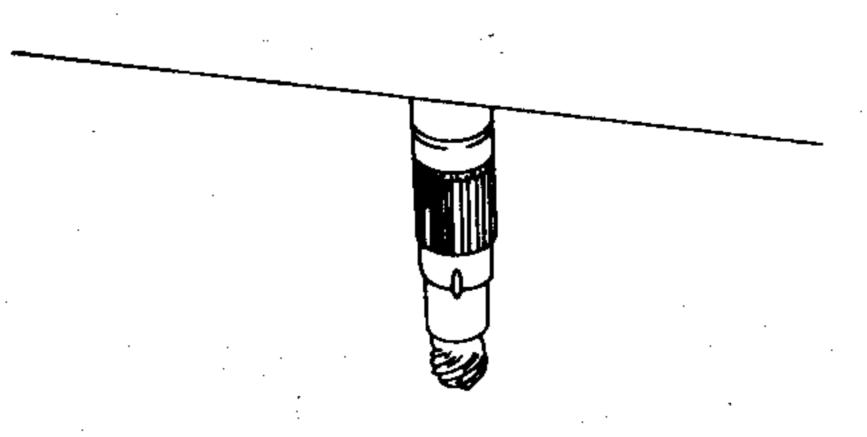
#### Pinion shalft reassembly

If previously disassembled, reassemble roller bearing runner race at the press and by means of a plate.

Install bearing with the protrusion towards pinion head.

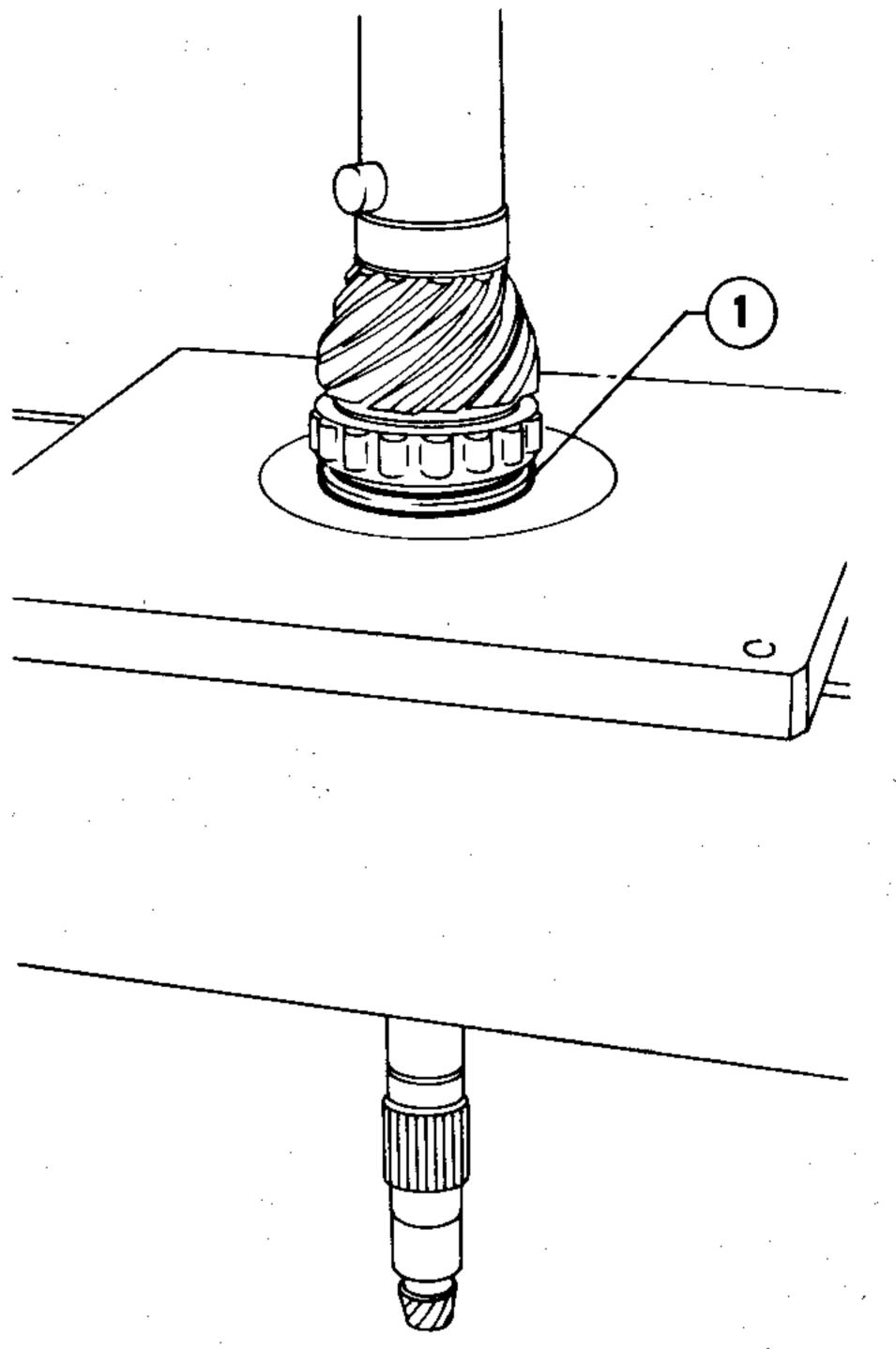






Heat ring nut (1) (140 °C, 284 °F) and insert it into pinion shaft, by means of the plate mentioned above.

To obtain the best installation, cool down the ring nut with compressed air when it is still under pressure, held in the press.



Ring nut

To complete pinion shaft reassembly, reverse the disassembly operations taking care to lubricate gears bushes, before reassembly, with the prescribed oil.

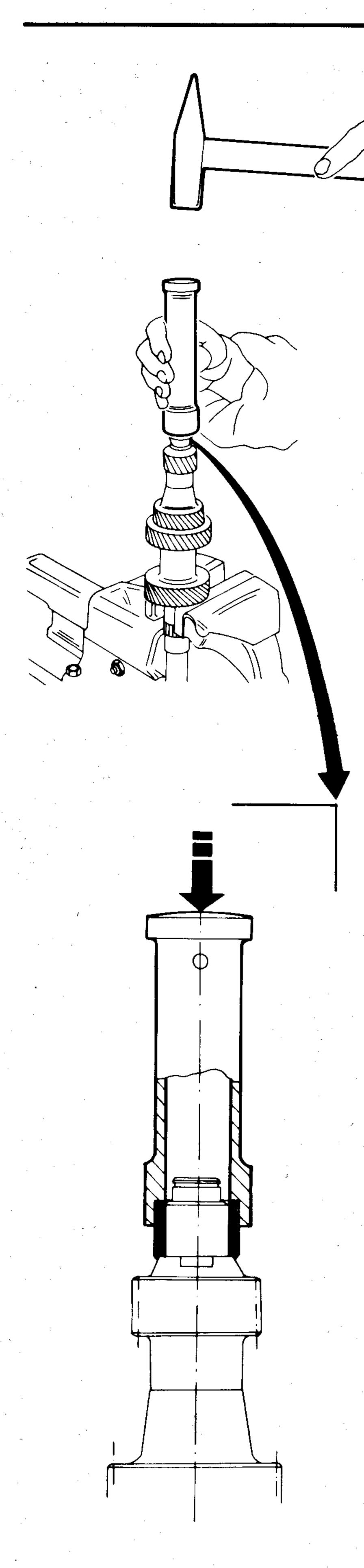
Oil:

AGIP Rotra SX 75W90 IP Pontiax HDS 75W90

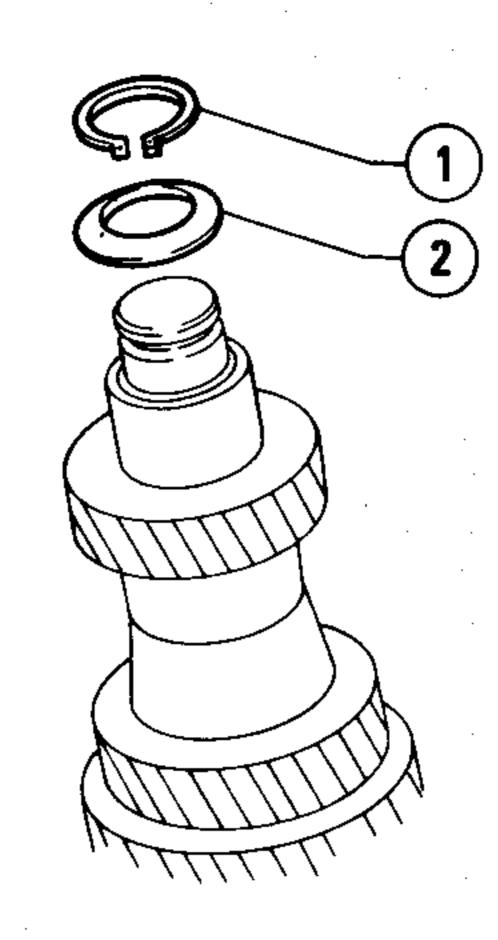
For correct installation of gear package, refer to exploded views of page 13-17

#### Main shaft reassembly

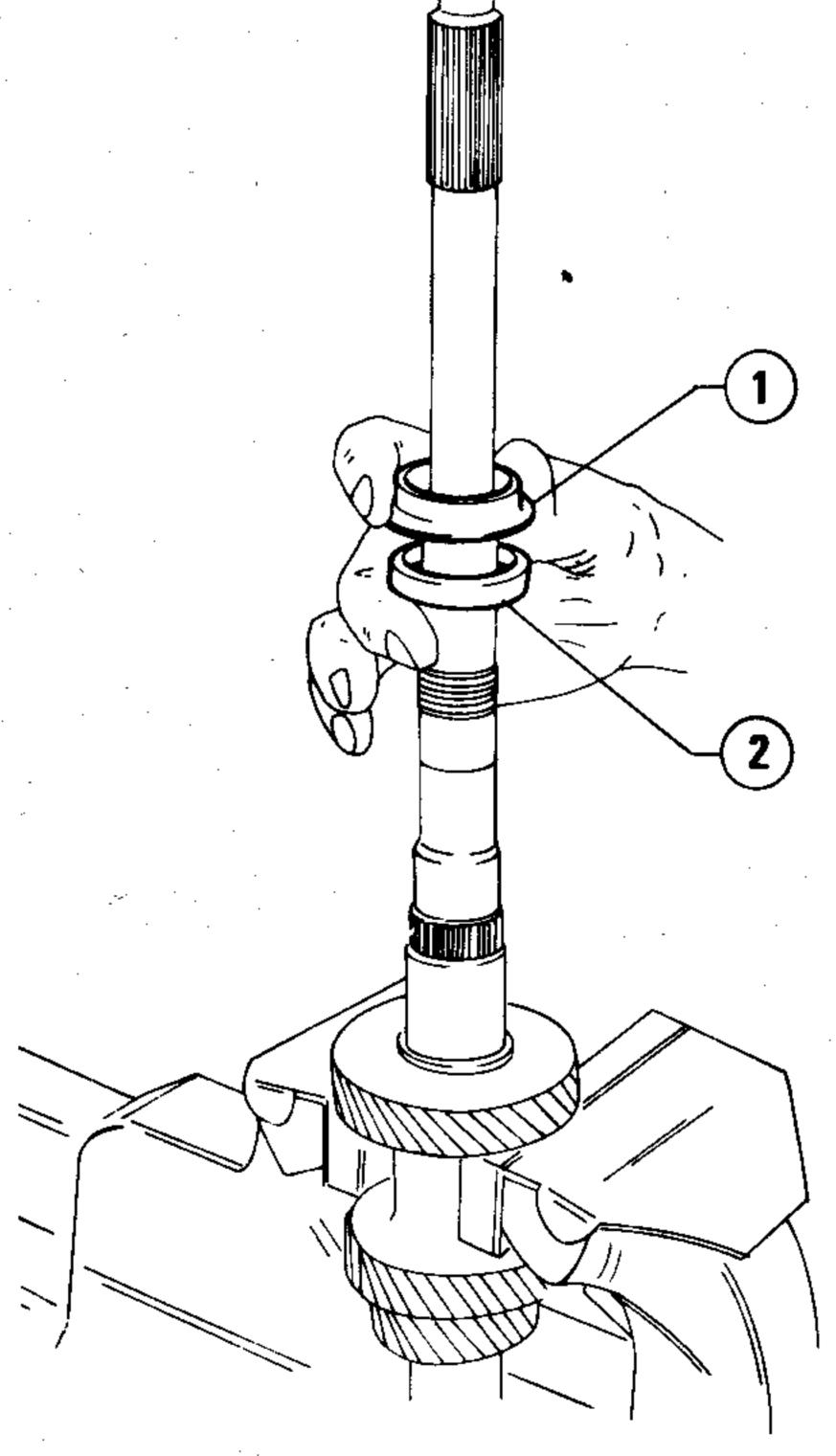
If previously disassembled, mount the rear bearing inner race on main shaft, making use of a suitable driver.



b. Reinstall bush 1 and secure it with ring 2.



- 1 Plastic bush 🕖
- 2 Retaining ring
- c. Insert spacer (2) and then rear inner half-race (1) of intermediate flange bearing on main shaft.



- 1 Rear inner half-race
- 2 Spacer

#### 4. Intermediate flange reassembly

#### **CAUTION:**

Before installing roller bearings, lubricate them with the prescribed grease.

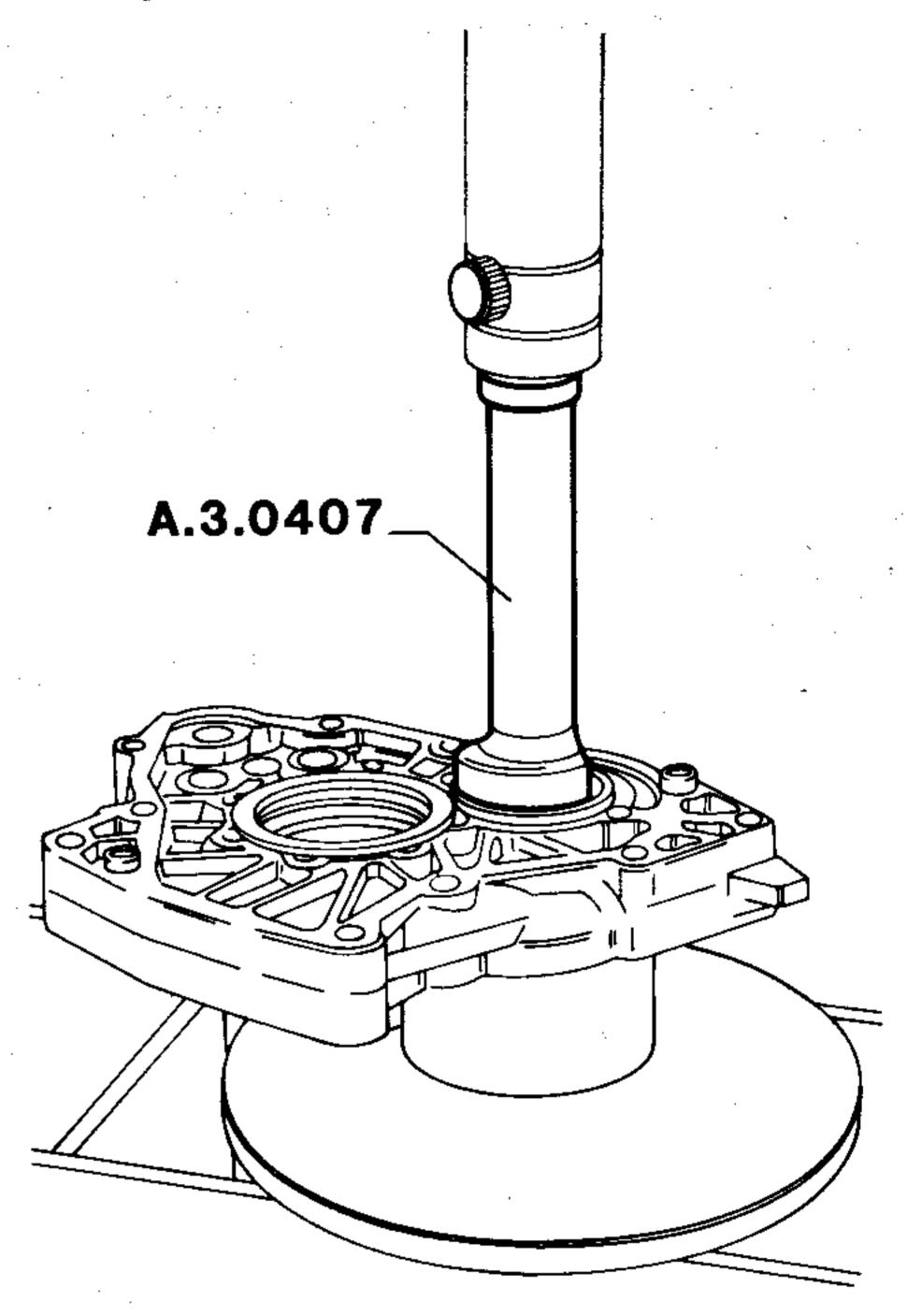
#### Grease:

AGIP F1 Grease 33 FD IP Autogrease FD

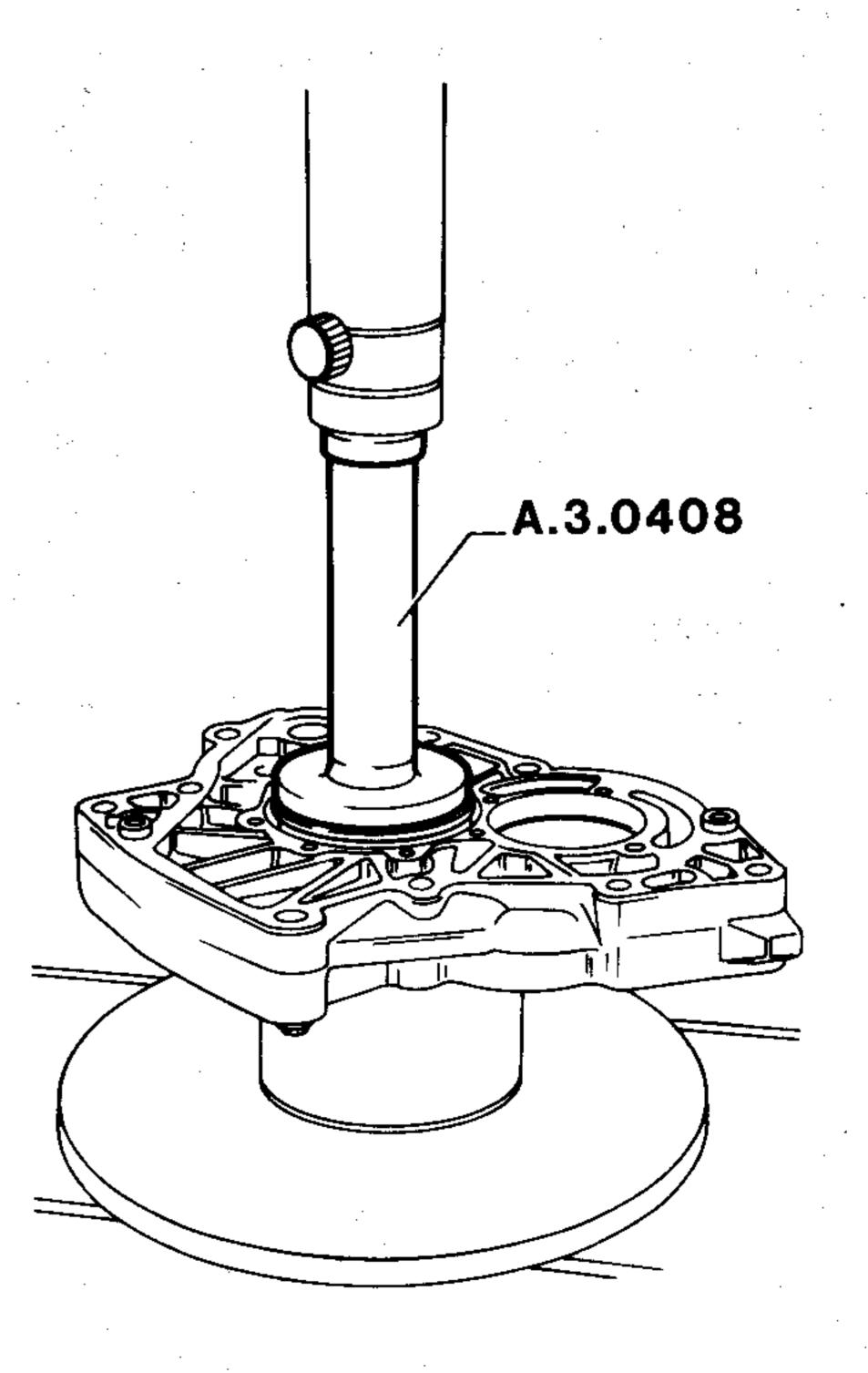
Solution with intermediate skew ball bearings

a. Operating at press and making use of tool A.3.0407 insert outer race of main shaft ball bearing until it strikes against the intermediate flange striker.

