Drive pinion and hollow shaft, disassembling and assembling

Special tools and equipment

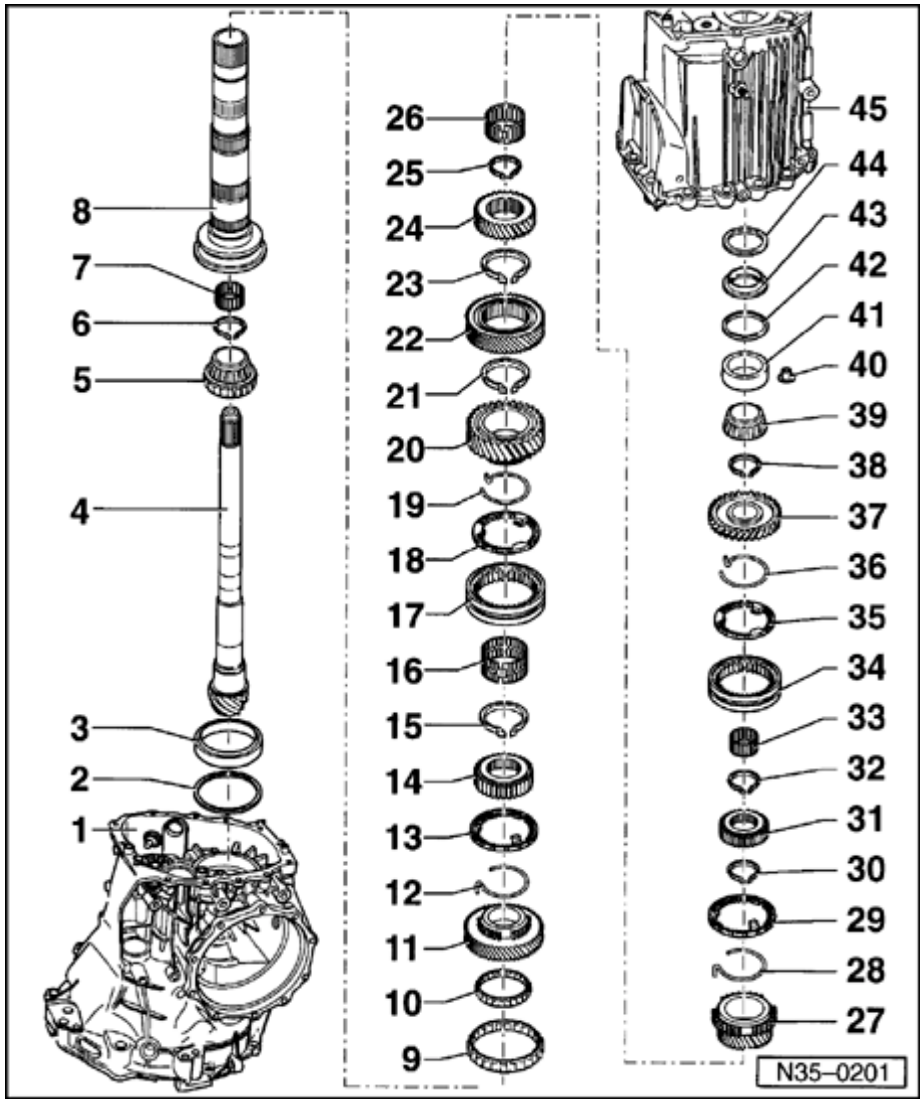
- VW401 thrust plate
- VW402 thrust plate
- VW407 punch
- VW411 punch
- VW412 thrust disc
- 415A tube
- 416B tube
- 418A tube
- 429 thrust ring
- VW4471 thrust pad

- VW454 thrust tube
- VW519 sleeve
- VW771 slide hammer-complete set

35-22

- 40-103 sleeve
- 2010 sleeve
- 3062 thrust pad
- 3128 bushing puller
- Kukko 17/2 separating tool
- Kukko 21/1 puller

35-23



Notes:

- *When installing new gears or the final drive set, consult technical data ⇒ Page 00-3 .*
- *Adjustments are required when replacing components marked by1) ⇒ Page 39-37 , List of adjustments*

1 - Transmission housing

2 - Shim S3

- List of adjustments overview ⇒ Page 39-37

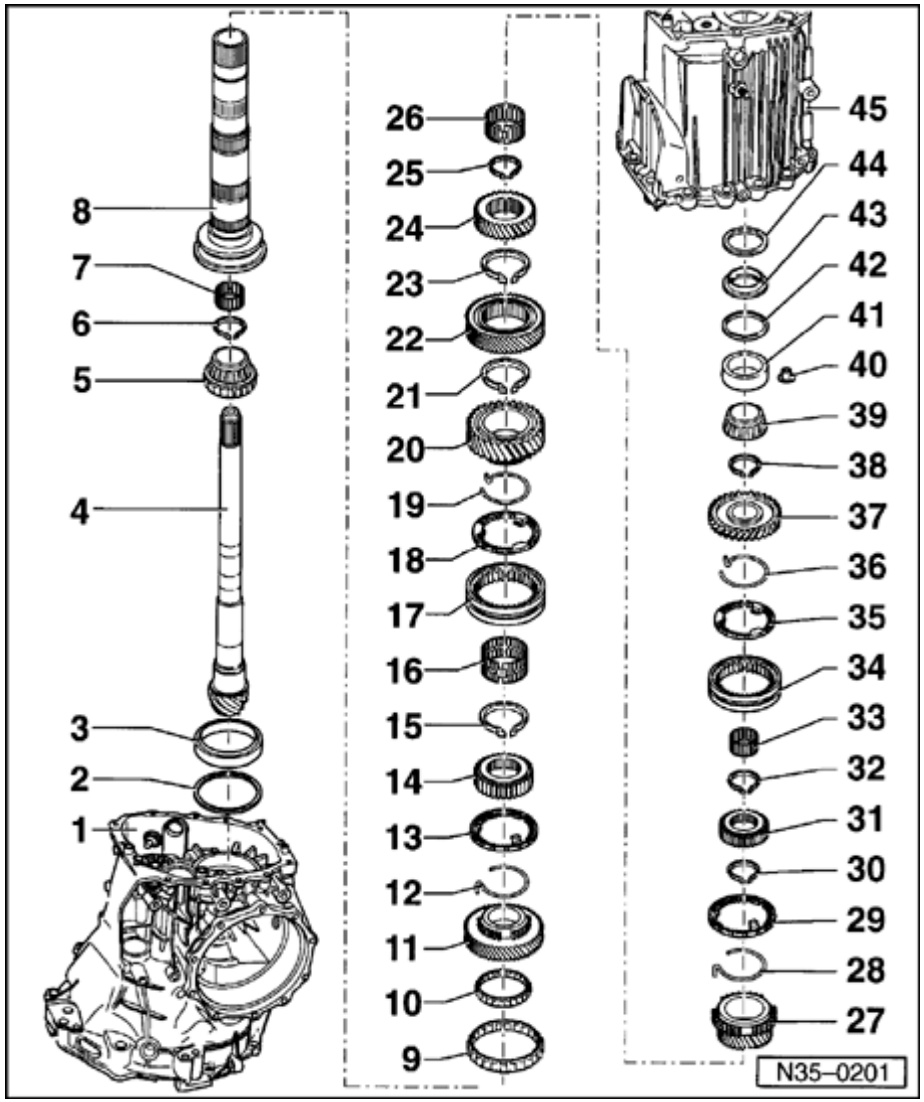
3 - Double tapered roller bearing outer race1)