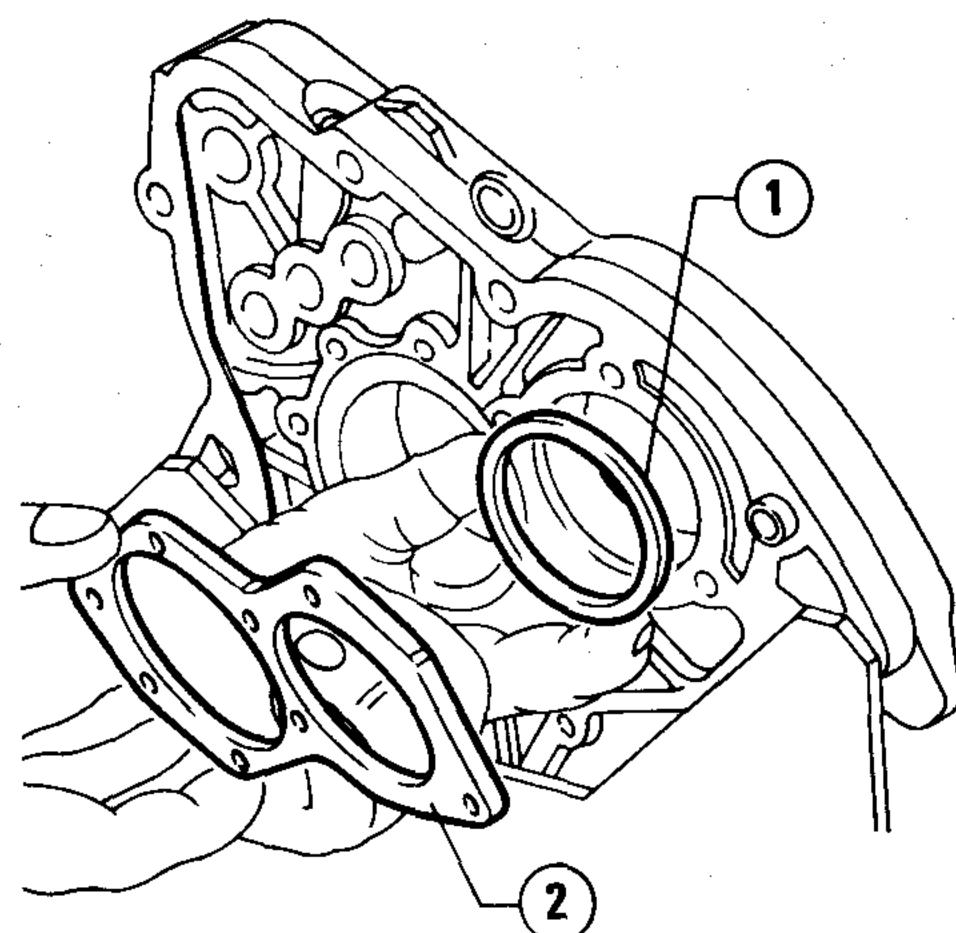
Exert the utmost care during insertion in oder not to force the intermediate flange striker.

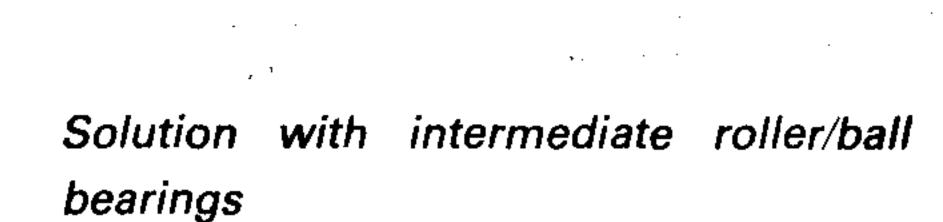


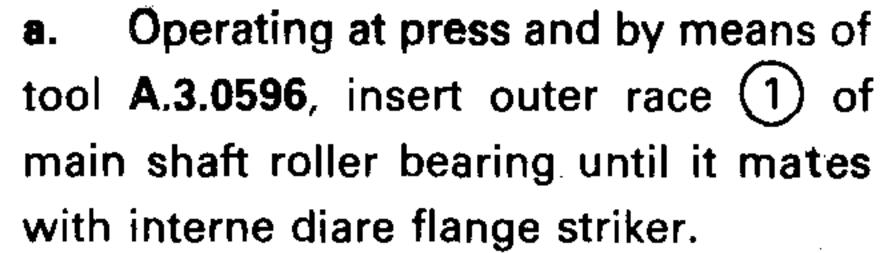
b. Always operating at the press and making use of tool A.3.0408, insert outer race of pinion shaft ball bearing until it mates with the plane of intermediate flange front side.

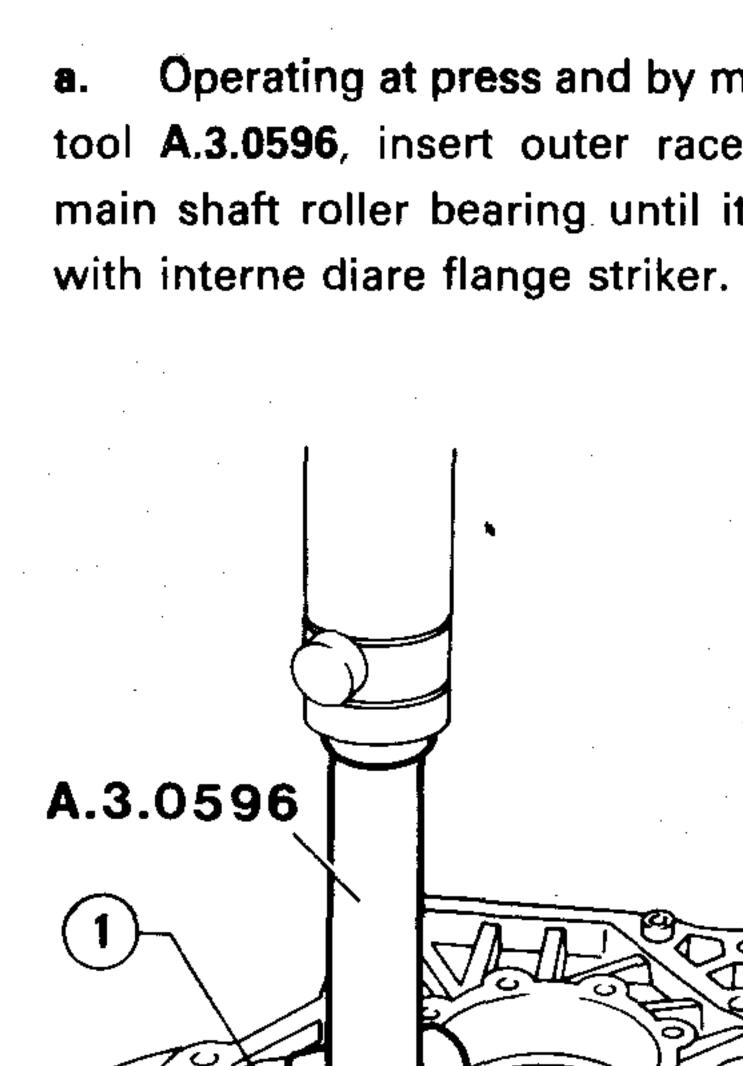


- Set intermediate flange on the special support, then secure it on an overhaul stand fitted with connection brackets.
- Position spacer 1 and plate 2 on intermediate flange rear side.
- Apply retainer (3) on rear side, then screw the plate securing screws without tightening them.

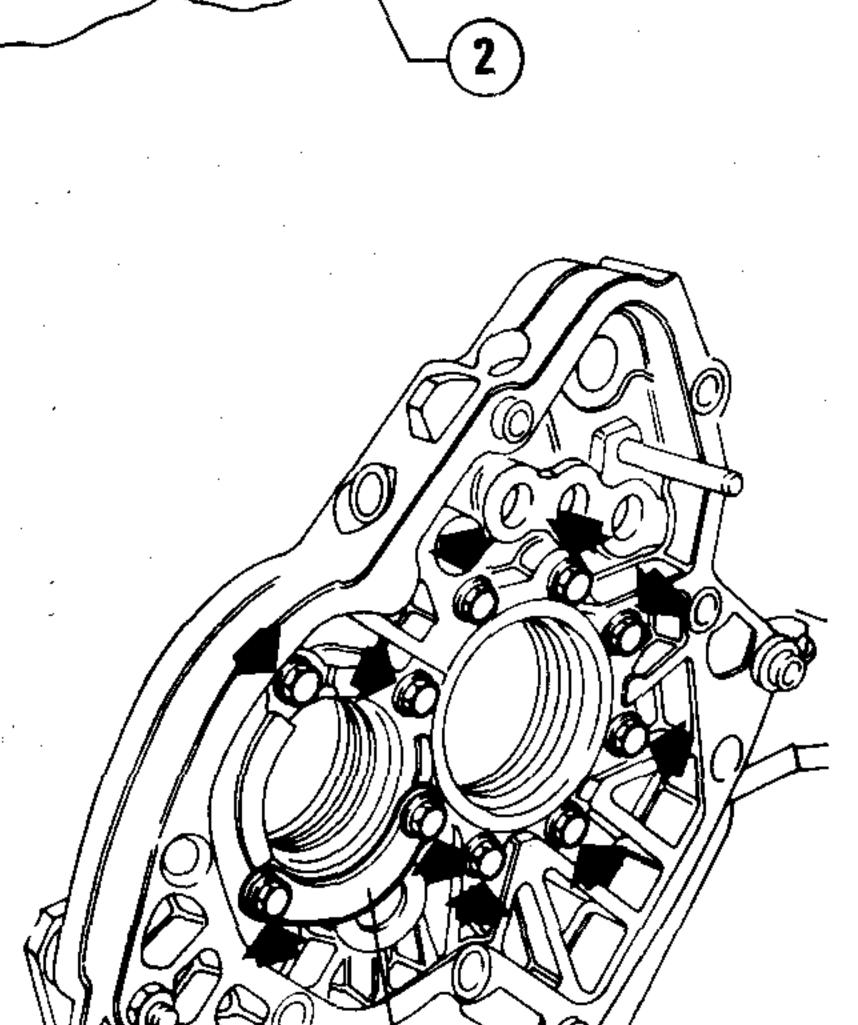








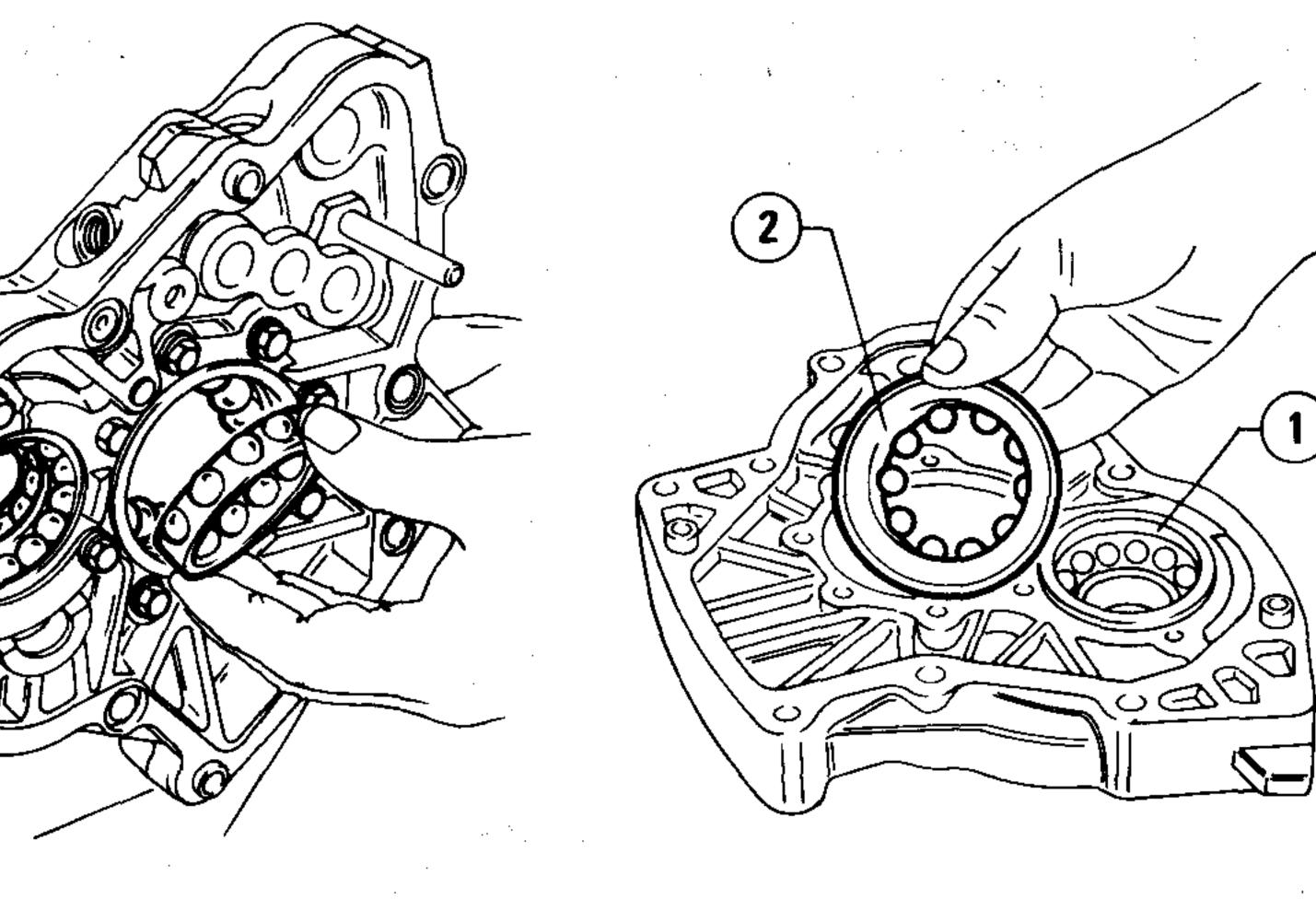
Roller bearing outer race



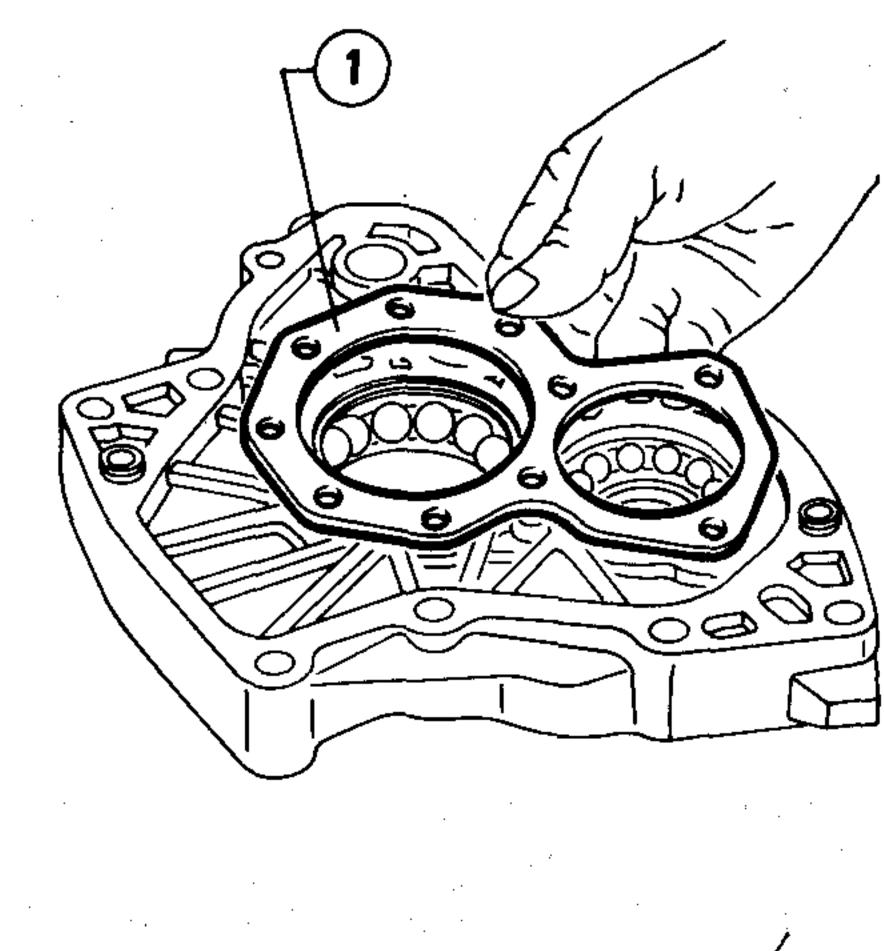
- Shoulder spacer
- Bearings shoulder plate
- Bearing outer race retainer
- Reinstall both front and rear cages with balls related to intermediate flange bearings.

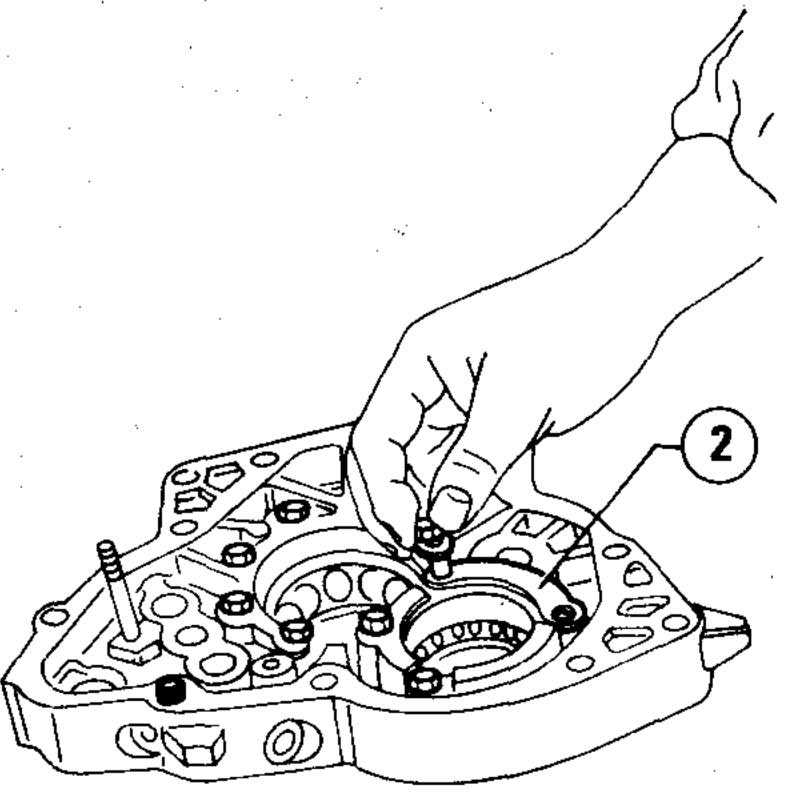
rolling elements must occupy the same position noted during disassembly.

- Reinstall on flange in the following order:
- main shaft ball bearing (1) complete with inner half-race.
- pinion shaft ball bearing (2) taking care to position it correctly with the thinner lip upwards.



- Main shaft ball bearing
- Pinion shaft ball bearing
- Temporarily apply the bearings retaining plate (1) and retainer (2) to flange by screwing the plate securing screws without tightening them.

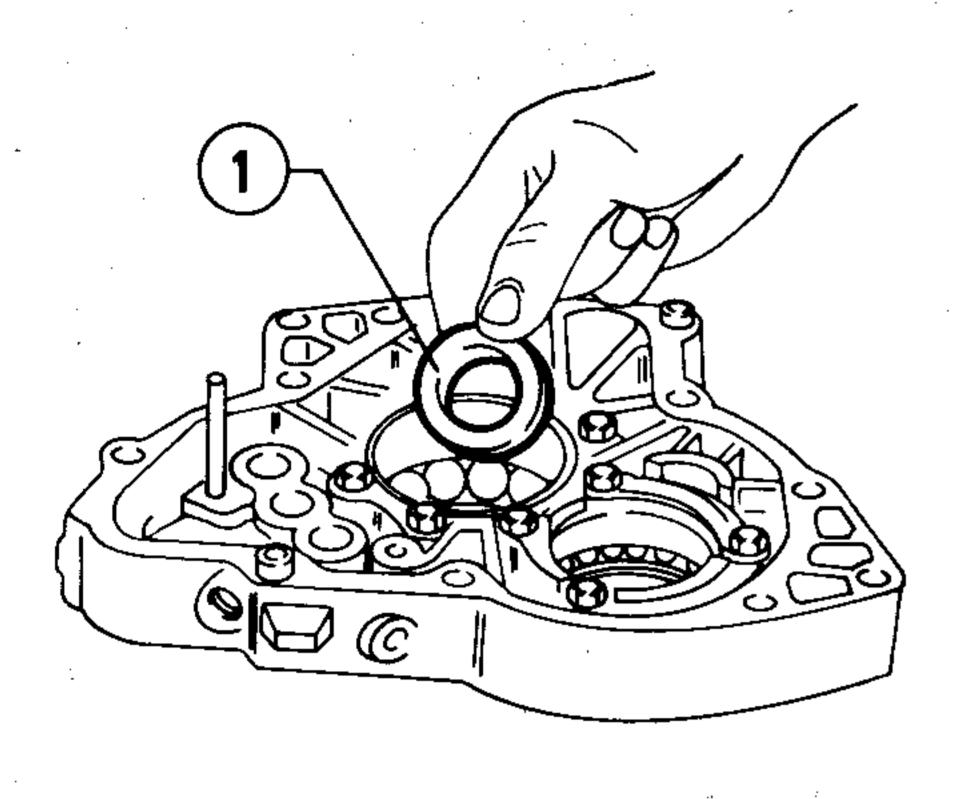


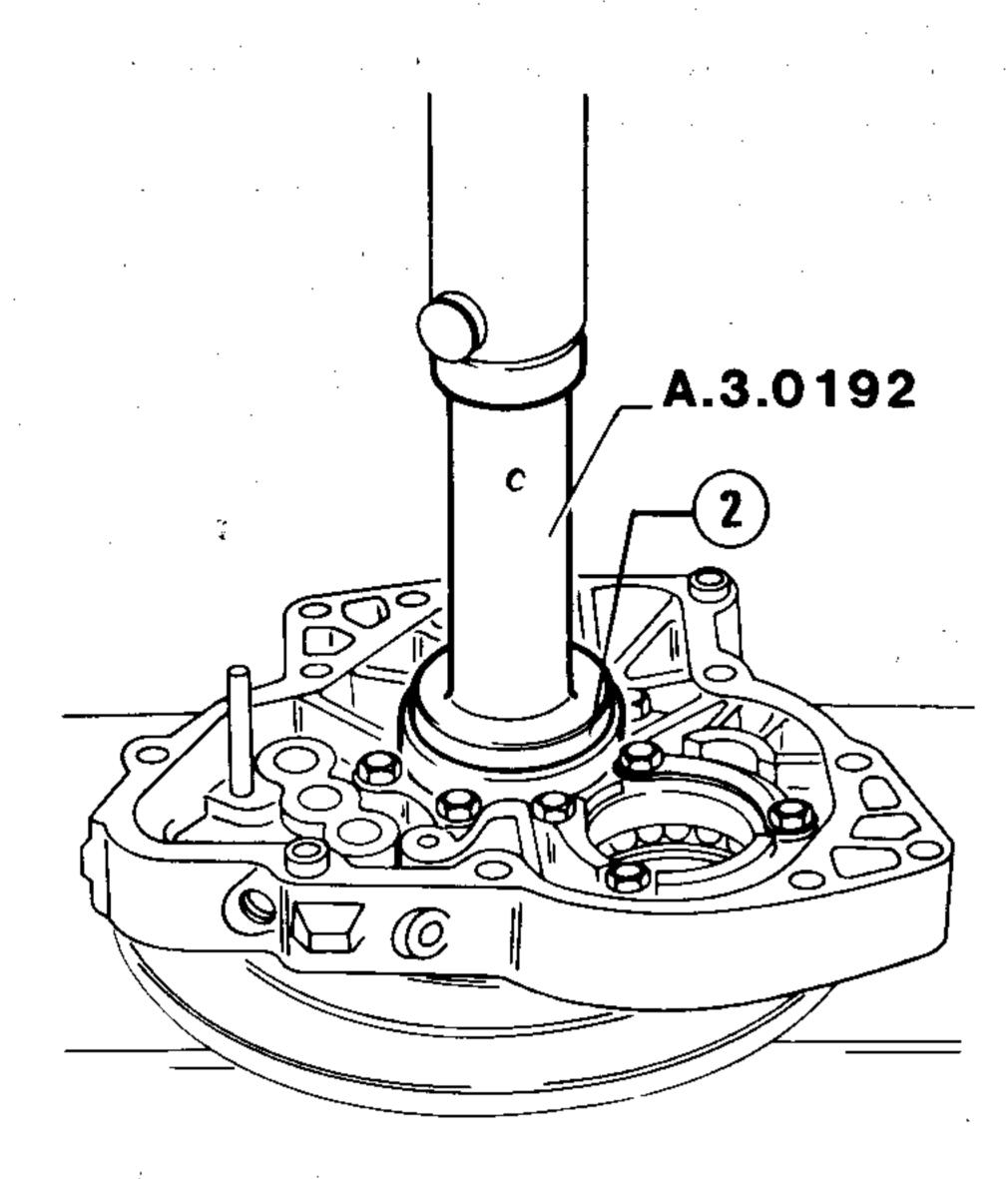


- Bearings retaining plate
- Bearing retainer
- Reassemble inner half-race (1) of pinion shaft ball bearing then, with the press and by means of tool A.3.0192, insert pinion shaft roller bearing (2).

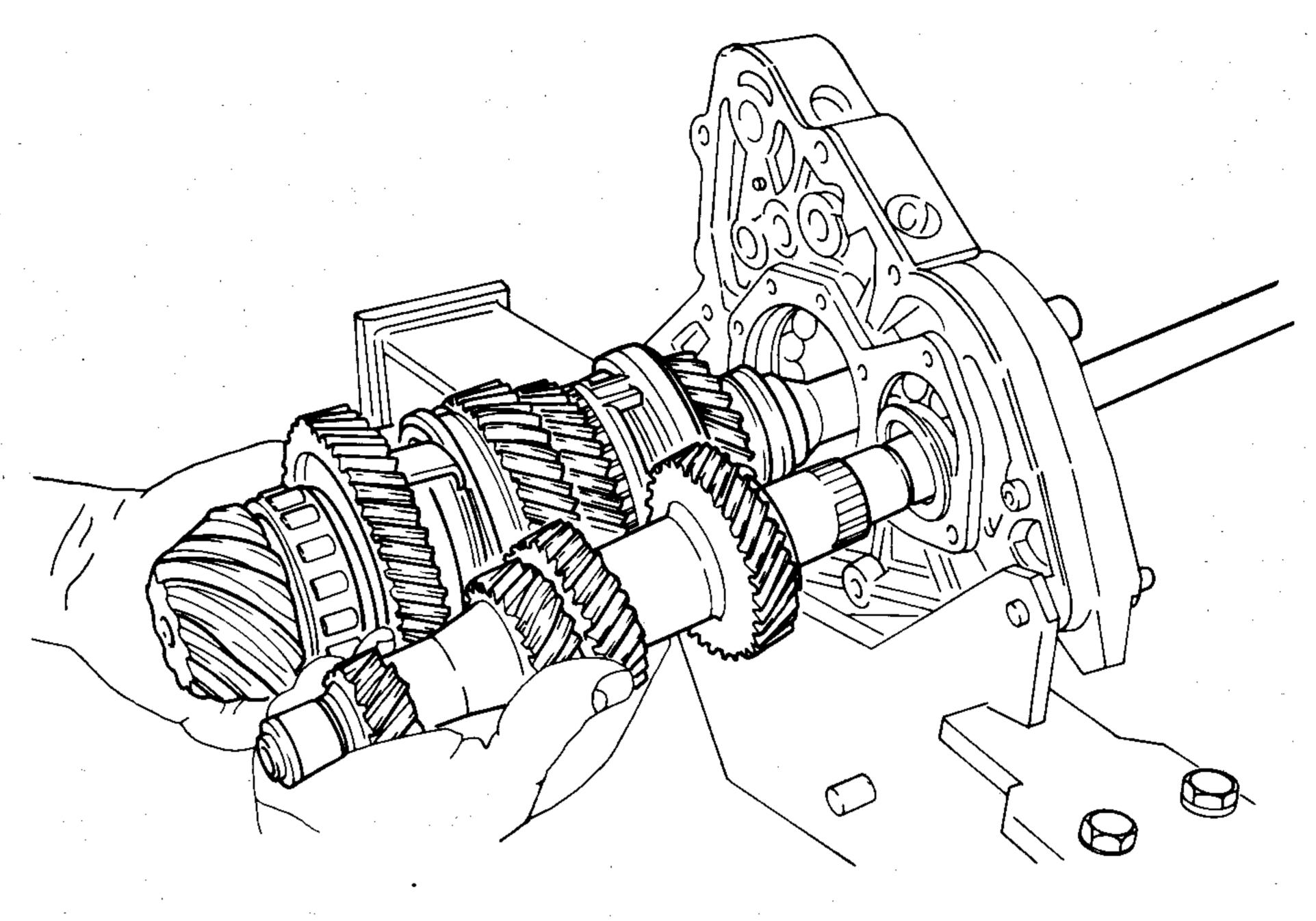
For the re-used bearings, the cages with

Insertion must be carried out with the utmost care without forcing components.





- 1 Pinion shaft inner half-race
- 2 Pinion shaft roller bearing

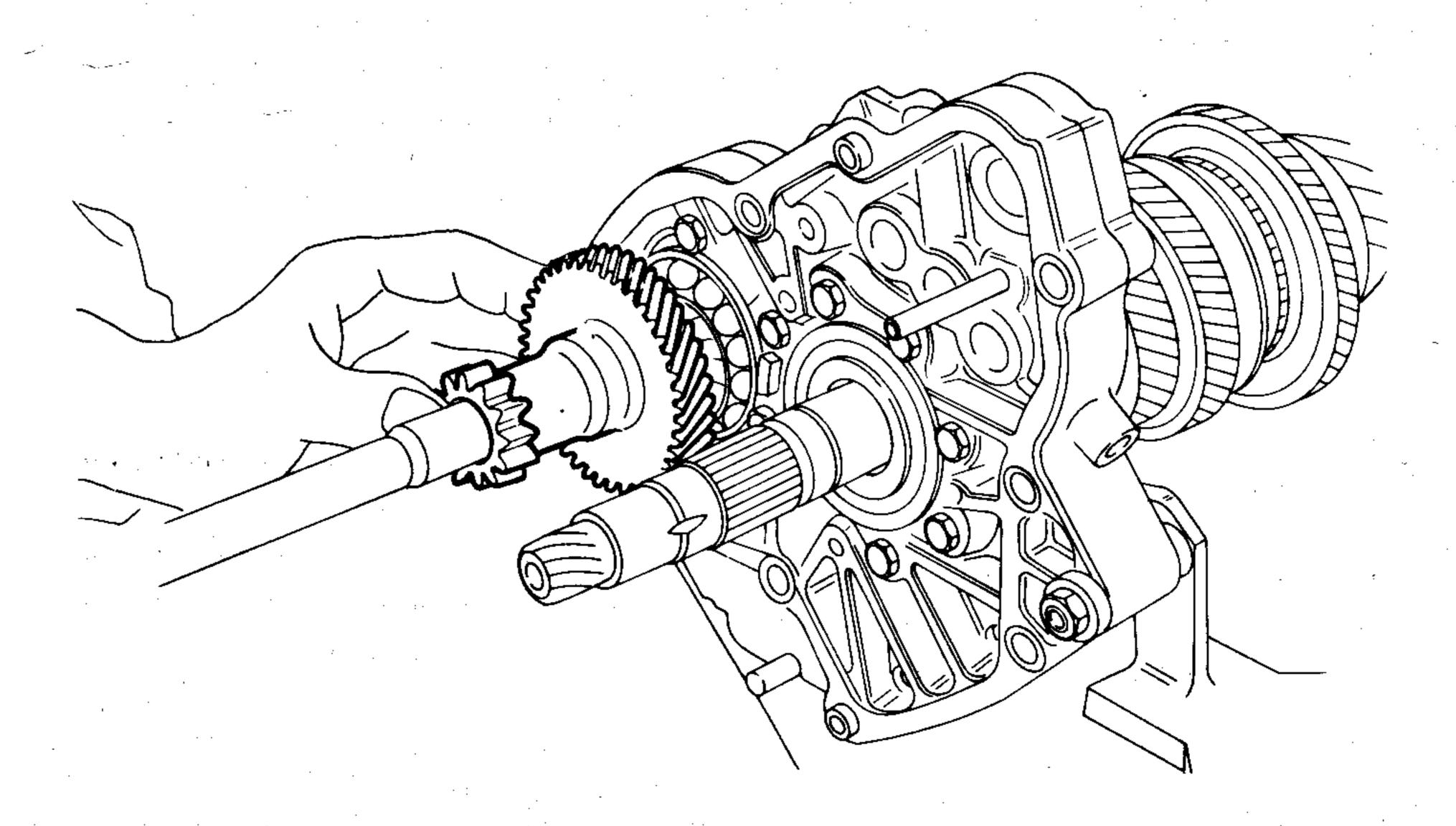


- b. Position intermediate flange on differential-speed gear casing taking care to align pinion shaft correctly, then rotate both speed gear shafts so as to bed the bearings. Next tighten the bearing retaining plate securing screws to the prescribed torque.
- T: Tightening torque
  Screws securing shoulder plate to
  intermediate flange
  14 to 15 N·m
  (1.4 to 1.6 Kg·m)
  (10.1 to 11.6 ft·lb)
- c. Remove intermediate flange complete with main and pinion shafts from differential-speed gear casing, and set it on an overhaul stand to complete the reassembly operations.

#### 6. Shafts reassembly

- a. Insert front inner half-races of intermediate flange bearings on shafts, taking care to bed them into the related seats on flange itself.
- b. Install the 5th and Reverse speeds gear on main shaft, then screw nut without tightening it.

- e. Set intermediate flange on the special support, then secure it to an over-haul stand fitted with connection brackets.
- 5. Tightening of bearings retaining plate screws
- a. Insert roller bearings inner races of main and pinion shafts; then install shafts themselves positioning them, at the same time, in the intermediate flange.



c. Install the 5th and Reverse speeds gear package on pinion shaft, then screw nut without tightening it.

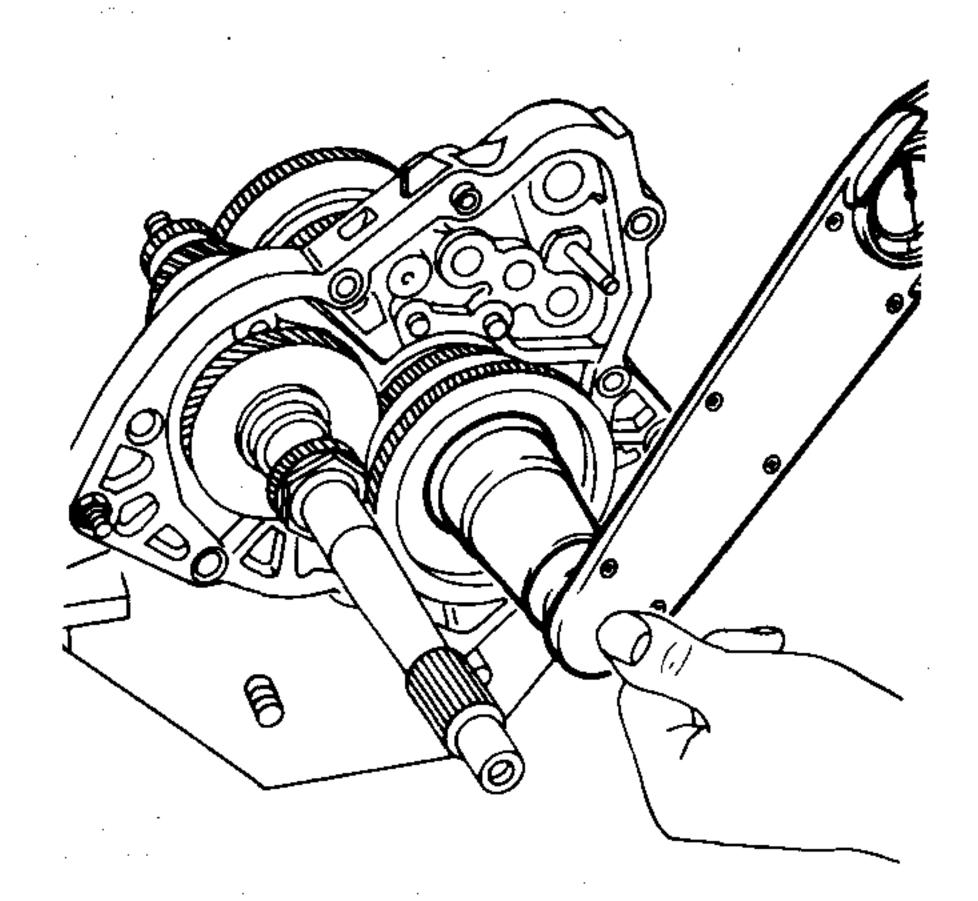
For correct installation of package, refer to exploded views of page 13-17.

- d. Operate on the control sleeves for the 1st-2nd and 3rd-4th speeds to engage two speeds in order to block shafts rotation.
- e. By means of a torque spanner, tighten pinion shaft nut to the prescribed torque.
- T: Tightening torque
  Bevel pinion nut

  112 to 124 N·m

  (11.4 to 12.6 kg·m)

  (82.4 to 91.7 ft·lb)



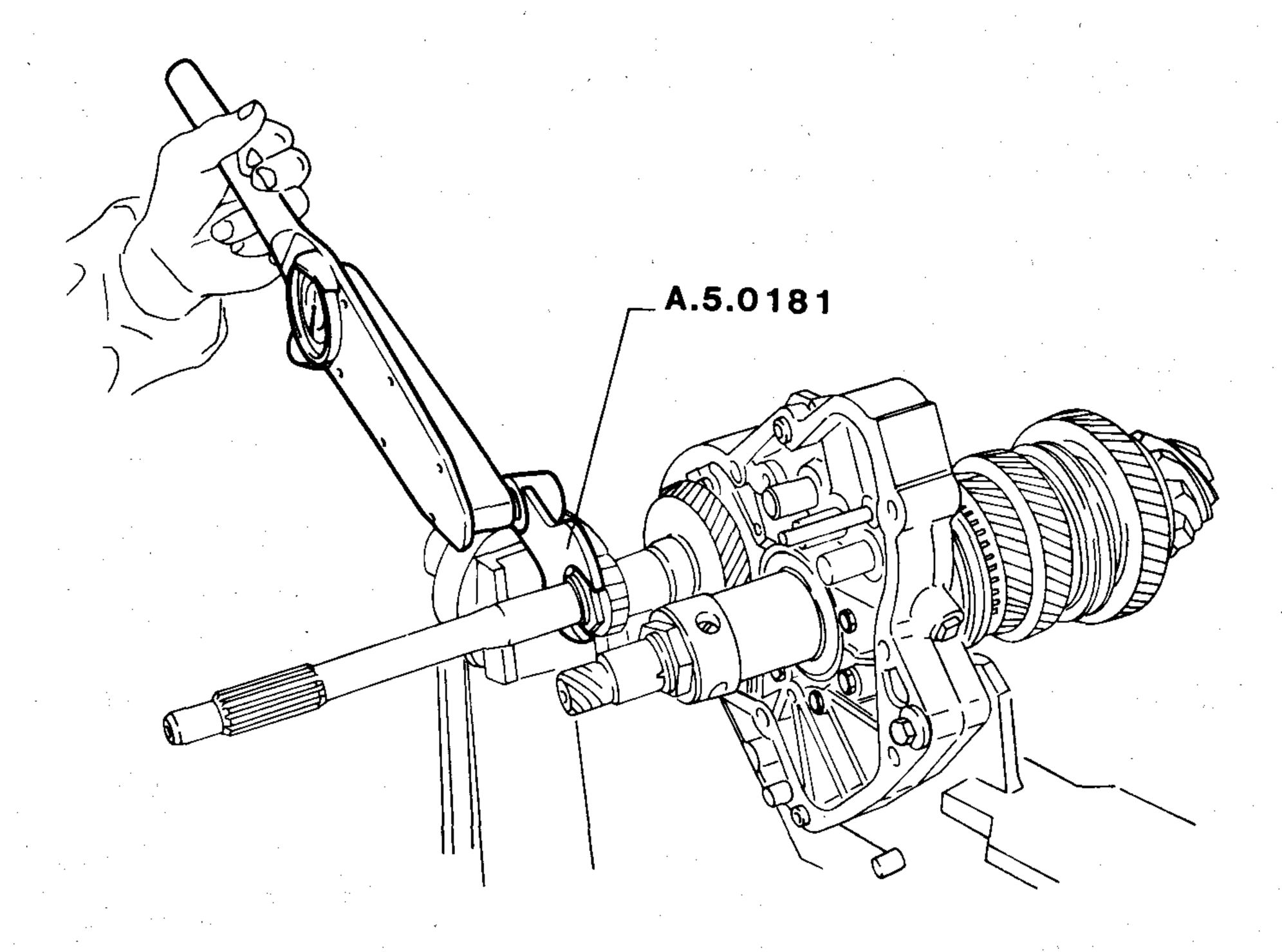
- f. By means of a torque spanner fitted with wrench A.5.0181, tighten main shaft nut to the prescribed torque.
- T: Tightening torque

  Main shaft nut

  93 to 103 N·m

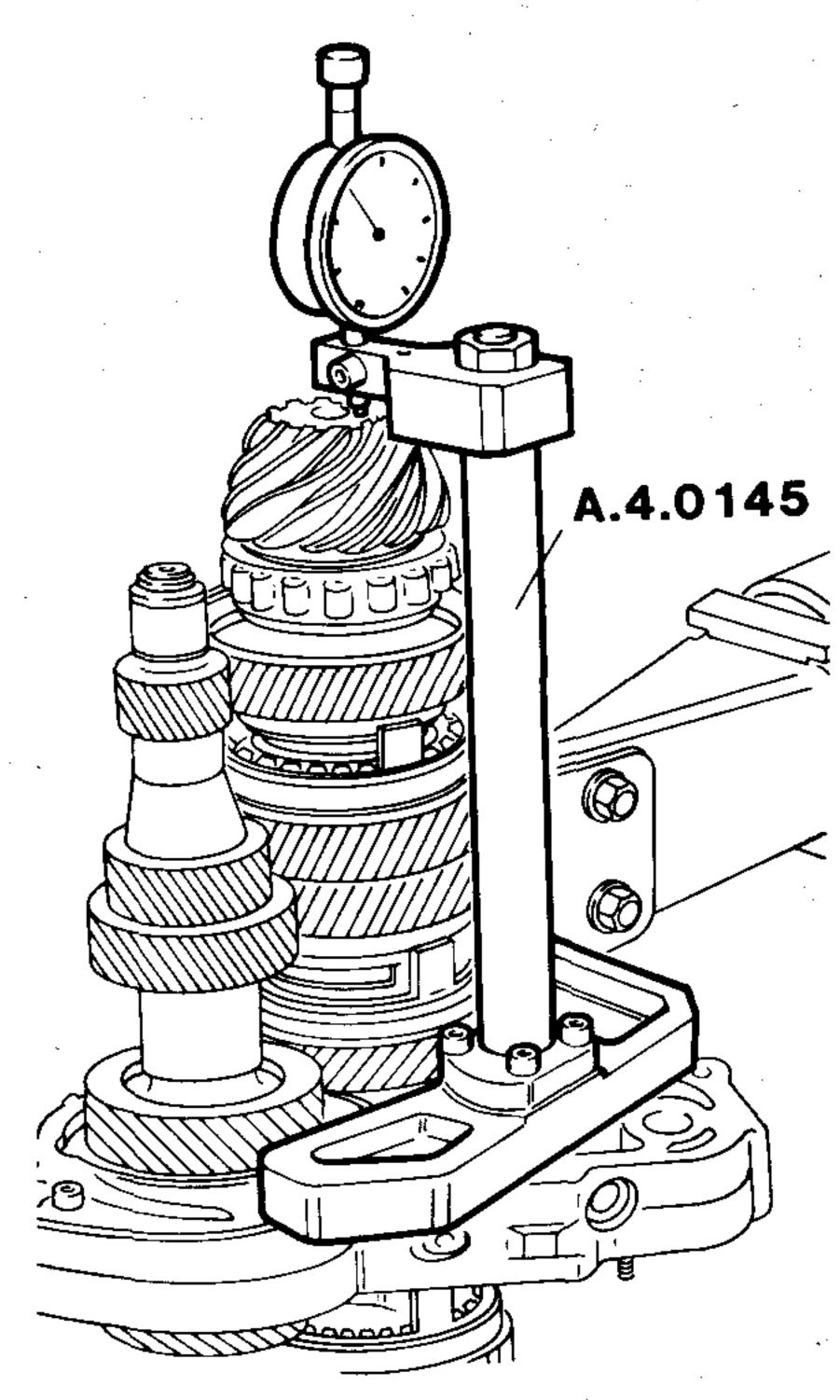
  (9.5 to 10.5 kg·m)