- Replace together with item - 5 -
- Pulling out ⇒ Fig. 1
- Pressing in ⇒ Fig. 3

4 - Drive pinion

- Matched to ring gear, always replace together as a set
- Adjusting drive pinion and ring gear ⇒ Page 39-34

35-24



5 - Double tapered roller bearing inner race1)

- Always replace
- Damaged when removed
- Pressing off ⇒ Fig. 2
- Pressing on ⇒ Fig. 4

6 - Circlip

- Re-determine thickness if double roller bearing is replaced ⇒ Fig. 5

7 - Needle bearing for hollow shaft1)

- For drive pinion in hollow shaft
- Lubricate with MOS2 grease

8 - Hollow shaft1)

9 - Needle bearing for 1st gear

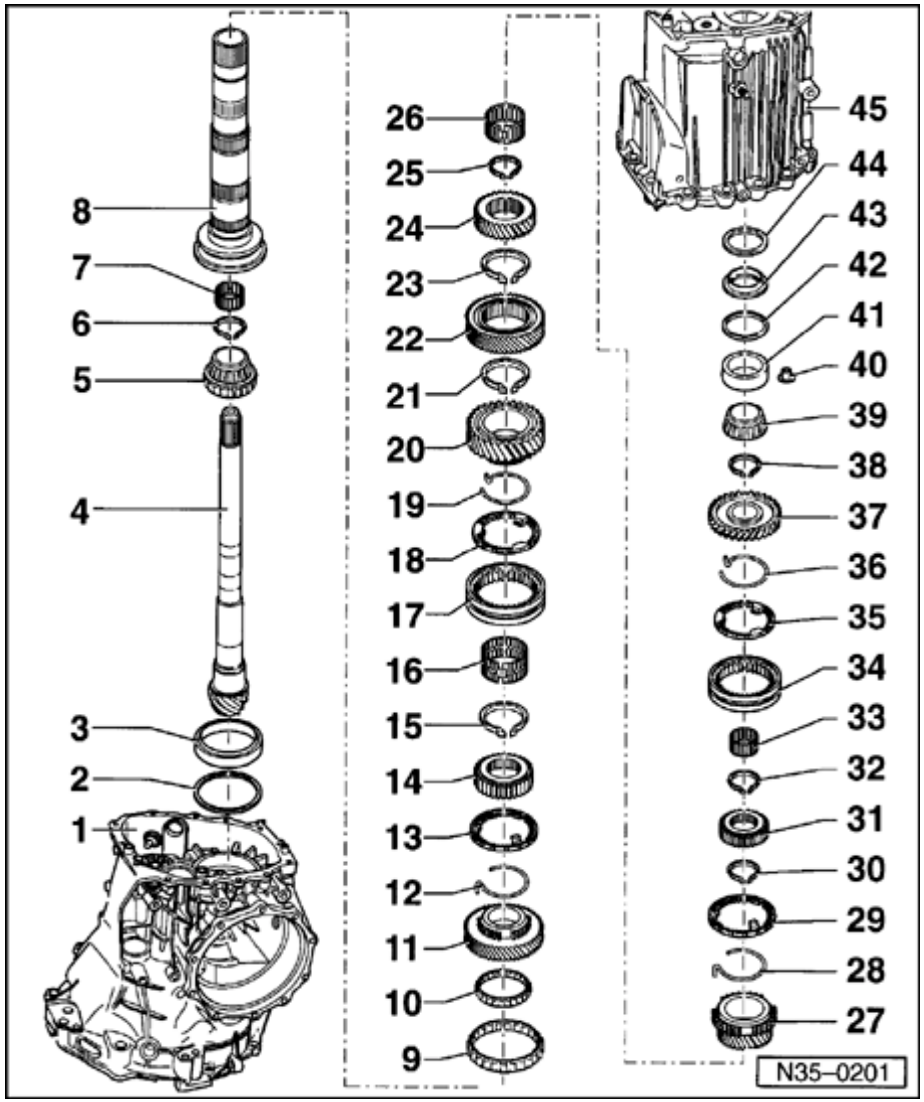
10 - Needle bearing for 1st gear

11 - 1st gear

12 - Spring

- Inserting in 1st gear ⇒ Fig. 16
- Application of spring to gear ⇒ Parts catalog

35-25



13 - Synchronizer ring for 1st gear

- Checking for wear ⇒ Fig. 17

14 - Synchronizer hub for 1st and 2nd gear

- Pressing off ⇒ Fig. 14
- Pressing on ⇒ Fig. 18

15 - Circlip

- Identification
- Allocation ⇒ Fig. 15 , item -1-
- Re-determining thickness if synchronizer hub is replaced ⇒ Fig. 5