  (68.7 to 75.9 ft·lb)

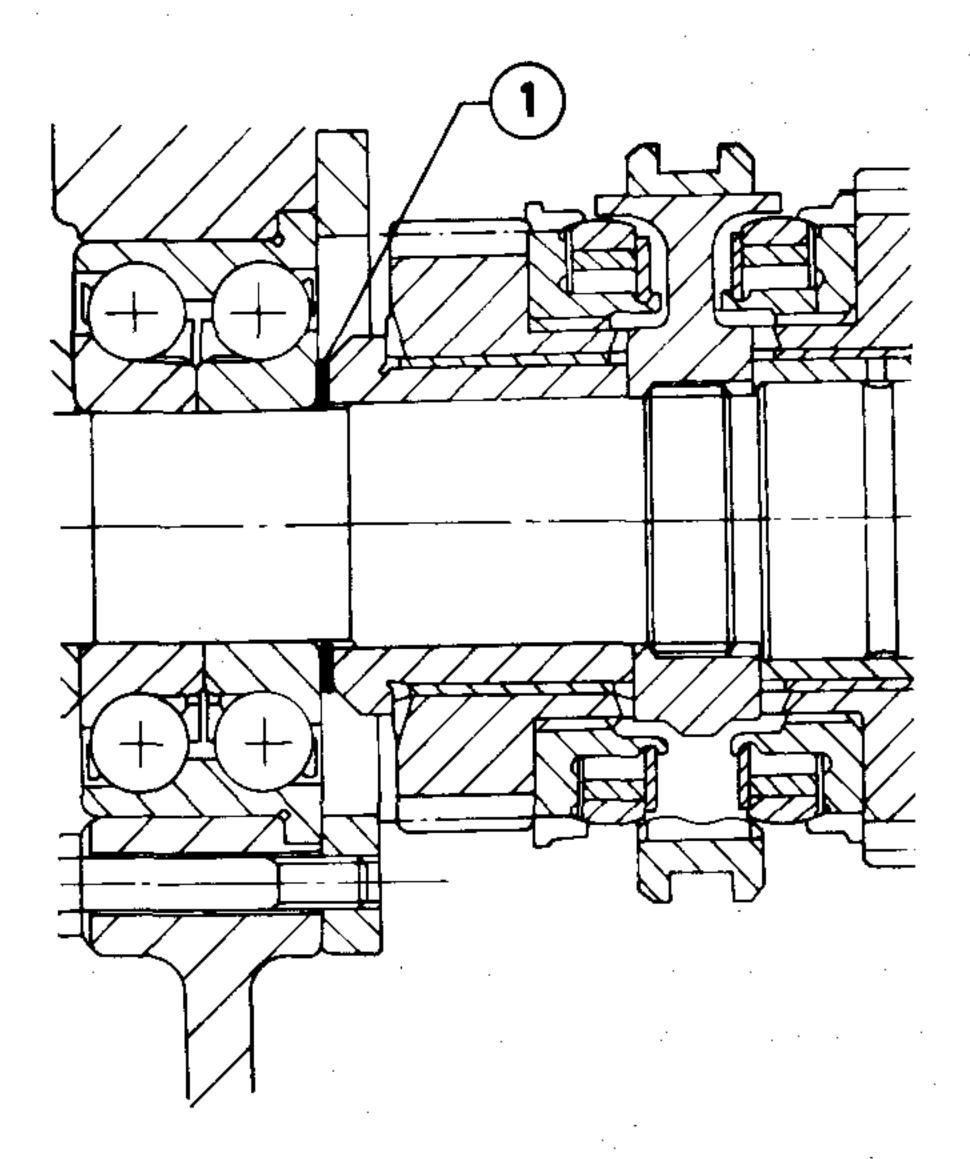


- 7. Verification of pinion shaft dimension
- a. By means of a centesimal gauge mounted on support A.4.0145, verify that dimesion "A" measured between intermediate flange inner plane and pinion head upper plane corresponds to the value measured before disassembly.

0.03 mm (0.00118 in) tolerance is allowed.



b. If the value does not correspond to that prescribed, modify thickness of the ring 1 between bush of 4th speed gear and half-race of intermediate bearing.



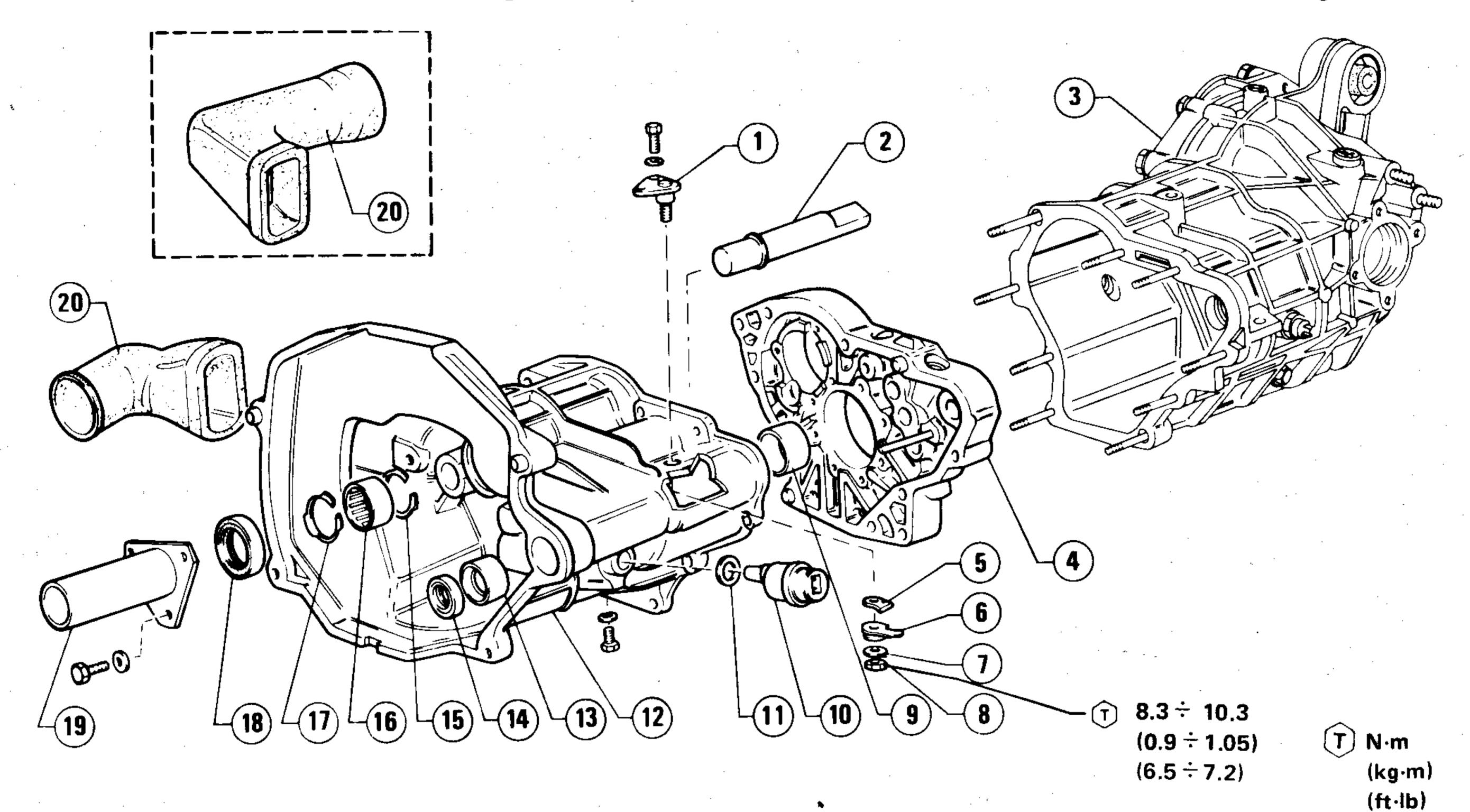
- 1 Shim ring
- c. Caulk the nuts of both speed gear shafts from one side only.
- 8. Rods and forks reasembly.

Refer to: "Rods and Forks - Reassembly".

#### **CLUTCH - SPEED GEAR CASING**

#### Solution with intermediate roller/ball bearings

#### Solution with intermediate skew ball bearings



- 1 Safety device support
- 2 Reverse speed gear pin
- 3 Differential-speed gear casing
- 4 Intermediate flange
- 5 Plate
- 6 Pawl
- 7 Washer
- 8 Nut
- 9 Pinion shaft bush
- 10 Odometer pulse transmitter

- 1 11 Washer
- 12 Clutch speed gear casing
- 13 Guide bush
- 14 Oil seal ring
- 15 Retaining ring
- 16 Main shaft needle bearing
- 17 Retaining ring
- 18 Oil seal ring
- 19 Tube
- 20 Sleeve

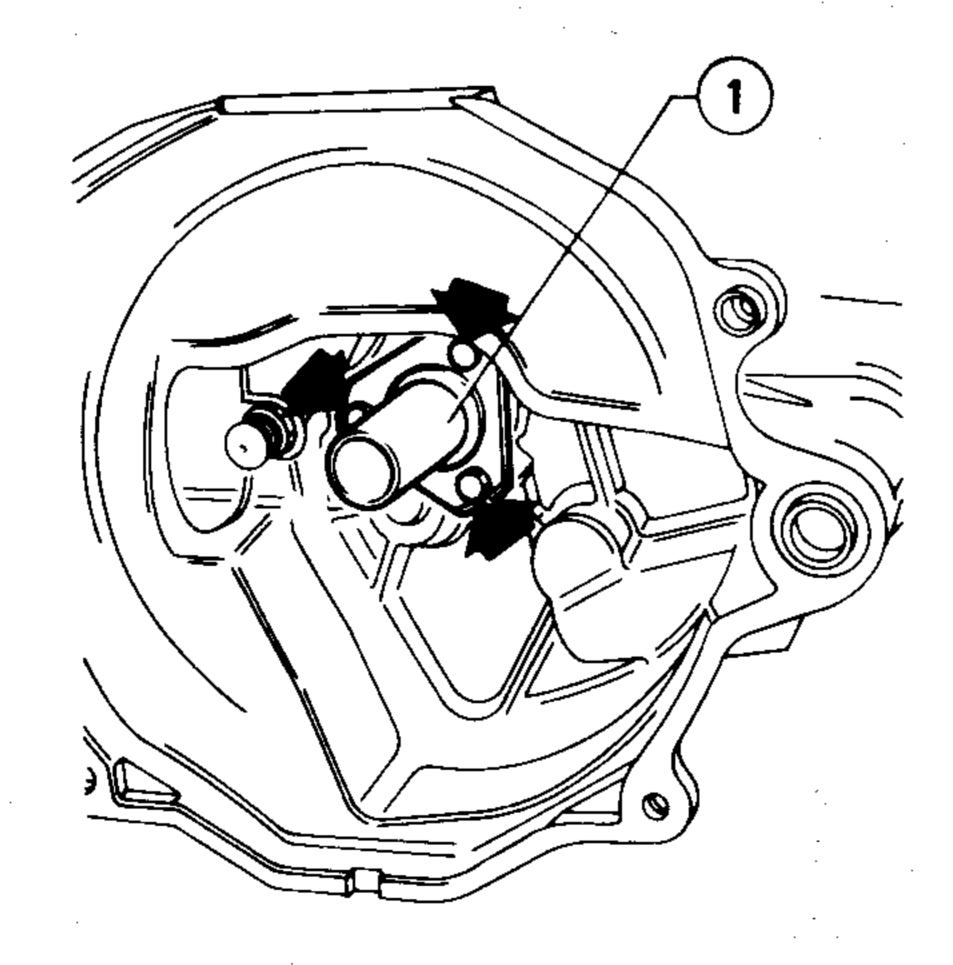
#### **CAUTION:**

The clutch - speed gear casing in aluminium alloy, take then the utmost care to prevent damaging it.

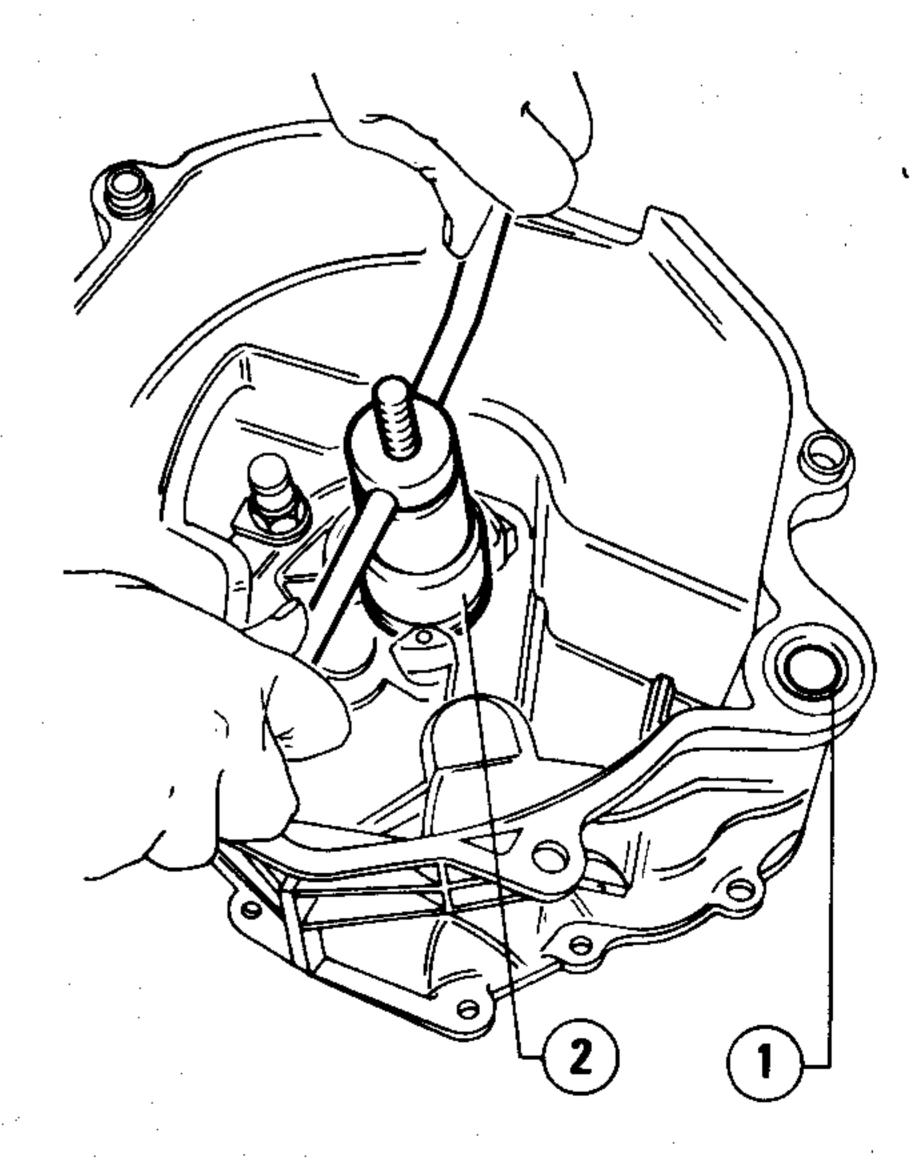
#### DISASSEMBLY

Remove the clutch - speed gear casing from the whole unit (Refer to: "Separation and Reconnection at Bench of Speed Gear Unit from/to Differential unit - Separation") and disassemble it operating as follows:

1. Release and remove the screws with the related washers securing tube 1 from clutch - speed gear casing; remove tube.

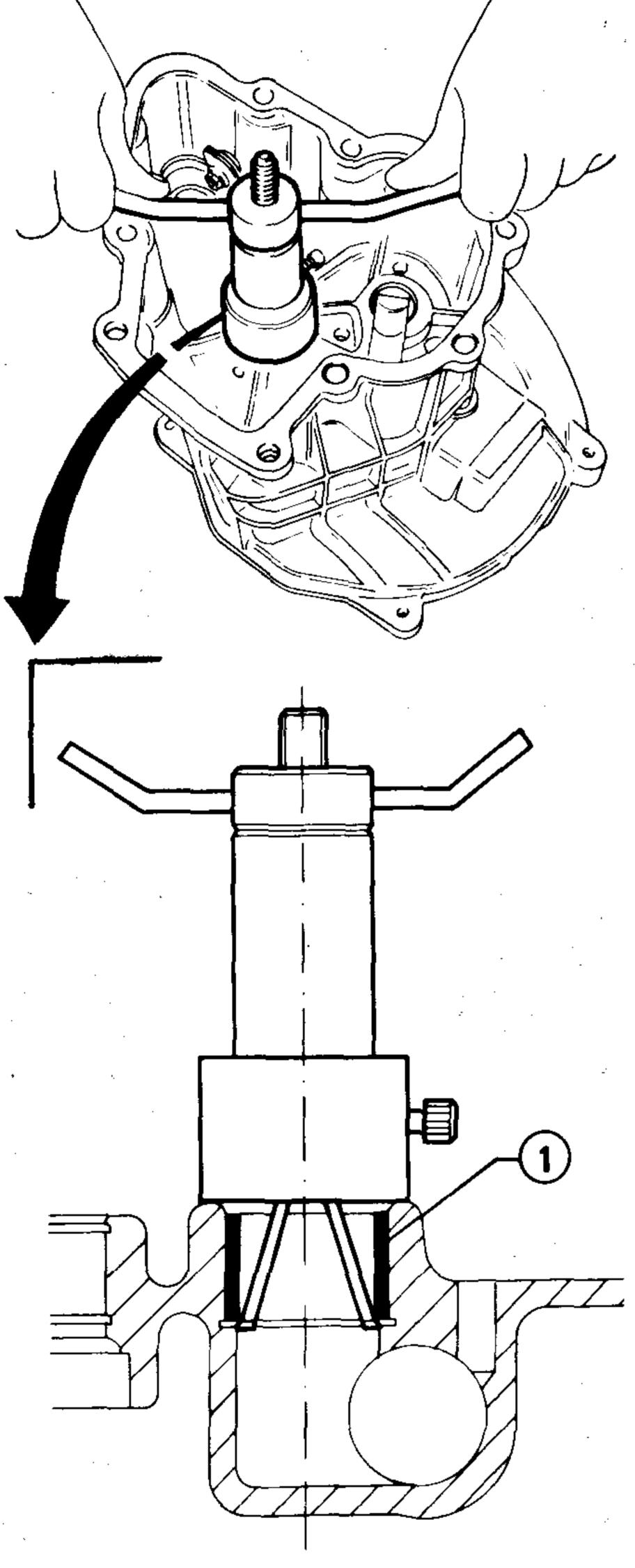


- 1 Thrust bearing guide tube
- 2. By means of suitable puller, remove oil seal rings 1 and 2.

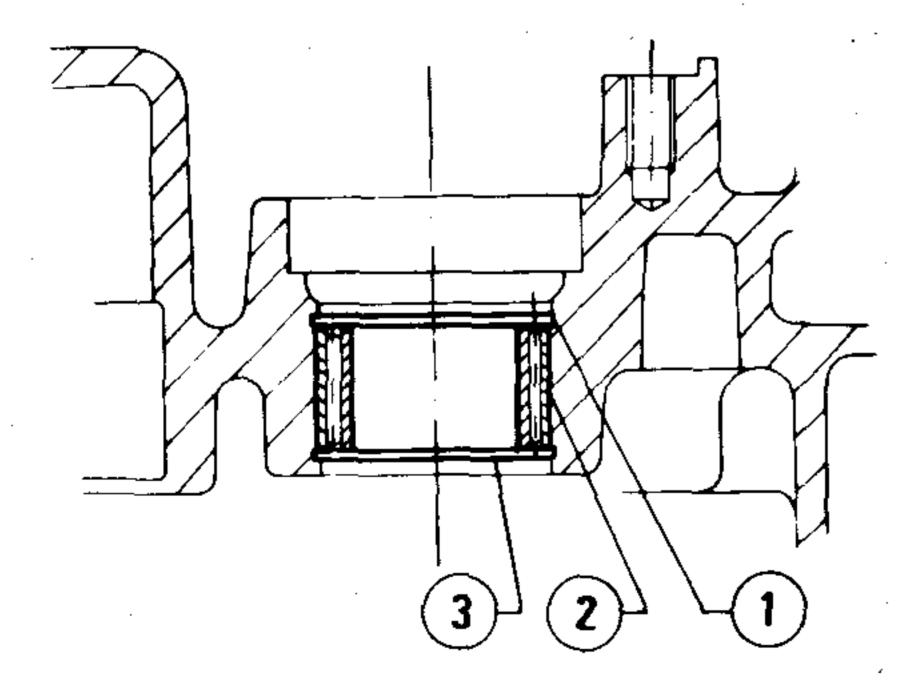


- 1 Oil seal ring for speed selection and engagement rod
- 2 Main shaft oil seal ring

3. By means of same puller, remove bush 1.

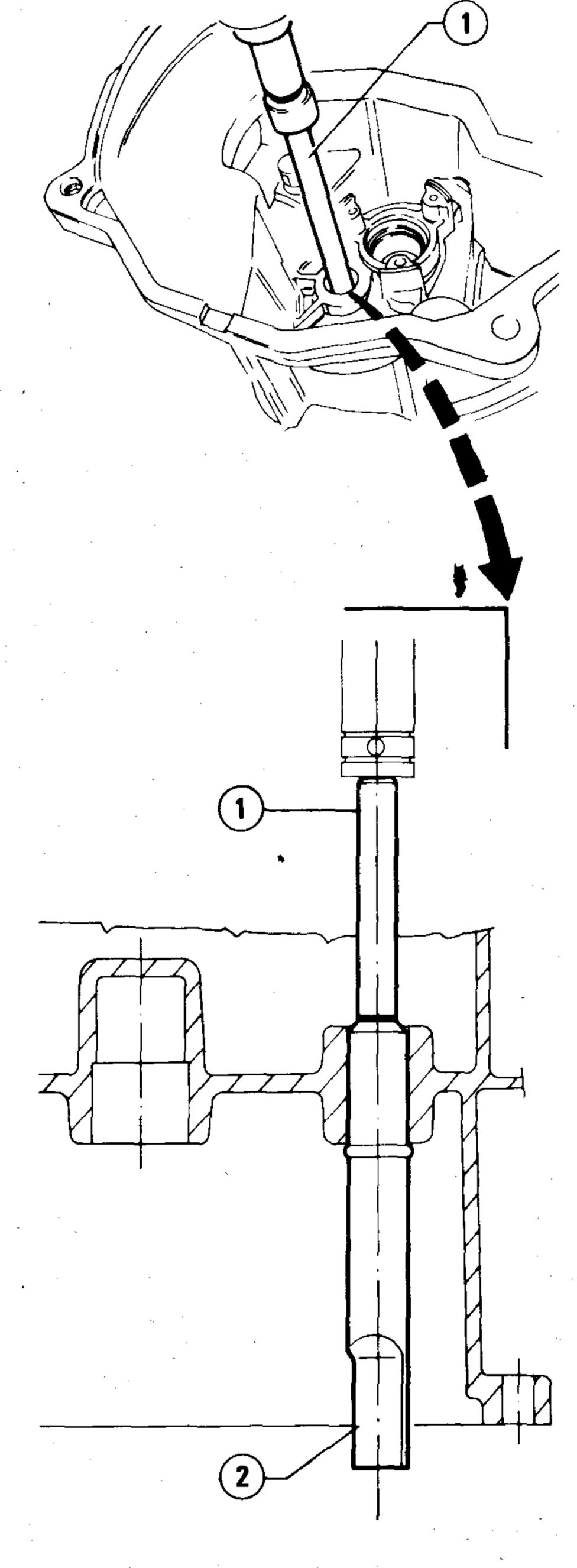


- 1 Pinion shaft support bush
- 4. Withdraw main shaft needle bearing operating as follows:
- a. Remove retaining ring 1.
- b. Withdraw bearing 2.
- c. If necessary, remove retaining ring (3).

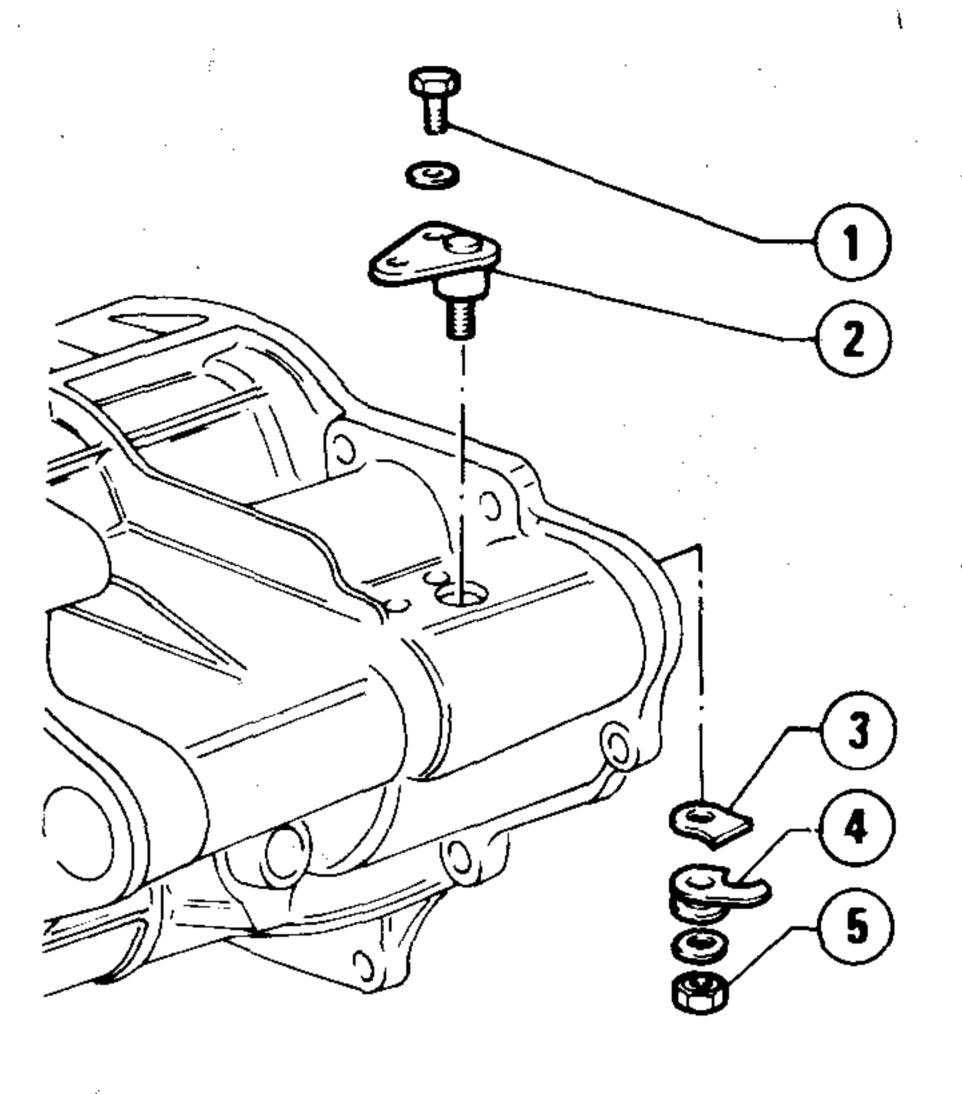


- 1 Front retaining ring
- 2 Needle bearing
- 3 Rear retaining ring

5. Rest clutch-speed gear casing on half-plates and, by means of suitable punch, remove pin 2.

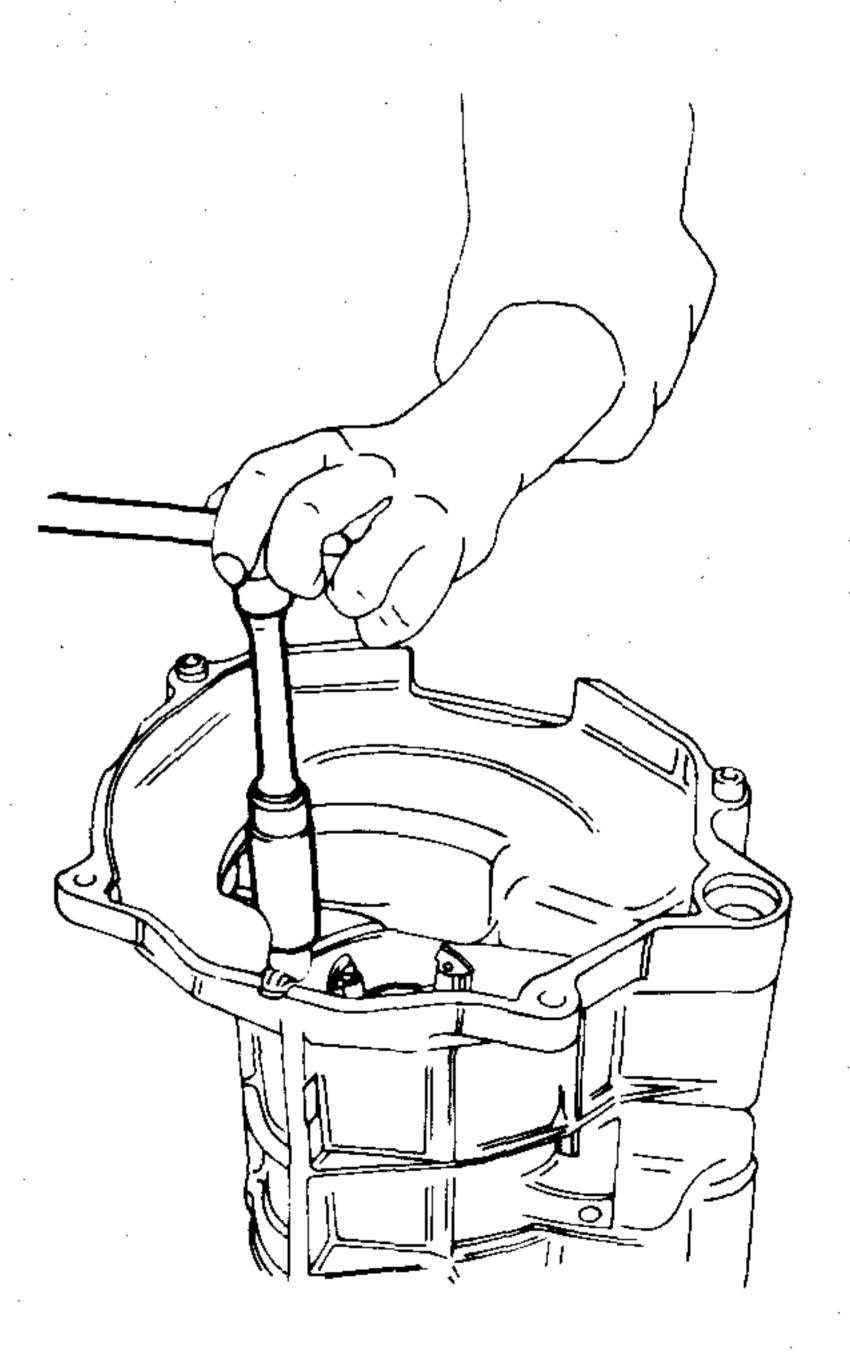


- 1 Punch
- 2 Reverse speed pin
- 6. Disassemble interlock plunger (it prevents accidental transition from 5th to reverse speed) operating as follows:
- a. Unscrew nut (5), withdraw interlock plunger (4) and the plate (3) underneath.
- b. Loosen the two screws 1 and remove support 2.

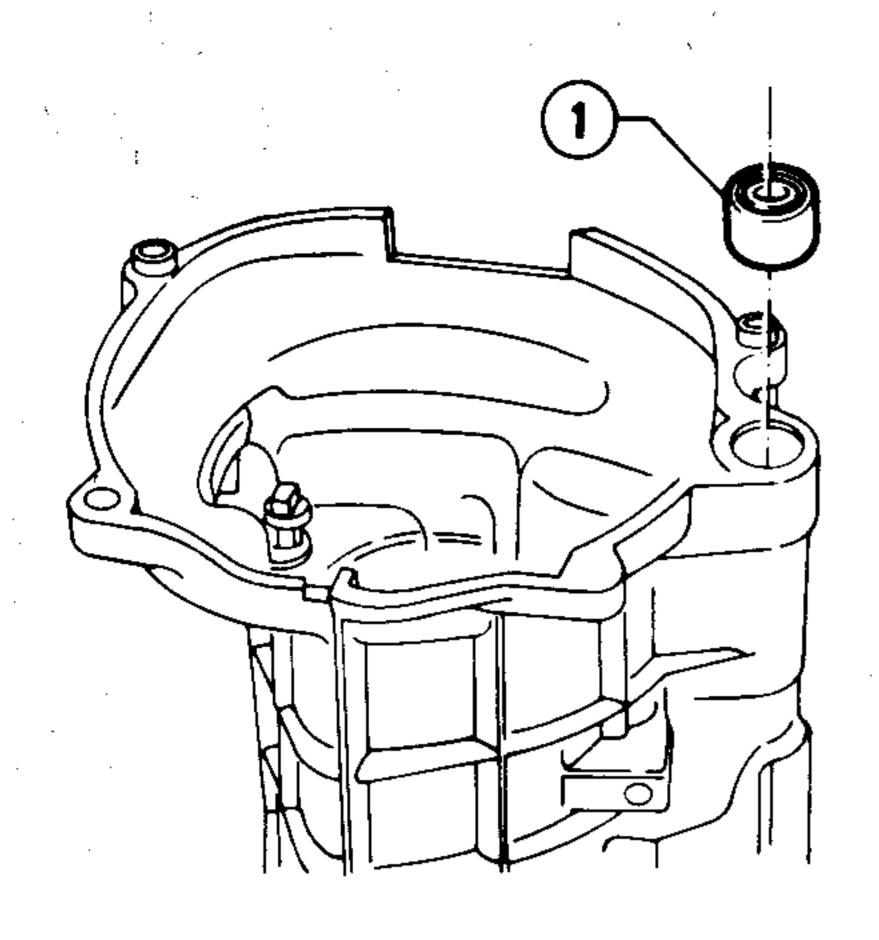


- 1 Screw
- 2 Safety device support
- 3 Plate
- 4 Interlock plunger
- 5 Inner nut securing interlock plunger

7. By means of suitable spanner, unscrew the clutch fork pin and remove it with the washer underneath.



8. If necessary, withdraw bush 1 from clutch-speed gear casing.



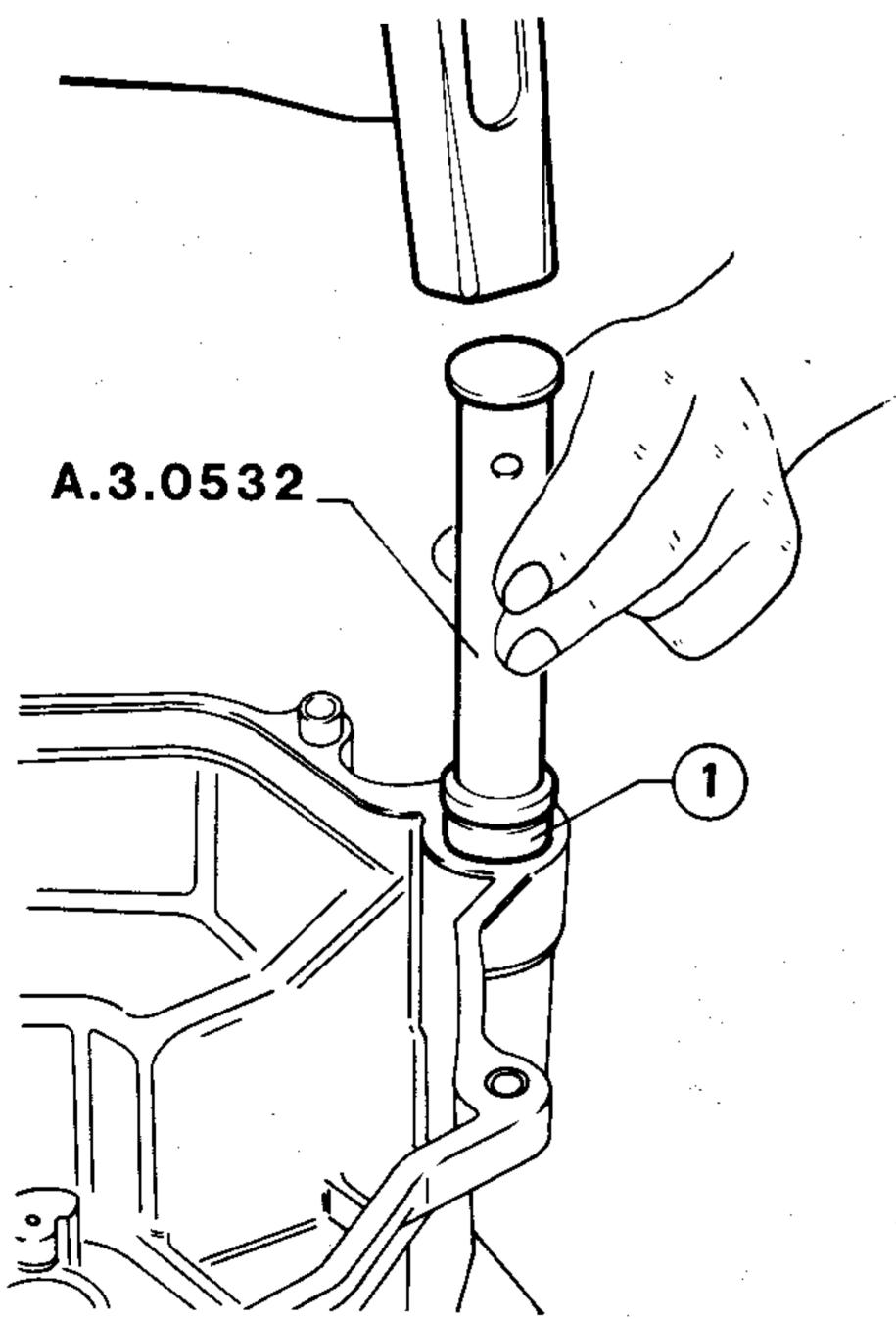
1 Guide bush for speed selection and engagement rod

#### **CHECKS AND INSPECTIONS**

- 1. Clean the casing with solvent removing sealant traces in correspondance with mating surfaces between clutch-speed gear casing and intermediate flange and in correspondance with the housing of reverse speed safety device.
- 2. Verify that casing is free from scratches and splinters.

#### REASSEMBLY

- 1. If previously removed, reinstall guide bush of speed selection and engagement rod operating as follows:
- a. By means of driver A.3.0532, reinstall bush 1 on clutch-speed gear casing, previously heated at a temperature within 140 to 160 °C (284 to 320 °F).



1 Guide bush for speed selection and engagement rod

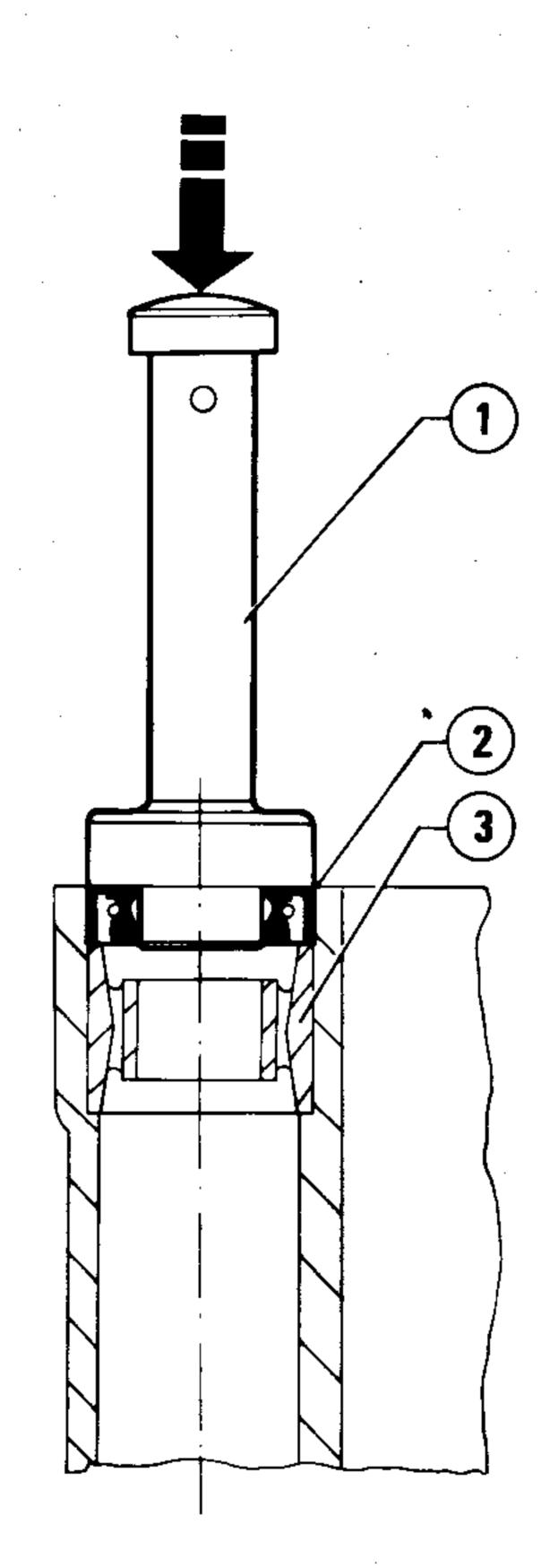
b. Let the clutch-speed gear casing cools down, then install oil seal ring 2 inserting it by means of driver 1 after lubricating outer surfaces and inner leap with the prescribed oil and grease, respectively.