16 - Needle bearing for 2nd gear

17 - Operating sleeve for 1st and 2nd gear

- Allocation ⇒ Fig. 19

18 - Synchronizer ring for 2nd gear

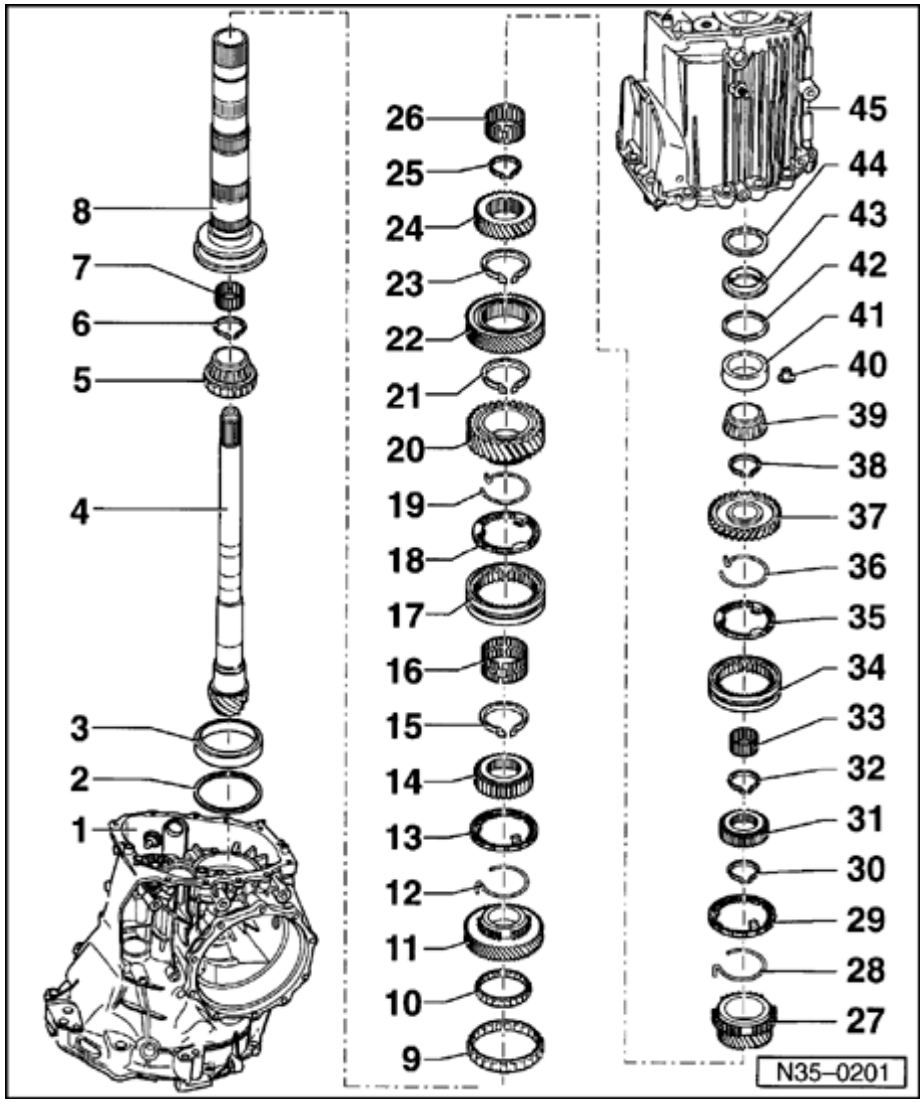
- Checking for wear ⇒ Fig. 17

19 - Spring

- Inserting in 2nd gear ⇒ Fig. 16
- Application of spring to gear ⇒ Parts catalog

20 - 2nd gear

35-26



21 - Circlip

- Identification
- Allocation ⇒ Fig. 15 item -2-

22 - 3rd gear

- Pressing off ⇒ Fig. 13
- Pressing on ⇒ Fig. 20

23 - Circlip

- Identification
- Allocation ⇒ Fig. 15 , item -3-
- Re-determining thickness if 3rd gear is replaced ⇒ Fig. 5