Oil:

AGIP Rotra SX 75W90 IP Pontiax HDS 75W90

Grease:

ISECO Molykote BR2

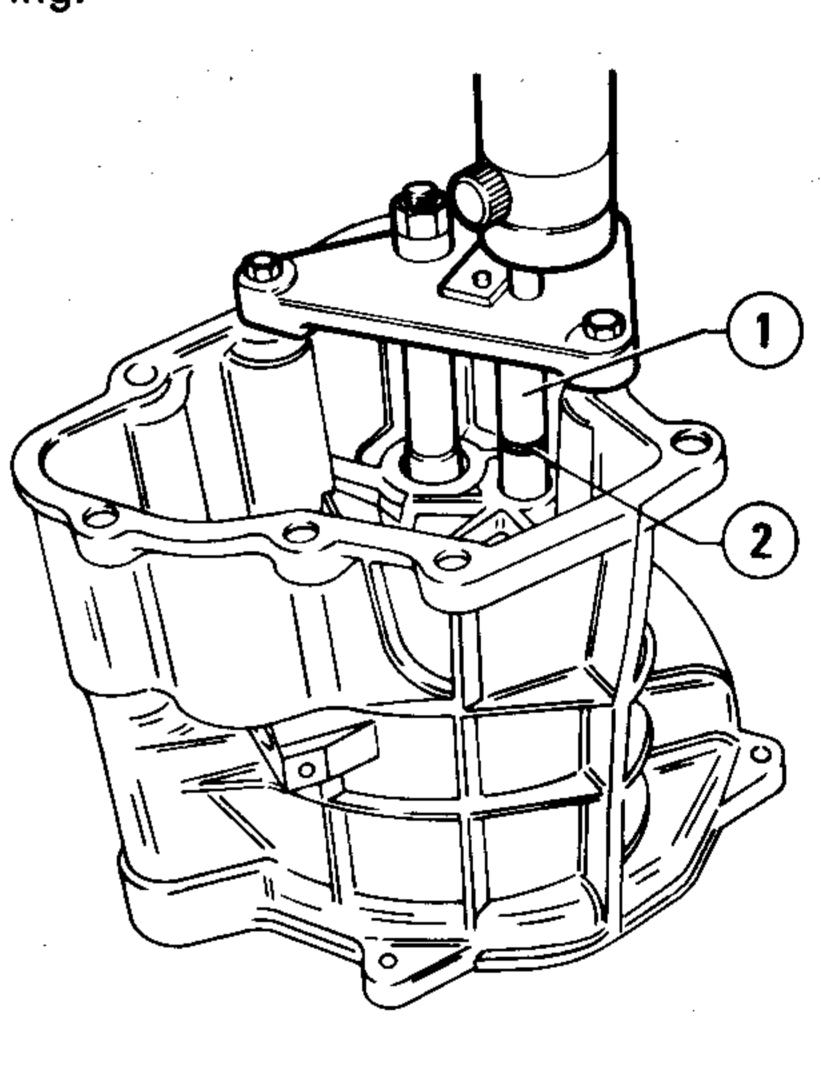


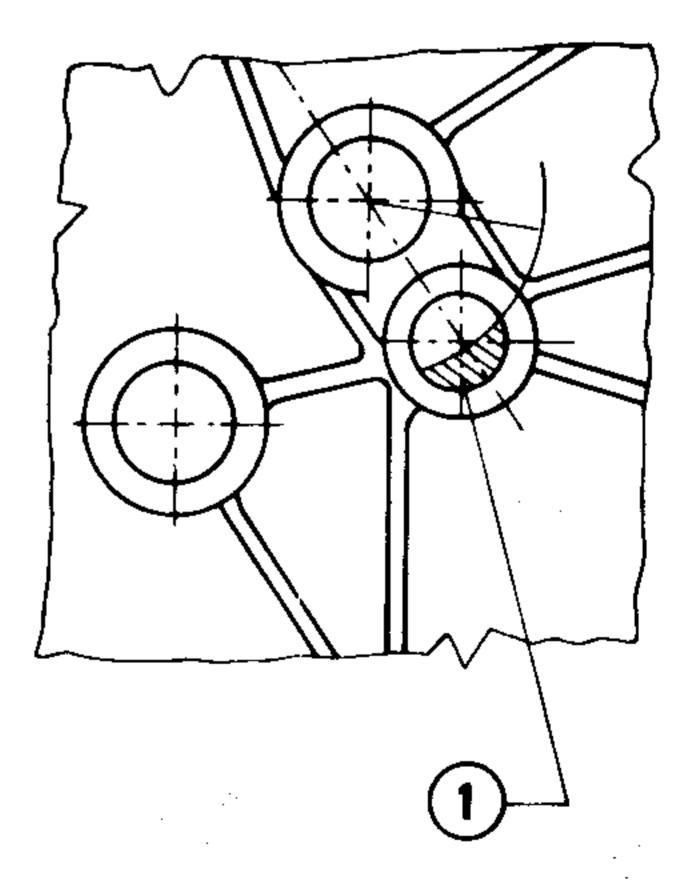
- 1 Oil seal ring driver
- 2 Oil seal ring
- 3 Guide bush for speed selection and engagement rod
- 2. Tighten fork pin into the related seat.
- 3. Reassemble interlock plunger by reversing the order of disassembly (Refer to: "Disassembly" step 6) applying a coat of the prescribed sealant on the mating surface between the support for reverse speed engagement safety device and clutch-speed gear casing.

#### Sealant:

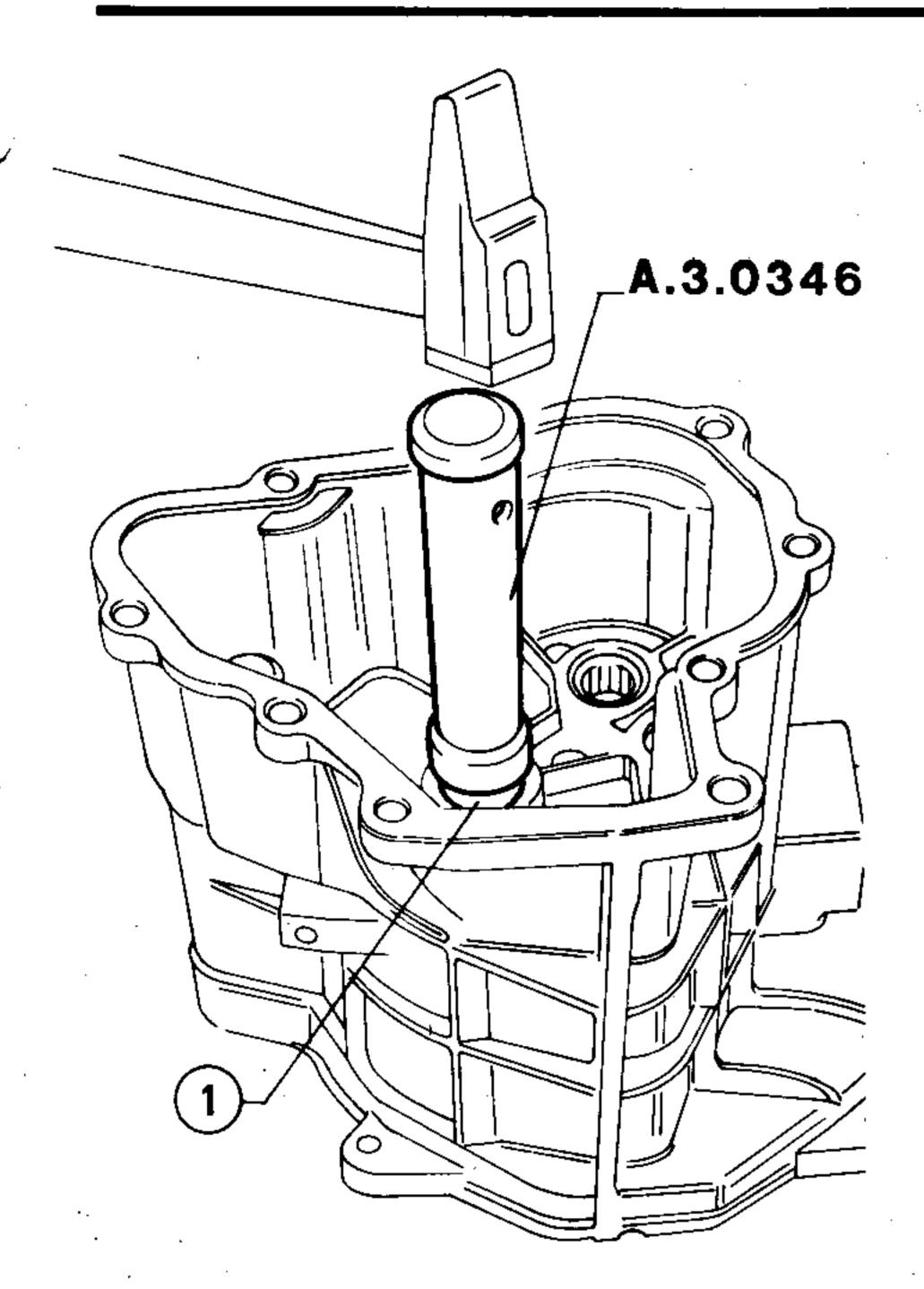
Sealing compound LOWAC Perfect Seal

- T: Tightening torque
  Nut securing plate for reverse
  speed engagement safety device
  8.3 to 10.3 N·m
  (0.9 to 1.05 kg·m)
  (6.5 to 7.2 ft·lb)
- 4. Reassemble the reverse speed pin operating as follows:
- a. Install retaining ring (2) on pin.
- b. Heat the clutch-speed gear casing at a temperature within 140 to 160 °C.
- c. Position pin into the related seat on clutch-speed gear casing. Secure the pin positioning tool to clutch-speed gear casing.
- d. Insert pin until retaining ring comes into contact with clutch-speed gear casing.



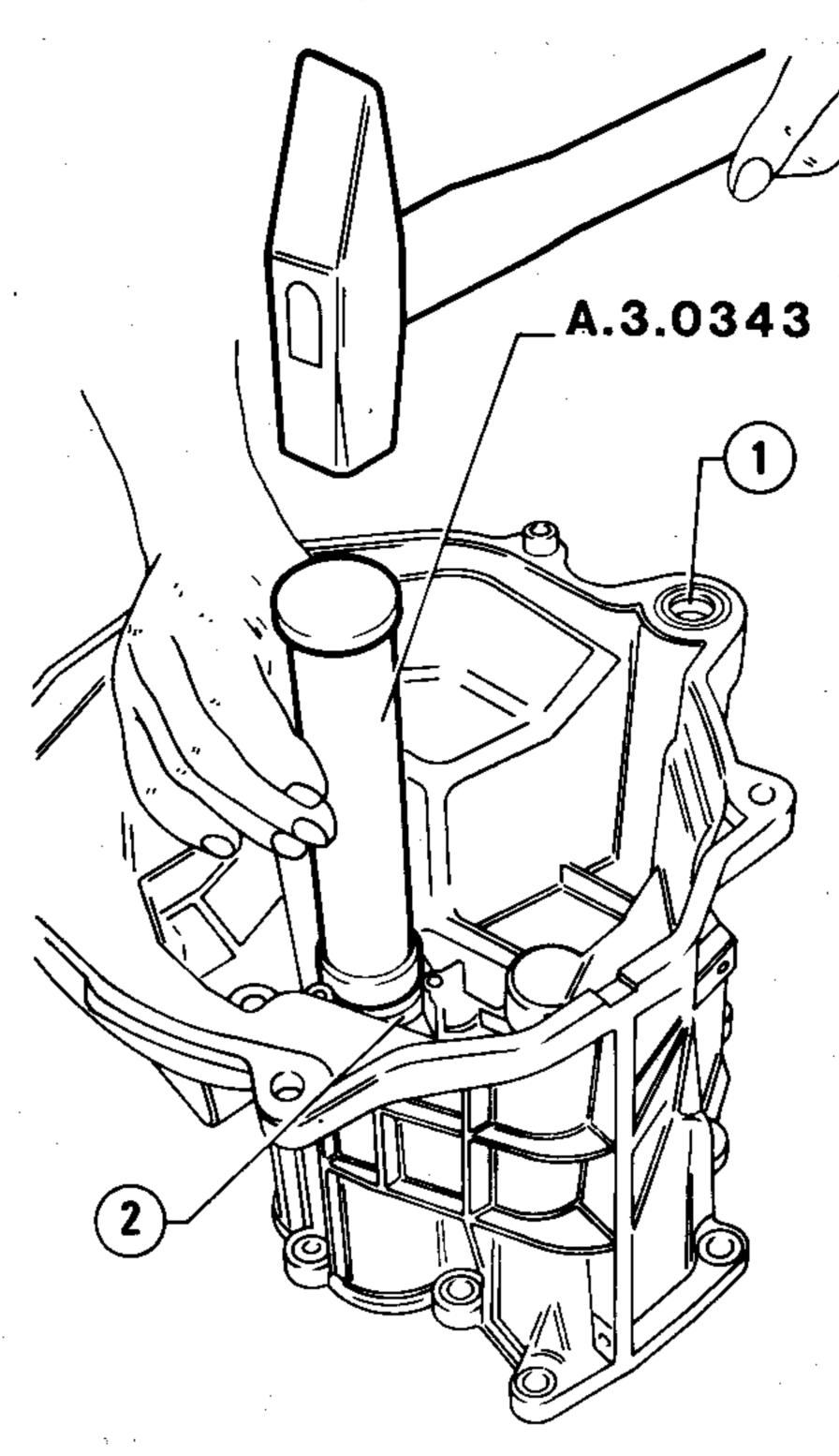


- Reverse speed pin
- 2 Retaining ring
- 5. Reassemble the main shaft needle bearing by reversing the order of disassembly (Refer to: "Disassembly" step 4).
- 6. Reinstall bush (1) making use of driver A.3.0346.



1 Pinion shaft support bush

7. Reassemble oil seal rings 1 and 2 operating as per figure, by means of driver A.3.0343.



- 1 Oil seal ring for speed selection and engagement rod
- 2 Main shaft oil seal ring

8. Reassemble guide tube by reversing the order of disassembly (Refer to: "Disassembly" - step 1)

Once the clutch-speed gear casing has been reassembled, reconnect it to Differential unit (Refer to: "Separation and Reconnection at Bench of Speed Gear Unit from/to Differential Unit - Reconnection").

### SERVICE DATA AND SPECIFICATIONS

#### **SERVICE DATA**

Alfa 90   15t speed   162.02   162.12   162.12   162.12   162.12   162.12   162.12   162.12   162.12   162.12   162.12   162.13   162.12   162.13										1			
1st speed   2nd		Alfa 90		,	20		20 (iii	Integione	20 6V injezione	17. 17.	furbodiesei	250	- Piezione
1st speed   2nd speed   3nd speed   1   3nd speed   1   3nd speed   1   5th speed   1   11/42   1   15.24 (9.46)   2nd speed   1   13.364   1   17.468   2nd speed   1   17.468   2nd speed   1   15.224 (9.46)   3nd speed   1   15.224 (9.46)   3nd speed   1   15.224 (9.46)   3nd speed   1   1   13.612   2nd speed   1   1   1   13.612   2nd speed   1   1   1   1   1   1   2nd speed   1   1   1   1   1   1   2nd speed   1   1   1   1   1   2nd speed   1   1   2   2nd speed   2nd spe			LH 162.02	H	LH 162.12	I I	LH 162.14	RH 162.15	LH RH 162.10 -	162.06	I I	LH 162.18	RH 162.19
2nd speed         3rd speed         1           4th speed         5th speed         1           5th speed         11/42         1           1 st speed         1:13.364         1           2nd speed         1:7.488         1           2nd speed         1:7.488         1           2nd speed         1:7.488         1           2nd speed         1:3.624 (9.46)         1           3nd speed         1:3.612         1           3nd speed         1:3.612         1           4th speed         1:3.612         1           5th speed         1:2.978         1           6th speed         1:2.978         1           6th speed         1:2.978         1           6th speed         1:2.978         1					•••	3.500			1 : 2.875	·	-	3.500	
3rd speed   5th speed   1   11/42   1						1.956			1 : 1.720			1.956	
Sth speed   1   R speed   1   11/42   1     R speed   1   11/42   11/42   1   11/42			·			.258			1: 1.226		-	1.258	
Sth speed   1   11/42   11/42       11/42	•	,				0.946			1:0.946		1: (	0.946	
R speed						0.780			1:0.780		1: (	0.780	
1st speed   1:1					••	3.000		-	1:3.000	•	-	3.000	
1st speed				1/42			10/43 (1)		9/41	12	12/41	11/39	(2)
tential-speed gear overall ratios       km/h (mi/h)       8.508         rential-speed gear overall ratios       km/h (mi/h)       15.224         speed at 1000 r.p.m.       4th speed       1 : 3         km/h (mi/h)       31.478         5th speed       1 : 2         km/h (mi/h)       38.178				••			1: 15.05		1: 13.096		11.960	1:12	12.409
2nd speed       1 : 5.224         km/h (mi/h)       15.224         3rd speed       1 : 4         km/h (mi/h)       23.671         km/h (mi/h)       31.478         5th speed       1 : 2         km/h (mi/h)       38.178			8	805			7.543(4.69)		8.681 (5.40)	9.507	(5.91)	9.162	(5.69)
km/h (mi/h)         15.224           3rd speed         1 : 4           km/h (mi/h)         23.671           km/h (mi/h)         31.478           5th speed         1 : 2           km/h (mi/h)         38.178		2nd speed		<u></u>			1:8.41		1:7.835		6.684	1:6.	6.935
3rd speed       1 : 2         rential-speed gear overall ratios       km/h (mi/h)       23.671         inal speed at 1000 r.p.m.       4th speed       1 : 3         km/h (mi/h)       31.478         km/h (mi/h)       38.178			16	224			13.497 (8.39)		14.512 (9.02)	17.012	(10.57)	16.395 (	(10.19)
rential-speed gear overall ratios       km/h (mi/h)       23.671         inal speed at 1000 r.p.m.       4th speed       1:3         km/h (mi/h)       5th speed       1:2         km/h (mi/h)       38.178		3rd speed		••			1:5.40		1 : 5.584	1:	4.299	1:4	4.460
eed (mi/h) 31.478 (mi/h) 38.178	gear overall ratios		23	.671 (14.71		20	).987 (13.04)		20.362 (12.66)	26.451	(16.44)	25.492 (	(15.84)
(mi/h) 31.478 eed 1:2 (mi/h) 38.178	1000 r.p.m.			•••			1:4.07		1:4.309		3.232	1:3.	3.354
eed (mi/h) 38.178		km/h (mi/h)				27	7.906 (17.34)		26.387 (16.40)	35.174	(21.86)	33.900 (	(21.07)
(mi/h) 38.178				••			1:3.35		1:3.553	- 2	2.665	1:2.	2.765
		km/h (mi/h)	88	178		33	33.846 (21.04)		32.001 (19.89)	42.660	(26.51)	41.114 (	(25.55)
R speed 1:11.454			-				1: 12.90		1: 13.665	-	10.251	1 : 10	10.636
km/h (mi/h)		km/h (mi/h)	6				8.80 (5.47)		8.320 (5.17)	11.092	(6.89)	10.689	(6.64)

(1) Alfa 9020 and Alfa 9020 inications versions for Switzerland, Sweden and A

i .										
	Alfa 90 Super		20 iniezion	zione (*)	20 07	6V iniezione	2.2	furbodiesel	2.5 6V in	iniezione (*)
Gear ratios		LH RH 162.02.1	LH 162.14.1 162.14.2	RH 162.15.1	LH 162.10.1	RH 	LH 162.06.1	RH	LH 162.18.1	RH 162.19.2
Speed gear ratios	1st speed		1:2	.875			1:3	3.500	1:2	.875
	2nd speed		1:1	.720			1:1	.956		.720
	3rd speed			.226			1:1	1.258		.226
	4th speed		1:0	.946			1:0	0.946	1: 0	0.946
	5th speed		1:0	0.780			1:0	0.780	1:0	0.780
	R. speed		-	3.000			- :	3.000	-	3.000
Differential ratio		9/41	10	10/43	9/41	-1	12/	/41	10,	10/41
	1st speed	1: 13.096	•	12.362	1 : 13	13.096	1:1	11.960	-	11.787
	km/h (mi/h)	8.683 (5.39)	9.198	(5.74)	8.682	(5.39)	9.507	(2.90)	9.646	(2.99)
	2nd speed	1 : 7.835	•	7.396	1:7	.835	1:(	6.684	•	7.052
	km/h (mi/h)	14.511 (9.01)	15.374	(9.55)	14.512	(9.01)	17.012	(10.57)	16.123	(10.01)
	3rd speed	1 : 5.584	-	5.272	1:5	5.584	•	4.299	•	5.027
Differential-speed gear overall ratios	km/h (mi/h)	20.362 (12.65)	21.567	(13.40)	20.362	(12.65)	26.452	(16.43)	22.620	(14.05)
Nominal speed at 1000 r.p.m.	4th speed	1:4.309		4.068	1:4	4.309	••	3.232	-	3.879
	km/h (mi/h)	26.387 (16.39)	27.948	(17.36)	26.387	(16.39)	35.174	(21.85)	29.314	(18.21)
	5th speed	1:3.553	•••	3.354		3.553	:	2.665	•••	3.198
	km/h (mi/h)	32.002 (19.88)	33.900	(21.06)	32.002	(19.88)	42.660	(26.50)	35.552	(22.08)
	R. speed	1: 13.665		12.900		13.665	; ; <b>-</b>	10.251		12.300
	km/h (mi/h)	8.321 (5.17)	8.815	5 (5.48)	8.314	(5.16)	11.093	3 (6.89)	9.245	(5.74)

(\*) Also valid for versions for Switzerland, Sweden and Australia

FRH   LH   RH   LH   RH   LH   RH   LH   RH   LH   L														
Speed gaar ratios   List speed   State   List   State   Stat							2	<b>Q</b>	02		1	diesei	<b> </b>	iniezione
Speed geal ratios         1x speed         1x speed         1x speed         1x speed         1x speed         1x 1.260         1x 1.260         1x 1.266         1x 1.266 <th>ear ratio</th> <th></th> <th>161.000</th> <th>RH 1.01</th> <th>l I c</th> <th></th> <th>1 % 64</th> <th>RH 161.350</th> <th></th> <th></th> <th>LH 61.040</th> <th>Ŧ,</th> <th>LH 161.180</th> <th>RH 161.190</th>	ear ratio		161.000	RH 1.01	l I c		1 % 64	RH 161.350			LH 61.040	Ŧ,	LH 161.180	RH 161.190
2nd speed         1:1,226         1:1,226         1:1,286         1:1,288         1:1,289         1:1,289         1:1,289         1:1,249         1:1,249         1:1,249         1:1,249         1:1,249         1:1,249         1:1,240	eed gear						875				1	8	7 ?	.875
3rd speed   1:0.346   1:							720				-	92		.720
Stringered   Str							226					98		.226
Eth speed   1:0780   1:0.0780						0	946		E			မှ	0	0.946
Officerential ratio         R. speed         11:3.000         1:3.000 </th <th></th> <td></td> <td></td> <td></td> <td></td> <td></td> <td>780</td> <td></td> <td></td> <td></td> <td> </td> <td>Q.</td> <td>]</td> <td>0.780</td>							780					Q.	]	0.780
111   10,43   11,43   10,43   11,43   10,43   11,39	•					 	000					2		3.000
1st speed   1:13.086   1:12.362   1:11.288   1:12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1.12.362   1:12.407   1:12.362   1:12.407   1:12.362   1:12.407   1:12.362   1:12.402	rential r		9/4		10/4	8	11/43		10/43		11/39		10/41	-
Sundamental speed at 1000 r.p.m.   Ram/h (mi/h)   Ram (1965)   Ram (		1st speed		960	: 12.	362	11	38				27	-	.787
Independential speed gear overall ratios         1:7,836         1:7,396         1:6,723··         1:7,396         1:6,934         1:6,932         1:6,932         1:6,932         1:6,932         1:6,932         1:6,932         1:6,932         1:6,932         1:6,934         1:6,934         1:6,934         1:6,934         1:6,934         1:6,934         1:6,934         1:6,934         1:3,934         1:2,946         1:3,946         1:3,946         1:1,2,946         1:1,1,727         1:1,1,727         1:1,1,727         1:1,1,727         1:1,1,727         1:1,1,727         1:1,1,727         <		km/h (mi/h)		.17)	809	.47)	9) 069.6	.02)			.777 (5.	45)	9.239 (5	(5.74)
km/h (mi/h)         13.899 (8.64)         14.724 (9.15)         16.198 (10.07)         14.724 (9.15)         16.705 (9.76)         15.00           Offerential speed gear overall ratios         km/h (mi/h)         19.502 (12.12)         20.656 (12.84)         22.725 (14.12)         20.656 (12.84)         24.417 (15.18)         21.5           Nominal speed at 1000 r,p.m.         4th speed         1:4.068         1:3.698         1:4.068         1:4.068         1:4.068         1:4.068         1:4.068         1:3.353         1           Km/h (mi/h)         25.273 (15.71)         26.770 (16.64)         29.448 (18.30)         26.770 (16.64)         32.478 (20.19)         28.0           Fith speed         1:3.553         1:3.354         1:3.354         1:2.765         1           Rm/h (mi/h)         30.650 (19.05)         32.469 (20.18)         35.717 (22.19)         32.469 (20.18)         36.469 (20.18)         36.365 (24.48)         34.02 (5.25)         1           Rm/h (mi/h)         7.969 (4.95)         8.442 (5.25)         1:11.2290         1:11.2290         1:10.241 (6.35)         1         10.241 (6.35)         1				35	: 7	8	••	23	'.			4	'	.052
3rd speed         1: 5.84         1: 5.272         1: 4.60         1: 4.60           Differential-speed gear overall ratios         km/h (mi/h)         19:502 (12.12)         20.656 (12.84)         22.725 (14.12)         20.656 (12.84)         24.417 (15.18)         21           Nominal speed at 1000 r.p.m.         4th speed         1: 4.309         1: 4.068         1: 3.698         1: 4.068         1: 4.068         1: 3.533         26.770 (16.64)         22.478 (20.19)         28           km/h (mi/h)         25.273 (15.71)         26.770 (16.64)         29.448 (18.30)         26.770 (16.64)         32.478 (20.19)         28           km/h (mi/h)         30.650 (19.05)         32.469 (20.18)         32.469 (20.18)         33.469 (20.18)         39.385 (24.48)         34           R. speed         1: 13.665         1: 12.900         1: 11.290         1: 10.635         10.240 (6.35)         10.240 (6.35)         10.240 (6.35)		km/h (mi/h)	13.899 (	3.64)	.724	9.15)	198	0.07)	4.724 (9.		5.705 (9.	76)	442	(9.60)
Differential-speed gear overall ratios         km/h (mi/h)         19.502 (12.12)         20.656 (12.84)         22.725 (14.12)         20.656 (12.84)         24.417 (15.18)         21.3353           Nominal speed at 1000 r.p.m.         4th speed         1: 4.309         1: 4.068         1: 3.698         1: 4.068         1: 3.353         1: 3.353           Km/h (mi/h)         25.273 (15.71)         26.770 (16.64)         29.448 (18.30)         26.770 (16.64)         32.478 (20.19)         28           Km/h (mi/h)         30.650 (19.05)         32.469 (20.18)         35.717 (22.19)         32.469 (20.18)         34.246 (20.18)         39.386 (24.48)         34           R. speed         1: 13.665         1: 12.900         1: 11.727         1: 12.900         1: 10.635         32           Km/h (mi/h)         7.969 (4.95)         8.442 (5.55)         9.286 (5.77)         8.442 (5.25)         10.240 (6.35)         8		3rd speed	.5	84	: 5.	72	••	32	5			0	1:5.027	27
Nominal speed at 1000 r.p.m.       4th speed       1: 4.309       1: 4.068       1: 3.698       1: 4.068       1: 3.553       1: 3.354       1: 3.353       1: 3.353       1: 3.353       1: 3.354       1: 3.354       1: 2.765         5th speed       1: 3.553       1: 3.354       1: 3.354       1: 3.354       1: 2.765       1: 2.765         R. speed       1: 13.665       1: 12.900       1: 11,727       1: 12.900       1: 10.635         Km/h (mi/h)       7.969 (4.95)       8.442 (5.25)       9.286 (5.77)       8.442 (5.25)       10.240 (6.34)	ferential-spe	km/h (mi/h)	505	<u> </u>	.656 (1	2.84)	.725	1.12)	.656		417	18)	.663	(13.46)
km/h (mi/h)       25.273 (15.71)       26.770 (16.64)       29.448 (18.30)       26.770 (16.64)       32.478 (20.19)         5th speed       1:3.553       1:3.354       1:3.049       1:3.354       1:2.765         km/h (mi/h)       30.650 (19.05)       32.469 (20.18)       35.717 (22.19)       32.469 (20.18)       39.385 (24.48)         R. speed       1:13.665       1:12.900       1:11.727       1:12.900       1:10.635         km/h (mi/h)       7:969 (4.95)       8.442 (5.25)       9.286 (5.77)       8.442 (5.25)       10.240 (6.36)	speed at 1	4th speed	••	60	・・	88	••	<b>&amp;</b>			•	3	1 : 3.879	79
5th speed       1:3.553       1:3.354       1:3.049       1:3.354       1:2.765         km/h (mi/h)       30.650 (19.05)       32.469 (20.18)       35.717 (22.19)       32.469 (20.18)       39.385 (24.48)         R. speed       1:13.665       1:12.900       1:11.727       1:12.900       1:10.635         km/h (mi/h)       7.969 (4.95)       8.442 (5.25)       9.286 (5.77)       8.442 (5.25)       10.240 (6.36)		km/h (mi/h)	.273	71	.770		448	3.30)			478	19)	28.074 (1	(17.45)
(mi/h)         30.650 (19.05)         32.469 (20.18)         35.717 (22.19)         32.469 (20.18)         39.385 (24.48)           ied         1 : 13.665         1 : 12.900         1 : 11.727         1 : 12.900         1 : 10.635           (mi/h)         7.969 (4.95)         8.442 (5.25)         9.286 (5.77)         8.442 (5.25)         10.240 (6.36)		5th speed	•••	53	••	72		<u></u>			. 2.	10	ب س	198
Hed 1: 13.665 1: 12.900 1: 11.727 1: 12.900 1: 10.635 (mi/h) 7.969 (4.95) 8.442 (5.25) 9.286 (5.77) 8.442 (5.25) 10.240 (6.36)		km/h (mi/h)		9.02)	.469			. 19)	.469 (20.			<del>18</del>	34.052 (21.	1.16)
(mi/h) 7.969 (4.95) 8.442 (5.25) 9.286 (5.77) 8.442 (5.25) 10.240 (6.36)				92	: 12.	8	.11	27	: 12.	-	10	S.		8
		km/h (mi/h)	969	95)	442	25)	9.286 (5.7	<u>  (c)</u>	8.442 (5.25)		10.240 (6.3	99	8.854 (5	(5.50)

	Alfa 75	911	•			20		<b>1 1 1 1 1 1 1 1 1 1</b>	iniezione
Gear ratios		LH 161.000	RH L	H .020 16	ъ.	LH 161.080	161.090	LH 161.180	RH 161.190
Speed gear ratios	1st speed				1 : 3.5	3.500			
•	2nd speed		-		1:1.9	.956			
	3rd speed				1:1.2	1.258		·.	
	4th speed				1 : 0.9	0.946			
	5th speed				1:0.7	0.780			
	R. speed				1:3.0	3.000			
Differential ratio	-			11/42				12/41	41
	1st speed			1: 13.364	-			1: 11	960
	km/h (mi/h)			8.149 (5.06)	()		·	9.105	(2.66)
	2nd speed			1 : 7.468				1:6	6.684
	km/h (mi/h)			14.582 (9.06)	(9)			16.293	(10.13)
	3rd speed	•		1:4.803			•	1:4	4.299
Differential-speed gear overall ratios	km/h (mi/h)		7	22.673 (14.09)	03)			25.331	(15.74)
Nominal speed at 1000 r.p.m.	4th speed			1:3.612				1:3	3.233
	km/h (mi/h)			30.149(18.74)	74)			33.694	(20.94)
	5th speed			1:2.978				1:2	2.665
	km/h (mi/h)		;	36.568 (22.73)	73)			40.863	(25.40)
	R. speed			1: 11.454	+			1 : 10	10.251
	km/h (mi/h)			9.507 (5.91)	1)			10.623	(09.9)

1) Model with gearbox-rear axle long ratios (Switzerland, Sweden and Australia excluded)

Guillettig         In speed         In 13.46         In 13.										
over gener ratios         Lya         RAY         LYA         RAY         LYA         RAY         LYA		Giulietta	9				20		<b>Furboc</b> DITION	
1,1,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50   1,2,2,50	r ratio		<b>&amp;</b>	6	- · · · · · · · · · · · · · · · · · · ·	RH 13.5	LH 113.56	RH 113.57		
2nd speed   11,136   11,137   11,136   11,137	peed gear ratios	1st speed				က္ပ	00			
341 speed   11.286   11.286   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.946   11.0.940   11.0.946   1		2nd speed				• •	56			
fit speed         11/42         11/42         11/42         11/42         11/42         11/42         11/42         11/42         11/42         11/43 <th c<="" th=""><th></th><th>3rd speed</th><td></td><td></td><td></td><td>: 1</td><td>58</td><td></td><td></td></th>	<th></th> <th>3rd speed</th> <td></td> <td></td> <td></td> <td>: 1</td> <td>58</td> <td></td> <td></td>		3rd speed				: 1	58		
filt speed         11/42         10/43         11/42         11/43		4th speed				1:0.9	46			
Firspeed   Firspeed		5th speed				0.	80			
ferential ratio         11/42         11/42         11/43         11/13						1:3.0	00			
Ist speed         1:13.37         1:15.05         1:15.05         1:13.60         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:14.80         1:13.60	ferential r		-		11/42	•	10/4	13	11/43	
km/h (mi/h)         8.11 (5.04)         8.13 (5.05)         7.20 (4.47)         7.96 (4.94)           2nd speed         1.7.47         1.7.47         1.8.41         1.7.646           km/h (mi/h)         14.51 (9.01)         1.5.40         1.2.99 (8.01)         1.7.540           3rd speed         1.4.80         1.4.80         11.5.40         1.4.91           km/h (mi/h)         22.57 (14.02)         22.54 (14.06)         20.04 (12.45)         22.148 (13.75)           dth speed         1.3.61         1.3.61         1.4.07         1.3.68           km/h (mi/h)         30.01 (18.64)         30.09 (18.69)         26.65 (16.55)         29.448 (18.29)           sth speed         1.2.98         1.2.98         1.3.35         1.3.049           km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.22 (20.07)         35.77 (22.18)           km/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)		1st speed	• •				• •	05	• • •	
2nd speed         1:7.47         1:7.47         1:8.41         1:5.40         1:7.43         1:7.43         1:7.48         1:7.49         1:7.49         1:7.49         1:7.49         1:7.49         1:7.49         1:4.31         1:3.38         1:3.38         1:3.38         1:3.38         1:3.38         1:3.38         1:3.38         1:3.48         1:3.49         1:3.49         1:3.49         1:3.49         1:3.49         1:3.49         1:3.49         1:1.172           Runch (mi/h)         86.52 (22.68)         36.52 (22.68)         32.32 (20.07)         35.71 (22.18)         1:11.72           Runch (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)		km/h (mi/h)	11		13	5)	.20	.47)	96.	
km/h (mi/h)         14.51 (9.01)         14.56 (9.04)         12.89 (8.01)         14.243 (8.88)           3rd speed         11.480         11.480         11.540         11.491           km/h (mi/h)         22.57 (14.02)         22.64 (14.06)         20.04 (12.45)         22.148 (13.76)           km/h (mi/h)         30.01 (18.64)         30.09 (18.69)         26.65 (16.55)         29.448 (18.29)           sth speed         11.2.98         11.2.98         11.3.35         11.3.049           Km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (22.18)           R. speed         11.1.42         11.11.42         11.11.29         11.11.27         9.446 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)		2nd speed	1:7.47		1:7.47		1:8.4	1.1	1:7.646	
3rd speed         1:4.80         1:4.80         1:5.40         1:4.91           miled speed gear overall ratios         km/h (mi/h)         22.57 (14.02)         22.64 (14.06)         20.04 (12.45)         22.148 (13.76)           dth speed         th speed         11.3.61         11.4.07         11.3.698         11.3.698           km/h (mi/h)         30.01 (18.64)         30.09 (18.69)         26.65 (16.55)         29.448 (18.29)           km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (22.18)           R. speed         1:11.42         1:11.290         1:11.727           km/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)		km/h (mi/h)			14.56 (9.0	4)	12.89 (	3.01)	14.243 (8.85)	
ifferential-speed gear overall ratios         km/h (mi/h)         22.57 (14.02)         22.64 (14.06)         20.04 (12.45)         22.148 (13.76)           ominal speed at 1000 r.p.m.         4th speed         1:3.61         1:3.61         1:4.07         1:3.698           fkm/h (mi/h)         5th speed         1:2.98         1:2.98         1:3.35         1:3.049           fkm/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (22.18)           fkm/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)		3rd speed			1:4.80		1:5.4	0t	1:4.917	
ominal speed at 1000 r.p.m.       4th speed       1:3.61       1:3.61       1:4.07       1:3.698         km/h (mi/h)       30.01 (18.64)       30.09 (18.69)       26.65 (16.55)       29.448 (18.29)         5th speed       1:2.98       1:2.98       1:3.35       1:3.049         km/h (mi/h)       36.31 (22.55)       36.52 (22.68)       32.32 (20.07)       35.717 (22.18)         km/h (mi/h)       9.46 (5.87)       9.49 (5.89)       8.40 (5.22)       9.286 (5.77)	ferential-speed gear overall ratios	km/h (mi/h)			64	(90		2.45)	148	
km/h (mi/h)         30.01 (18.64)         30.09 (18.69)         26.65 (16.55)         29.448 (18.29)           5th speed         1:2.98         1:3.35         1:3.049           km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (22.18)           R. speed         1:11.42         1:11.42         1:11.290         1:11.727           km/h (mi/h)         9.46 (5.77)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)	ominal speed at 1000 r.p.m.	4th speed	1:3.61		1:3.61		4	)7	1:3.698	
5th speed         1:2.98         1:3.98         1:3.35         1:3.049           km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (22.18)           R. speed         1:11.42         1:11.42         1:11.290         1:11.727           km/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)		, km/h (mi/h)			60.	99)	_	6.55)	29.448 (18.29)	
km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (22.18)           R. speed         1:11.42         1:11.42         1:11.290         1:11.727           km/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.77)		5th speed	1:2.98		1:2.98		1:3.3	35	1:3.049	
R. speed     1:11.42     1:11.42     1:12.90     1:11       km/h (mi/h)     9.46 (5.87)     9.49 (5.89)     8.40 (5.22)     9.286	-	km/h (mi/h)			.52	38)	.32	0.07)	.717 (22.18)	
km/h (mi/h) 9.46 (5.87) 9.49 (5.89) 8.40 (5.22)		R. speed	1:11.42		1:11.42		1:12.	90	1:11.727	
		km/h (mi/h)			9.49 (5.8	(6	8.40 (5	.22)	9.286 (5.77)	

California   Cal						
Quality of Energy of E		Giulietta	1.6		20	turboo DITION
Spened gear ratios         111 spie         1.1 spie           2nd speed         4th speed         1.1 286           3nd speed         11.3 300         1.1 286           6th speed         11/42         1.1 320           10th entity ratio         11/42         1.1 320           10th entity ratio         11/42         1.1 300           10th entity ratio         11/42         1.1 506           10th entity ratio         11/42         1.1 506           10th entity ratio         11/42         1.1 506           10th entity ratio         11/42         1.1 500           10th entity ratio         11/42         1.1 500           10th entity ratio         11/42         1.1 500           10th entity ratio         1.1 500         1.1 500	ar ratios		LH 13.48 113.4	RF 113.	LH 13.56 1	
2nd speed         11.258         11.258           3nd speed         11.0346         11.258           Shi speed         11.0346         1.0346           Shi speed         11.142         11.0346           Shi speed         11.142         11.032         11.1500           Ist speed         11.1337         11.15.00         11.15           Ist speed         11.1337         11.15.00         11.15           Ist speed         11.1347         11.15.00         11.15           Ist speed         11.1327         11.15.00         11.15           Ist speed         11.142         11.143         11.15.00         11.15           Ist speed         11.142         11.143         11.15.00         11.4           Ist speed         11.142         11.44         11.4         11.4           Ist speed         11.350         11.4         11.4         11.4           Ist speed         11.361         11.4         11.4         11.4         11.4           Ist speed         11.361         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.4         11.4	peed g	1st speed			1:3.500	
3nd speed         11.0346           Aftr speed         11.0346           Differential ratio         11.02         11.0300           Principle and speed         11.142         11.142         11.15.05         1.11           Amount of peed speed of speed at 1000 r.p.m.         11.142         11.142         11.15.05         1.11           Differential ratios         11.142         11.142         11.15.05         1.11         1.11           Amount of peed of speed of speed of at 1000 r.p.m.         11.142         11.142         11.15.05         1.13           Differential speed gear overall ratios         4month (mi/h)         22.57;14.02j         22.64;14.06j         2004;12.45j         22.148           Nominal speed at 1000 r.p.m.          4m speed         11.369         11.361         11.407         13.3           Km/h (mi/h)         30.01 (18.64)         30.09 (18.64)         20.04 (12.45)         20.448           R speed         11.142         11.1407         13.35         11.3           R speed         11.289         11.280         11.200         11.3           R speed         11.142         11.142         11.1407         32.21 (20.07)         38.71 (22.65)           R speed         11.142         11.142		2nd speed			· · ·	
Sin speed   11,026   10,036   10,036   10,046   10,046   11,020		3rd speed			<del></del>	
Sit speed         11/42         11/300           Differential ratio         11/42         11/42         11/42         11/1506		4th speed			1:0.946	
Offerential ratio         R. speed         11/42         11/42         10/43         11.10           Offerential ratio         1 speed         1:1337         1:1505         1:13         1:13           Expressible of the ministration         2nd speed         1:1347         1:1347         1:1365         1:13           Differential speed gear overall ratios         2nd speed         1:1480         1:181         14.243         1:1424           Nominal speed at 1000 r.p.m.         4th speed         1:361         1:361         1:480         1:540         1:3           Kmn/h (mi/h)         30.01 (18.64)         30.00 (18.64)         20.04 (12.45)         22.148           Nominal speed at 1000 r.p.m.         4th speed         1:3.61         1:4.80         1:3.69         1:3           Kmn/h (mi/h)         36.112.861         30.00 (18.64)         30.00 (18.65)         26.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45)         25.04 (12.45) <t< th=""><th></th><th>5th speed</th><td></td><td></td><td>1:0.780</td><td></td></t<>		5th speed			1:0.780	
Differential ratio         11/42         11/42         10/43         11:15.05         11:11.05					1:3.000	
1.15 geed         1.13.37         1.15.06         1.15.06         1.15.06         1.15.06         1.15.06         1.15.06         1.15.06         1.15.06         1.15.06         1.15.06         1.15.06         1.15.04         1.15.06         1.15.04         1.15.04         1.15.04         1.15.04         1.15.04         1.15.04         1.15.04         1.15.04         1.14.24         1.14.07         1.13.04	rential rati		11/42	11/42	10/43	11/43
km/h (mi/h)         8.11(5.04)         8.13(5.05)         7.20(4.47)         7.96           2nd speed         117.47         1.7.47         1.8.41         1.7.47           km/h (mi/h)         1451(9.01)         14.56(9.04)         12.89(8.01)         14.243           Olfferential:speed gear overall ratios         km/h (mi/h)         22.5.7 (14.02)         22.64 (14.05)         20.04 (12.45)         22.148           Nominal speed at 1000 r.p.m.         km/h (mi/h)         30.01 (18.64)         30.09 (18.69)         26.65 (16.55)         29.448           Km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         38.717           R. speed         1:11.42         1:11.29         1:11.29         1:11.29           R. speed         1:11.42         1:11.29         3.11.139         1:11.142		1st speed	• •	·		• • •
2nd speed         17.47         1.547         1.841         17.47           Differential-speed gear overall ratios         3rd speed         1.4.80         1.4.80         1.5.40         1.4.24           Nominal speed at 1000 r.p.m.         4th speed         1.3.61         1.3.61         1.4.07         1.3.61           Nominal speed at 1000 r.p.m.         4th speed         1.3.61         1.2.98         1.2.98         1.3.65         1.3.65           Respeed         1.2.98         1.2.98         1.2.98         1.3.35         1.3           Respeed         1.11.42         1.11.42         1.11.290         1.11           Respeed         1.11.42         9.49 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286		km/h (mi/h)	11	13	.20	96.
Nominal speed gear overall ratios         km/h (mi/h)         14.56 (9.04)         12.89 (8.01)         14.26 (9.04)         12.89 (8.01)         14.245           Differential-speed gear overall ratios         km/h (mi/h)         22.57 (14.02)         22.64 (14.06)         20.04 (12.45)         22.148           Nominal speed at 1000 r.p.m.         4th speed         1:3.61         1:4.07         1:3           Sth speed         1:2.98         1:2.98         1:3.35         1:3           Km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         36.717           R. speed         1:11.42         1:11.42         1:12.90         1:11           Km/h (mi/h)         9.49 (5.89)         8.40 (5.22)         9.286		2nd speed	1*7.47	1:7.47	1:8.41	1:7.646
Differential-speed gear overall ratios       3rd speed       1:4.80       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:5.40       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.61       1:3.62       1:3.62       1:3.62       1:3.62       1:3.62       1:3.62       1:3.62       1:3.62       1:3.62       1:3.62       1:3.62       1:1.1       1:1.1       3.6.51       2.2.66       1:1.1       3.6.51       3.6.52       1:1.1       3.6.51       3.6.52       1:1.1       3.6.51       3.6.52       3.6.5		km/h (mi/h)	.51	14.56 (9.04)	.89 (8.0	14.243 (8.85)
Differential-speed gear overall ratios         km/h (mi/h)         22.57 (14.02)         22.64 (14.06)         20.04 (12.45)         22.148           Nominal speed at 1000 r.p.m.         4th speed         1:3.61         1:4.07         1:3           Km/h (mi/h)         30.01 (18.64)         30.09 (18.69)         26.65 (16.55)         29.448           5th speed         1:2.98         1:3.35         1:3           Km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717           R. speed         1:11.42         1:11.42         1:11.290         1:11           Km/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286		3rd speed	7:	1:4.80		:4.9
Nominal speed at 1000 r.p.m.       4th speed       1:3.61       1:4.07       1:3.61         km/h (mi/h)       30.01 (18.64)       30.09 (18.69)       26.65 (16.55)       29.448         5th speed       1:2.98       1:2.98       1:3.35       1:3.17         km/h (mi/h)       36.31 (22.55)       36.52 (22.68)       32.32 (20.07)       35.717         km/h (mi/h)       9.46 (5.87)       9.49 (5.89)       8.40 (5.22)       9.286	ifferential-speed gear overall ratios	km/h (mi/h)	.57	(14.06	20.04 (12.45)	
km/h (mi/h)         30.01 (18.64)         30.09 (18.69)         26.65 (16.55)         29.448 (           5th speed         1:2.98         1:2.98         1:3.35         1:3.0           km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (           R. speed         1:11.42         1:11.290         1:11.           km/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286	minal speed at 1000 r.p.m.	4th speed	1:3.61	1:3.61	:4.07	1:3.698
5th speed       1:2.98       1:3.58       1:3.049         km/h (mi/h)       36.31 (22.55)       36.52 (22.68)       32.32 (20.07)       35.717 (22.71)         km/h (mi/h)       9.46 (5.87)       9.49 (5.89)       8.40 (5.22)       9.286 (5.71)		km/h (mi/h)	.01 (	(18.69	.65 (	.448
km/h (mi/h)         36.31 (22.55)         36.52 (22.68)         32.32 (20.07)         35.717 (22.22)           R. speed         1:11.42         1:11.42         1:11.290         1:11.727           km/h (mi/h)         9.46 (5.87)         9.49 (5.89)         8.40 (5.22)         9.286 (5.72)		5th speed	1:2.98	1:2.98	1:3.35	1:3.049
R. speed     1:11.42     1:11.42     1:12.90     1:11.72       km/h (mi/h)     9.46 (5.87)     9.49 (5.89)     8.40 (5.22)     9.286 (5.8)		km/h (mi/h)	.31	(22.68	32.32 (20.07)	717.
km/h (mi/h) 9.46 (5.87) 8.40 (5.22) 9.286 (5.		R. speed	:11.	:11		1.
		km/h (mi/h)		9.49 (5.89)	8.40 (5.22)	286 (5.