24 - 4th gear

- Pressing off ⇒ Fig. 12
- Pressing on ⇒ Fig. 21

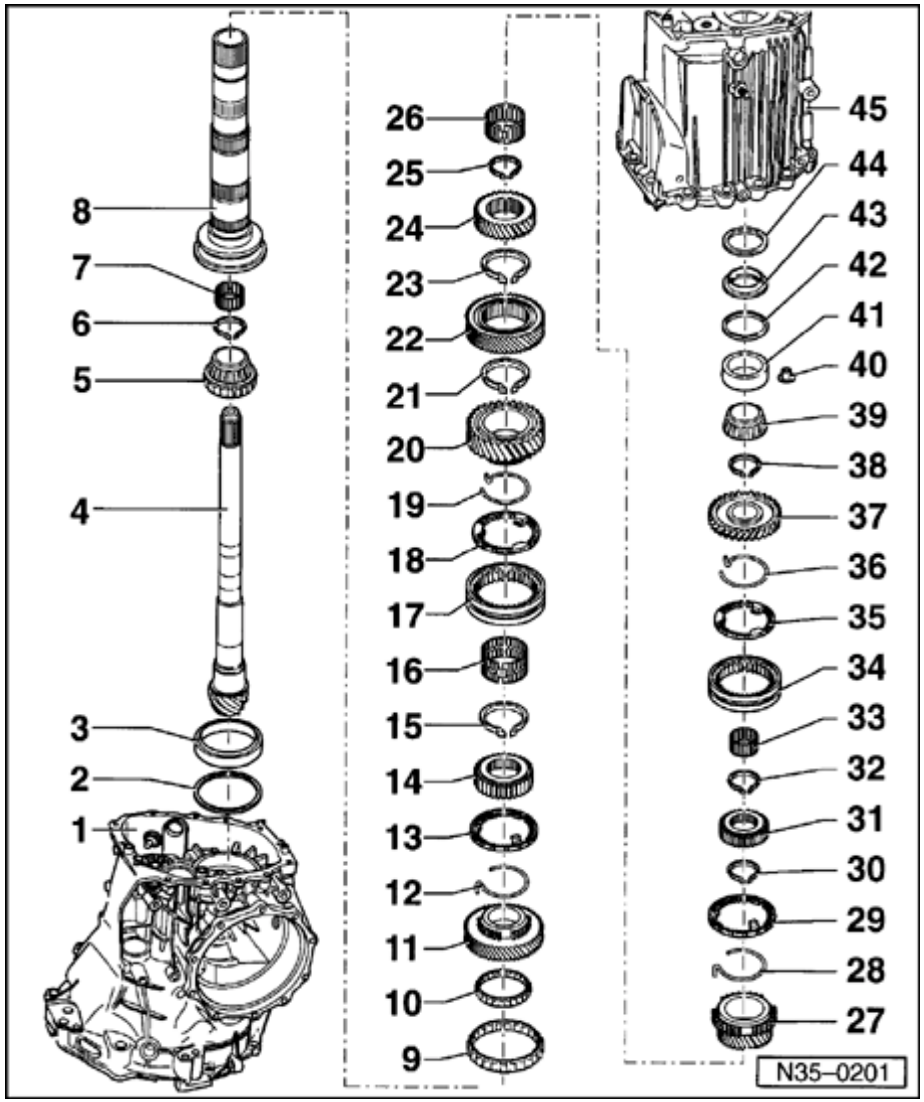
25 - Circlip

- Identification
- Allocation ⇒ Fig. 15 , item -4-
- Re-determining thickness if 4th gear is replaced ⇒ Fig. 5

26 - Needle bearing

27 - 5th gear

35-27



28 - Spring

- Inserting in 5th gear ⇒ Fig. 16
- Application of spring to gear ⇒ Parts catalog

29 - Synchronizer ring for 5th gear

- Checking for wear ⇒ Fig. 17

30 - Circlip

- Identification
- Allocation ⇒ Fig. 15 , item -5-

31 - Synchronizer hub for 5th gear and reverse gear

- Pressing off ⇒ Fig. 11
- Pressing on ⇒ Fig. 22

32 - Circlip

- Identification
- Allocation ⇒ Fig. 15 , item -6-
- Re-determining thickness if synchronizer hub is replaced ⇒ Fig. 5

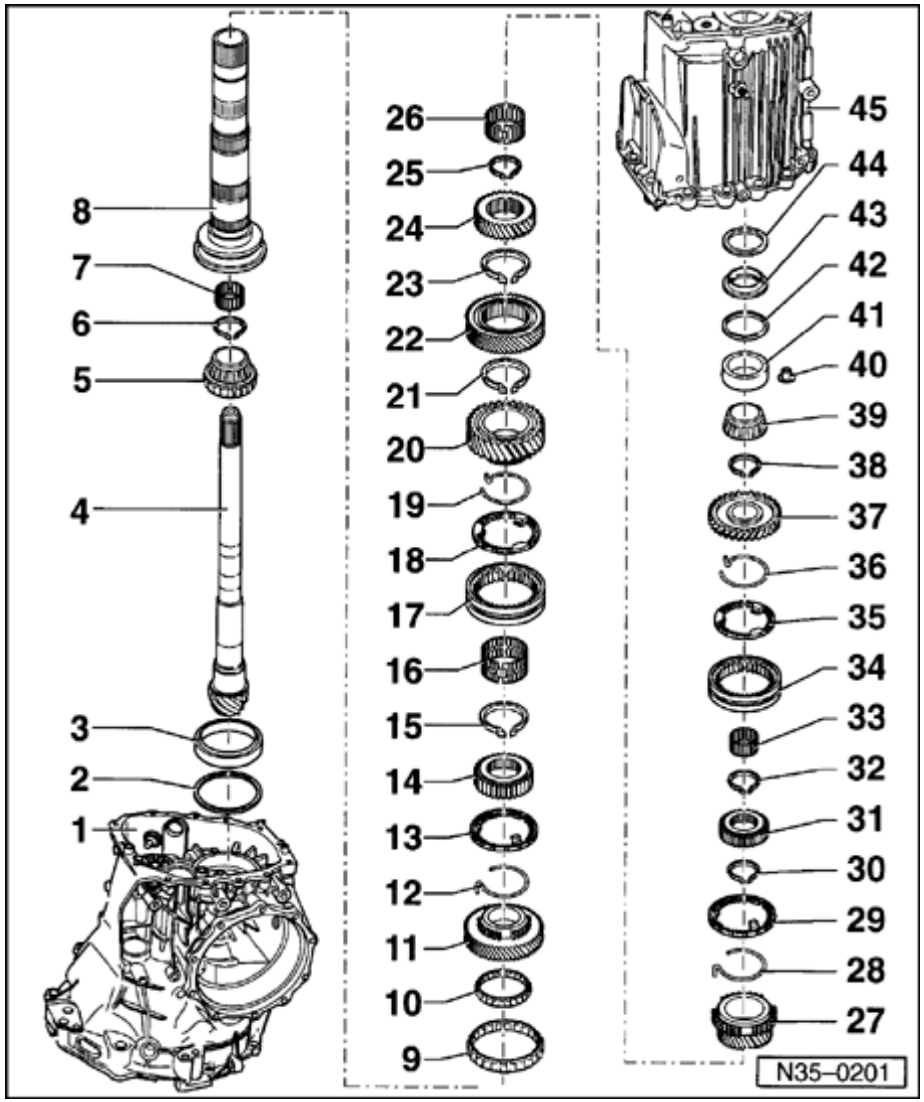
33 - Needle bearing

- For reverse gear

34 - 5th and reverse gear operating sleeve

- Allocation ⇒ Fig. 23

35-28



35 - Synchronizer ring for reverse gear

- Checking for wear ⇒ Fig. 17

36 - Spring

- Insert in reverse gear ⇒ Fig. 16
- Application of spring to gear ⇒ Parts catalog

37 - Reverse gear

38 - Circlip

- Identification
- Allocation ⇒ Fig. 15 , item -7-

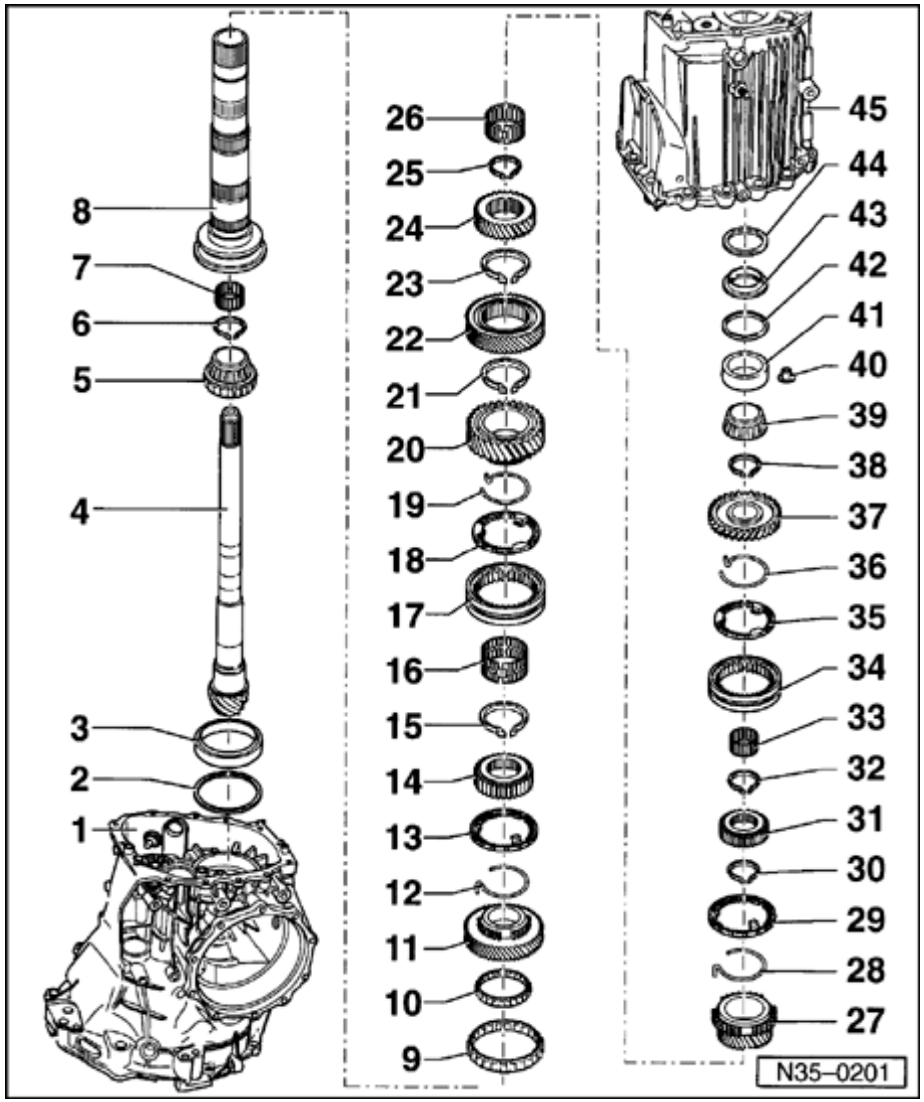
39 - Tapered roller bearing inner race1)

- Pressing off ⇒ Fig. 9
- Pressing on ⇒ Fig. 10

40 - Bushing

- To secure small tapered roller bearing outer race
- Pulling out ⇒ Fig. 6
- Does not need to be installed after small tapered roller bearing has been replaced

35-29



41 - Tapered roller bearing outer race1)

- Pressing out ⇒ Fig. 7
- Pressing in ⇒ Fig. 8

42 - Shim S4

- List of adjustments ⇒ Page 39-37

43 - Ring

- Holds rubber washer
- Application ⇒ Parts catalog

44 - Rubber washer

- Compensates length variations
- Application ⇒ Parts catalog

45 - Transmission cover

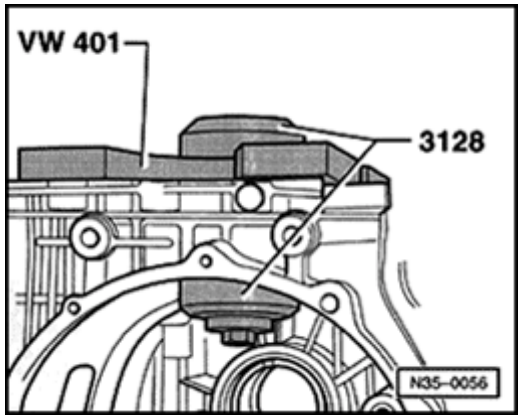


Fig. 1 Pulling out double tapered roller bearing outer race

- Remove differential ⇒ Page 39-16 .
- Place pressure piece of 3128 bushing puller below outer race.
- Install threaded part of 3128 bushing puller using VW401 thrust plate onto transmission housing.

When the bolt is tightened, the outer race will be pulled out of the housing.

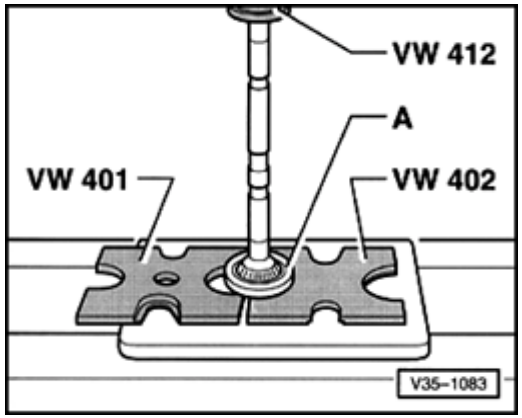


Fig. 2 Pressing off double tapered roller bearing inner race

- Remove circlip before pressing off.
- Outer race -A- must be installed to press off inner race.