Alfetial Ratios		RH - 1:3.500 1:1.258	LH RH	20 • 17 H.	Ĩ.	State of the state	Fare-election in the second in
peed gear ratios  peed gear ratios  2nd speed 3rd speed 4th speed 5th speed R. speed 1st speed 1	11. THE	1:3.500	LH 17.01	H1	HE HE	<b>1</b>	<b>I</b>
peed gear ratios  2nd speed 3rd speed 4th speed 5th speed R. speed 1st speed		1:3.500		117.13	117.14	117.06	117.02
2nd speed 3rd speed 4th speed 5th speed R. speed 1st spe		1:1.956				1:3.500	1:3.500
3rd speed 4th speed 5th speed R. speed 1: tst speed 1: tm/h (mi/h) 8.2		1:1.258				1:1.956	1:1.956
4th speed 5th speed R. speed 1: 1st speed 1: 2nd speed 1:		1.0 946				1:1.345	1:1.258
Ential ratio    Sth speed   R. speed   1:		>+>:0.1			••	1:1.026	1:0.946
R. speed ential ratio  1st speed track tra		1:0.780				1:0.780	1:0.780
ential ratio  1st speed 1: km/h (mi/h) 8.29		1:3.000				1:3.000	1:3.000
1st speed 1: km/h (mi/h) 8.2 2nd speed 1	1/43		11/42			10/41	11/42
km/h (mi/h) 8.2 2nd speed 1	13.681		1:13.363			1:14.35	1:13.363
	3 (5.15)	· •	8.495 (5.28)			7.90 (4.91)	8.508 (5.28)
	7.646		1:7.468			1:8.019	1:7.468
km/h (mi/h) 14.847 (9	7 (9.22)		15.201 (9.44)			14.17 (8.8)	15.225 (9.46)
3rd speed	:4.917		1:4.803	. *		1:5.514	1:4.803
Differential-speed gear overall ratios 23.087 (1	7 (14.34)		23.635 (14.68)			22 (13.66)	23.673 (14.7)
· Naminal speed at 1000 r.p.m. 4th speed	:3.698		1:3.612			1:4.206	1:3.612
km/h (mi/h) 30.697 (			31.428 (19.52)			29.26 (18.17)	31.478 (19.55)
5th speed 1:3.049	3.049		1:2.978			1:3.198	1:2.978
km/h (mi/h) 37.232 (2	2 (23.12)		38.119 (23.68)			35.49 (22.04)	38.180 (23.71)
R. speed	-		1:11.454			1:12.3	1:11.454
km/h (mi/h) 9.680 (6	0 (6.01)		9.911 (6.15)			9.22 (5.73)	9.927 (6.16)

		GT	<b>V</b> 2.0	GTV 6 2.5	Vers. 1985
Gear ratios		LH 113.17	RH 113.18	LH 113.15.1 113.15	RH 113.16.1 113.16
Speed gear ratios	1st speed	1:	3.500	1 : 2.8	375
	2nd speed	1:	1.956	1 : 1.7	720
	3rd speed	1:	1.258	1:1.2	226
	4th speed	1:	0.946	1:0.9	946
	5th speed	1:	0.780	1:0.7	780
	R. speed	1:	3.000	1:3.0	000
Differential ratio		10	/43	10/4	1
	1st speed	1:	15.05	1:11.7	788
	km/h (mi/h)	7.53	(4.68)	9.646 (6	(00)
	2nd speed	1:	8.41	1:7.0	52
	km/h (mi/h)	13.48	(8.37)	16.123 (1	0.01)
	3rd speed	1:	<b>5.40</b>	1 : 5.0	27
Differential speed gear overall ratios	km/h (mi/h)	20.98	(13.03)	22.620 (1	4.05)
Nominal speed at 1000 r.p.m.	4th speed	1:	4.07	1:3.8	79
	km/h (mi/h)	27.90	(17.33)	29.315 (1	8.21)
	5th speed	1:	3.35	1:3.1	98
	km/h (mi/h)	33.83	(21.01)	35.553 (2	2.08)
	R. speed	1:	12.90	1 : 12.	30
	km/h (mi/h)	8.79	(5.46)	9.244 (5	.74)

## **GENERAL SPECIFICATIONS**

#### FLUIDS AND LUBRICANTS

Applicat. No.	Application	Туре	Name	Q.ty
· <b>1</b>	Differential-speed gear roller bearings  Detent devices  Clutch fork spherical pin and thrust bearing seat	GREASE	<ul> <li>AGIP: Grease 33 FD</li> <li>IP: Autogrease FD</li> <li>Std. No. 3671-69833</li> </ul>	
2	Propeller shaft rear joint seat  Ball joint on speed control lever  Reverse speed sliding gear inner bush  Bush for bevel pinion on clutch-speed gear casing	GREASE	ISECO: Molykote BR2 Std. No. 3671-69841	5 cm³
3	Clutch-speed gear casing seal rings  - Inner seal lip  - Outer surface	GREASE	ISECO: Molykote BR2 Std. No. 3671-69841 - AGIP: Rotra SX 75W90 - IP: Pontiax HDS 75W90 Std. No. 3631-69412	
<b>4</b>	Differential-speed gear unit oil refilling	OIL	<ul> <li>AGIP: Rotra SX 75W90</li> <li>IP: Pontiax HDS 75W90</li> <li>Std. No. 3631-69412</li> </ul>	kg 2.570 (1) (5.66 lb) kg 2.070 (2) (4.56 lb)
5	Bushes for speed transmission and selection lever and speed transmission and engagement lever (isostatic control) (2) Ball joint on speed transmission and engagement lever end	GREASE	Molykote Longterm No. 2 Std. No. 3671-69831	

(1) For models Alfetta.

For cars with high top-up plug of models: Giulietta

nd GTV 6 2.5

(2) For models Alfa 90 and Alfa 75 For cars with low top-up plug of models: Giulietta

GTV 2

and

GTV 6 2.5

#### **SEALANTS AND SURFACE FIXING AGENTS**

Application	Туре	Name	Q.ty
Surfaces of differential-speed gear casing and clutch-speed gear casing mating with intermediate flange	SEALING COMPOUND	LOWAC Perfect Seal Seal Std. No. 3522-00011	_
Mating surfaces between Reverse speed engage- ment safety devices and differential-speed gear	···		
casing NOTE:			-
Use denatured ethyl alcohol to clean the sur-			
faces			

## CHECKS AND ADJUSTMENTS

Axial clearance between fork and synchronizers sleeves	G	mm (in)	0.7 to 0.9 (0.0275 to 0.0354)
Spring test load	С	N (Kg lb)	90 to 97.6 (9.18 to 9.95; 20.25 to 21.96
Spring length			
- Unloaded	L,	mm (in)	30.6 (1.2)
- Loaded		mm (in)	18.8 (0.74)
Gears axial and radial clearance		mm (in)	0.1 to 0.15 (0.00394 to 0.00591)
Pinion, shaft and rear ring nut	,		
<ul> <li>Squareness deviation of ring nut support planes</li> </ul>		mm (in)	0.02 (0.000787)
- Ring nut installation interference fit		mm (in)	0.019 to 0.060 (0.000748 to 0.00236)
<ul> <li>Eccentricity in seats H of front and rear bearings with res-</li> </ul>	· .		
pect to seats I of gear bushes and intermediate bearings		mm (in)	0.02 (0.000787)
<ul> <li>Squareness deviation for abutment plane L of rear bearing inner race with respect to seats H</li> </ul>		mm (in)	0.02 (0.000787)
		••••	
$\vdash$ ( $\mathbf{l}$ )	•		
		<b>H</b>	
Main shaft  - Eccentricity in seats C of differential-speed gear casing			
bearings and intermediate flange with respect to centering		·	
seat D on clutch shaft, to seat E of clutch-speed gear cas- ing bearing and to seat F of 5th speed gear		mm (in)	0.03 (0.00118)
- Squareness deviation of abutment plane G for rear bear-			
ing inner race with respect to seats C of bearings	. <del>.</del>	mm (in)	0.03 (0.00118)
$\mathbf{G}_{\mathbf{J}}$			
$(C) \qquad (E)$			
	· ·	-	
	· :.		

### **HEATING TEMPERATURES**

Application	Measurement unit	°C (°F)
Heating temperature for roller bearing locking ring r	nut of bevel pinion shaft (head side)	140 (284)
Ring nut	Bearing	
Heating temperature of clutch-speed gear casing for it of speed selection and engagement rod	nstallation of Reverse speed gear pin, and bush	140 to 160 (284 to 320)
Heating temperature of 3rd and 4th speed driving ge	ars for installation on main shaft	195 to 210 (383 to 410)

TIGH	ITENING	TORQ	UES	· · · · · · · · · · · · · · · · · · ·							
Unit: N·m (kg·m; ft·lb)	With skew ball bearings	5 103 68.7 to 75.9)	o 124 84.4 to 91.1)	o 13 8.7 to 10.1)	:o 15 10.1 to 11.6)	to 20 12.3 to 15.2)	to 32 20.3 to 23.9)	to 31 14.5 to 23.1)	to 31 18.1 to 23.1)	1.3 to 14 1.4; 8 to 10.1)	to 10 5.8 to 7.2)
	With roller-ball compound bearings	93 to (9.5 to 10.5; 6	112 to (11.4 to 12.6; 8	12 to 1.4; 8	14 to (1.4 to 1.6; 10)	17 to (1.7 to 2.1; 1;	28 to 32 (2.8 to 3.3; 20.3	20 to (2 to 3,2; 14)	25.1 (2.5 to 3.2; 1	11.3 to (1.1 to 1.4; 8	8.11 (0.8 to 1;
	Gearbox type Application	Main shaft nut	Bevel pinion shaft securing nut	Nuts securing differential speed gear casing and clutch-speed gear casing to intermediate flange	Screws securing shoulder plate to intermediate flange	Containers for the laking of spring and balls securing rods	Nut securing speed control rear lever to speed selection and engagement lever (1)	Nut securing joint connecting rear lever to speed control rod (1)	Nut securing ball joint connecting rear lever to transmission lever (2)	Nut securing speed selection tie rod (2)	Bolt securing speed selection and transmission lever to speed transmission and engagement lever (2)

Application	/ith roller-ball compound bearings	With skew ball bearings
Bolt and screw securing bracket to speed gear rubber pad (2)	8.11 (0.8 to 15	.1 to 10 1 5.8; to 7.2)
Bolts securing speed gear unit rubber pads to casing	18.6 (1.9 to 2.3;	18.6 to 23 2.3; 13.7 to 16.6)
Fast idle switch (on intermediate flange)	40 1 (4.1 to 4.9;	40 to 48 4.9; 26.9 to 35.4)
Screws securing clutch unit to differential speed gear unit	29 to (2.9 to 3.2; 2	29 to 32 3.2; 21 to 23.1)
Screws securing propeller shaft joint to clutch shaft fork	55 to 57 (5.6 to 5.8) (40.5 to 41.9)	39 to 49 (4 to 5) (28.9 to 36.1)
Unions for clutch hydraulic system pipes	8 to (0.8 to 1; 5	8 to 10 1; 5.8 to 7.2)
Unions for clutch hydraulic system hoses	10 t (1 to 1.5; 7	to 15 7.2 to 10.8)
Screws securing forks of 1st-2nd-3rd and 4th speed	21 to (2.1 to 2.3;	to 23 ; 15.2 to 16.6)
Screws securing speed gear-differential unit to lateral support small block	18.6 to (1.9 to 2.4; 13	to 23.5 13.7 to 17.3)
Screws (lower) securing speed control lever support to body	20 to (2 to 3.25; 1	20 to 32.5 3.25; 14.5 to 23.5)
Screws (upper) securing speed control lever support to body	4.8 (0.5 to 0.6;	4.8 to 6 0.6; 3.6 to 4.3)
Nut securing plate for Reverse speed engagement safety device	8.3 to (0.9 to 1.05;	5 10.3 5; 6.5 to 7.2)
Bolt securing lever to external speed control rod	13 to 1.6;	13 to 16 1.6; 9.4 to 11.6)

# TROUBLE DIAGNOSIS AND CORRECTIVE ACTION

Condition	Probable cause	Corrective action
Transmission is faulty when in for- ward speeds	Once detected where the noise comes from an the engine, proceed as follows in order to, in a run the car to the speed where noise is many adjusting the speed as required, change quences - all different speeds	dentify the faulty unit
	Once determined the cause of the noise, rep	air or replace the faulty components
	Oil level insufficient or oil not of the prescribed type	Fill-up to proper level or replace oil with the prescribed type
	Oil leaks from oil seal rings of differen- tial carrier a/o from topping-up or drain plugs	Replace oil seal rings a/o plugs
	<ul> <li>Main shaft bearings (in this case, noise should be present also with speed gear in neutral)</li> </ul>	Replace bearings
	<ul> <li>Pinion shaft bearings (noise present only if speed is engaged and this with all speeds)</li> </ul>	Replace bearings
Noisy when vehicle is moving even if speedgear is in neutral	Bearings of differential inner drive shafts faulty or seized	Replace bearings
	Bevel pinion bearings noisy	Check a/o replace
Noisy when in one particular speed	Gear teeth mating surfaces worn or seized	Replace gears
Noisy both during acceleration and deceleration (drive shafts already checked)	Differential gears worn or damaged	Replace gears
	Hypoid gear excessive clearance	Verify and replace if necessary
	Crown wheel and pinion securing screws loosened	Tighten the screws
	Bevel pinion shim (determining pin- ion-crown axis distance) worn or da- maged	
	Pinion shaft securing nut loosened	Check speed gear components a tighten nut
	Gear package excessive clearance	Adjust package

Condition	Probable cause	Corrective action		
Transmission noisy when in curve, both with speed engaged and when in "neutral" (drive shafts already	Teeth of side pinion and crown wheel gears worn, damaged or seized	Replace differential casing		
checked)				
Transmission noisy when in "neu-tral" (with vehicle stationary)	Driving torque irregular variation	Adjust idling r.p.m.		
	Not enough oil	Fill up to correct level		
Transmission noisy when in reverse speed	Reverse gears worn or damaged	Replace the faulty components		
Speed engagement/disengagement is difficult	First of all, determine whether trouble is due to speed gear or control system.  Check whether clutch correctly engages when pedal is released and disengages when pedal is pressed. If clutch s not faulty, the trouble is due to speed gear control system.			
Stiffening of speed gear control a/o non-return of lever to neutral	<ul> <li>Excessive friction in the rotation of tie rod joints of speed transmission and engagement lever</li> </ul>	Replace selection tie rod and central ball joint of speed transmission and engagement lever		
	<ul> <li>Excessive tightening between speed transmission and selection lever bush and speed transmission and engage- ment lever</li> </ul>	Replace levers, shoulder rings, bushes and pin		
	<ul> <li>Insufficient lubrication of speed trans- mission and selection lever and speed transmission and engagement lever bushes</li> </ul>	Grease the points subject to friction		
	<ul> <li>O-rings for speed transmission and selection lever broken or too worn, with consequent water a/o dust see- page</li> </ul>	Replace O-rings and grease pin of speed transmission and selection lever		
	<ul> <li>Insufficient oil level in the differential- speed gear casing</li> </ul>	Restore oil correct level		
	Synchronizing unit faulty	Refer to: "Synchronizing unit grinds or is faulty"		
	<ul> <li>Inner controls deformed or worn</li> </ul>	Repair or replace the faulty components		
Excessive clearance in speed selection	<ul> <li>Abnormal wear of pin and related bushes connecting speed transmis- sion and engagement lever with speed transmission and selection lever bush</li> </ul>	Replace the worn components		

Condition	Probable cause	Corrective action		
Noisy	<ul> <li>Incorrect positioning of the unit in the longitudinal direction with interfer- ences</li> </ul>	Verify a/o adjust control assembly position		
	<ul> <li>Interference with rear floor sidewall</li> </ul>	Rivet the area concerned		
Speed slip out	Sleeves and gears worn or faulty	Replace the worn components		
	<ul> <li>Excessive clearance of the gear which becomes disengaged (Noise present both in acceleration and deceleration)</li> </ul>	Verify gear package adjustment		
Speed engagement is poor	Control levers bushes worn	Replace the worn components		
	Pawls worn or damaged	replace pawls		
· · · · · · · · · · · · · · · · · · ·	Springs fatigued or broken	Replace springs		
	Rods milling warn or damaged	Replace rods		
	Selector fork a/o lever worn or da- maged	Replace selector a/o levers		
Synchronizing unit grinds or is faulty	Sleeve and gear with front toothing worn or damaged	Replace the faulty components		
	<ul> <li>Incorrect distance between front toothing of gear and sleeve</li> </ul>	Replace the faulty components		
	Synchronizing ring worn	Replace		
	Sleeve splines worn or damaged	Replace		
Reverse lights do not light when engaging the Reverse speed	Reverse lights switch faulty	Replace switch		
Speed selector lever vibrates and is noisy	Lever return spring fatigued	Replace the faulty components		
	Speed control lever bushes faulty	Replace the faulty components		
	Refer to other steps concerning the noisy speed			

Condition	Probable cause	Corrective action	
Seizure or breakage	<ul> <li>Insufficient oil level or oil not of the prescribed type</li> </ul>	Replace the faulty components and use the prescribed oil	
	Insufficient clearances	Adjust clearances and replace the faulty components	
	Gears and bearings incorrect adjust- ment	Check the speed gear unit	
	Excessive torque or improper use of clutch	Replace the faulty components	
	Securing screws loosened	Replace the faulty components and restore the rightening torques	

# SPECIAL SERVICE TOOLS

Tool number	Tool name	Page ref.
A.2.0075	Support for jacking up car	13-6
A.2.0267	Dummy rods for striking rod balls and speed engagement detent balls.	13-13
A.2.0268	Spacer for removing De Dion axle	13-6
A.2.0349-0100	Half-ring support plate for disassembling ring nut and inner race of pinion shaft bearing (to be used with A.2.0401 and A.2.0402)	13-20
A2.0401	Half-rings for removing inner race of pinion shaft rear bearing - (to be used with A.2.0349/0100)	13-20
A.2.0402	Half-rings for removing ring nut of pinion shaft rear bearing - (to be used with A.2.0349-0100)	13-20
A.3.0192	Puller-driver for outer race of pinion shaft bearing on intermediate flange (Solutions with intermediate roller/ball bearings)	13-22 13-27
A.3.0343	Driver for main shaft oil seal ring	13-33
A.3.0346	Driver for pinion shaft bush	13-32

Tool number	Tool name	Page ref.
A.3.0361	Puller for inner race of main shaft rear bearing	13-20
A.3.0407	Puller-driver for outer race of pinion shaft intermediate bearing (Solution with intermediate skew ball bearings)	13-21 13-26
A.3.0408	Puller-driver for outer race of pinion shaft intermediate bearing (Solution with intermediate skew ball bearings)	13-21 13-26
A.3.0532	Driver for bush of speed selection and engagement rod.	13-32
A.3.0596	Puller-driver for outer race of main shaft bearing on intermediate flange (Solution with intermediate roller/ball bearings)	13-22 13-27
A.4.0145	Support of gauge for determining pinion shim (to be used with C.6.0166)	13-18 13-29
A.5.0181	Wrench, 30 mm. for main shaft nut	13-18 13-29
A.5.0216	Spanner for plug of speed control rod ball	13-14 13-15
C.6.0166	Reference gauge for determining pinion shim (to be used with A.4.0145)	13-18