Note:

When pressing off, the inner ring of the double tapered roller bearing is damaged.

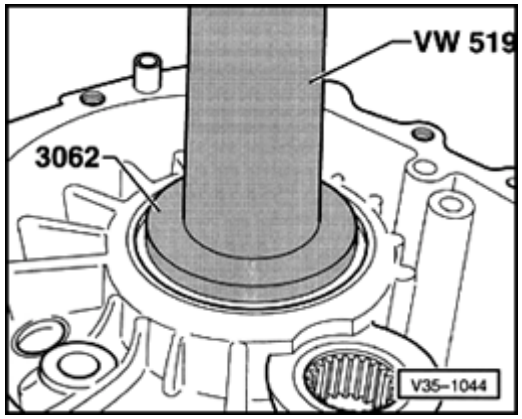


Fig. 3 Pressing in double tapered roller bearing outer race

The smaller diameter of 3062 thrust pad faces outer race.

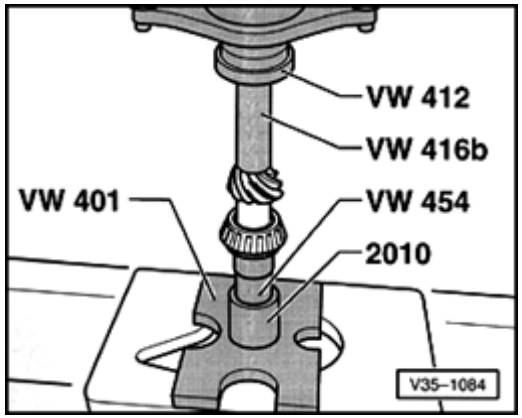


Fig. 4 Pressing on double tapered roller bearing inner race

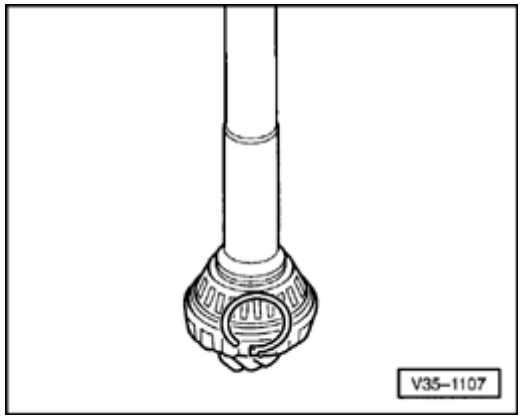


Fig. 5 Determining thickness of circlip

- Determine thickest circlip which can still just be installed and install it.
- Circlips for synchronizer hubs, needle bearings and individual gears should be determined as for double tapered roller bearing shown.

  Available circlips and part numbers ⇒ Parts catalog

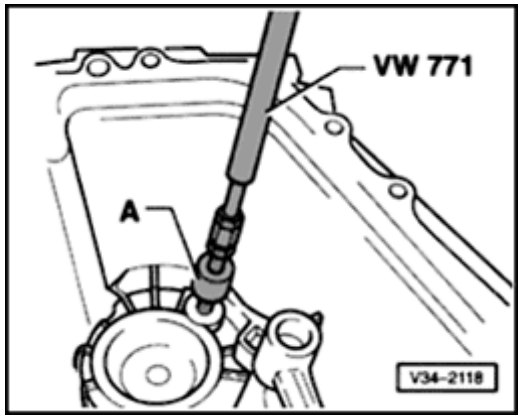


Fig. 6 Pulling out securing bushing for small tapered roller bearing outer race

A - Puller 12-14.5 mm (0.472-0.570 in.), e.g. Kukko 21/1 puller

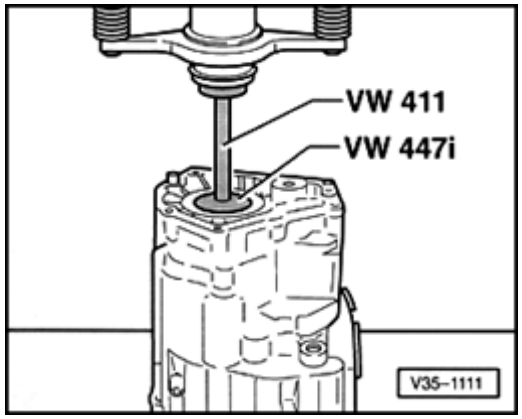


Fig. 7 Pressing out tapered roller bearing outer race

The outer race is pressed out together with pressure plate (item - 43 -), ⇒ Page 35-29 , shim S4 (item -42-) ⇒ Page 35-29 and the rubber washer for compensating length variations (item 44), ⇒ Page 35-29 .

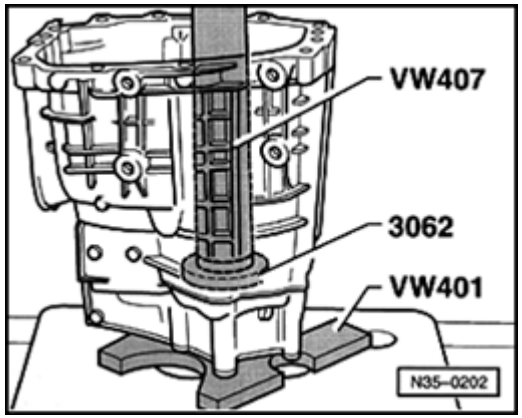


Fig. 8 Pressing in tapered roller bearing outer race

35-34

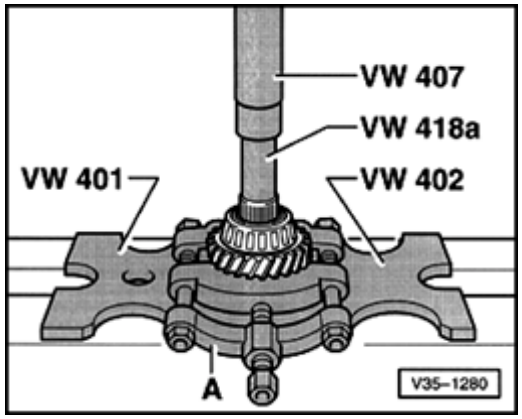


Fig. 9 Pressing off tapered roller bearing inner race

- Press off inner race together with reverse gear.

A - Separating tool 22-115 mm (0.866-0.590 in.), e.g. Kukko 17/2 separating tool

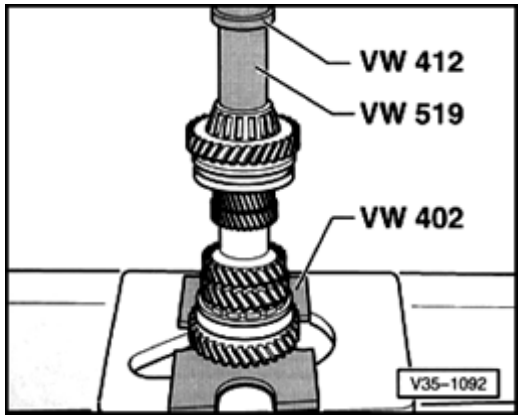


Fig. 10 Pressing on tapered roller bearing inner race

- Install circlip before pressing on inner race.

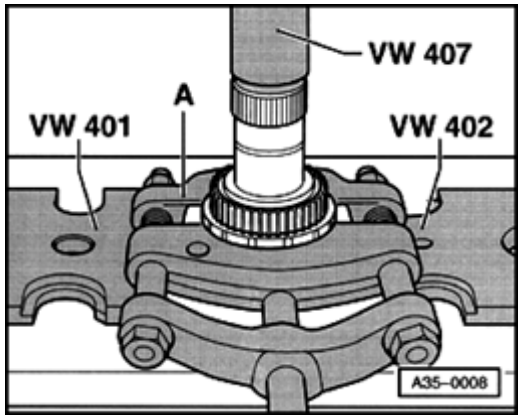


Fig. 11 Pressing off synchronizer hub for 5th gear and reverse idler gear

- Remove circlip before pressing off.
- Press off synchronizer hub together with 5th gear.

A - Separating tool 22-115 mm (0.866-0.590 in.), e.g. Kukko 17/2 separating tool

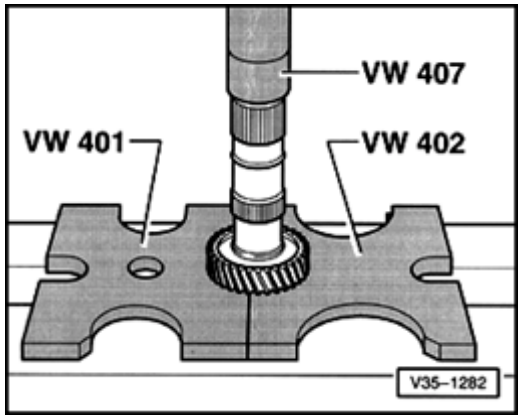


Fig. 12 Pressing off 4th gear

- Remove circlip before pressing off.

35-36

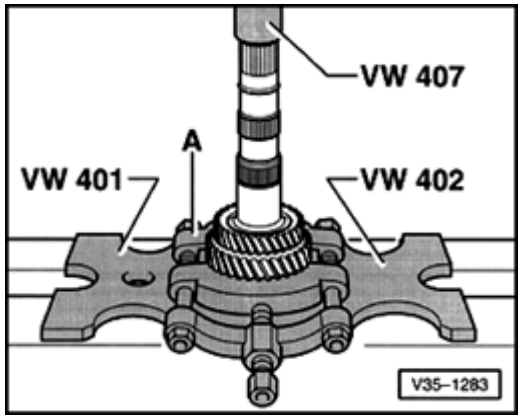


Fig. 13 Pressing off 3rd gear

- Remove circlip before pressing off.
- Press off 3rd gear together with 2nd gear.

A - Separating tool 22-115 mm (0.866-0.590 in.), e.g. Kukko 17/2 separating tool

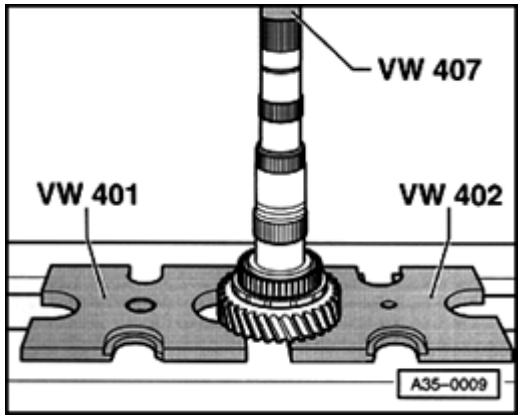


Fig. 14 Pressing off 1st and 2nd gear synchronizer hub

- Remove circlip before pressing off.
- Press off synchronizer hub together with 1st gear.

35-37

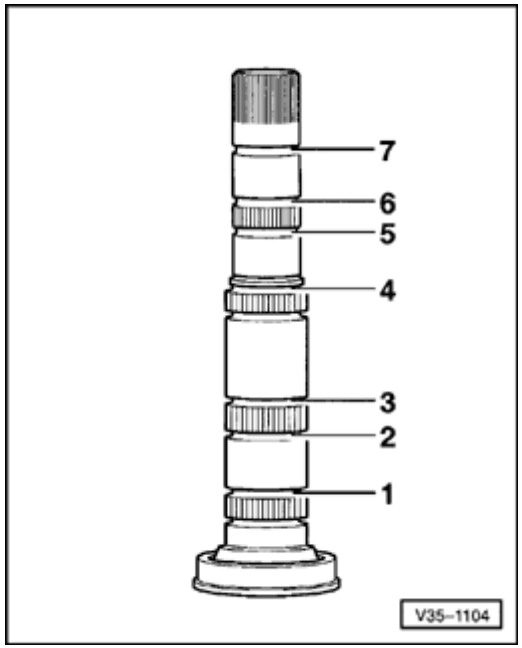


Fig. 15 Allocation of circlips

- Circlips for synchronizer hubs, needle bearings and individual gears should be determined according to Fig. ⇒ 5 .

Circlip 1- secures the 1st and 2nd gear synchronizer hub

Identification: color blue

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	

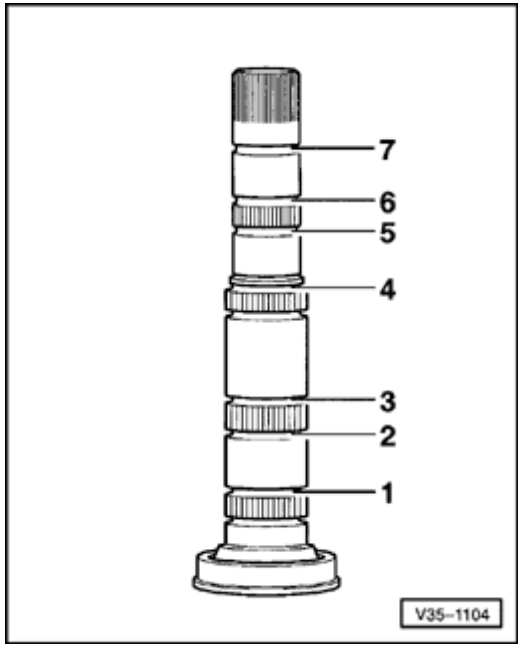
Circlip 2- secures the needle bearing/ 2nd gear

Thickness: 2.00 mm (0.078 in.). Identification: color blue

Circlip 3- secures the 3rd gear

Circlip thickness (mm)		
1.90	1.98	2.06
1.94	2.02	

35-38



Circlip -4- secures the 4th gear.

Circlip thickness (mm)		
1.86	1.94	
1.90	1.98	

Circlip -5- secures the needle bearing/ 5th gear

Thickness 2.00 mm (0.078 in.)

Identification: color brown

Circlip -6- secures the synchronizer hub for 5th and reverse gear

Identification: color blue

Circlip thickness (mm)		
1.90	1.96	2.02
1.93	1.99	2.05

Circlip -7- secures needle bearing for reverse gear

Thickness 2.50 mm (0.098 in.)

- Determine circlips according to table. Part number ⇒ parts catalog

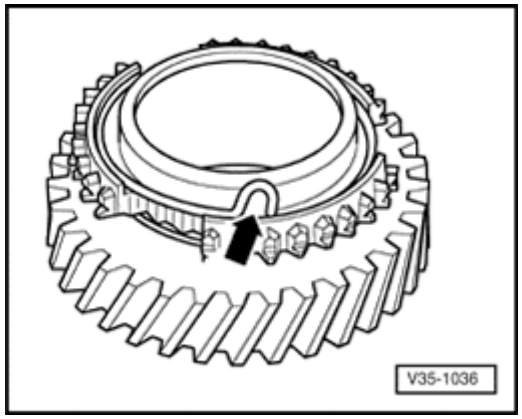


Fig. 16 Inserting spring in gear

The bent end of the spring (arrow) must be hooked into the hole in the gear.

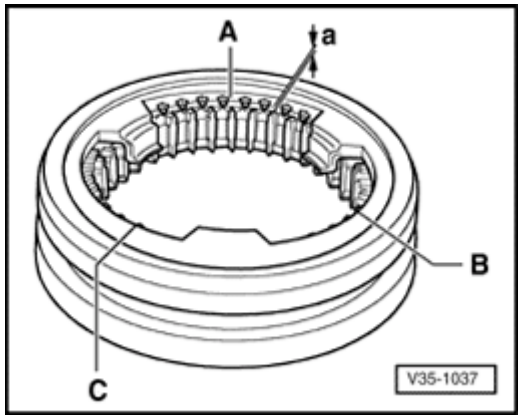


Fig. 17 Checking synchronizer ring for wear

- Press synchronizer-ring into operating sleeve and measure gap -a- using feeler gauge at positions -A-, -B- and -C-.
- Add calculated measurements and divide by 3.

The average gap must not be less than 0.5 mm (0.019 in.).

35-40

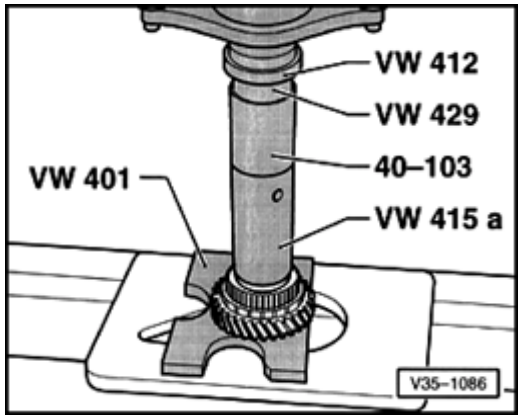


Fig. 18 Pressing on 1st and 2nd gear synchronizer hub

Allocation: higher inner collar faces 2nd gear.

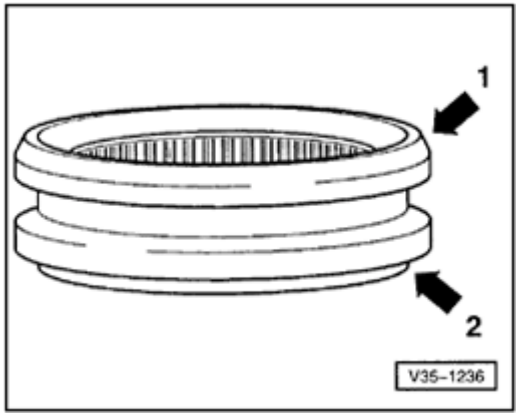


Fig. 19 Allocation of 1st and 2nd gear operating sleeve

- Chamfer (arrow -1-) faces 2nd gear.
- Stepped side (arrow -2-) faces 1st gear.

35-41

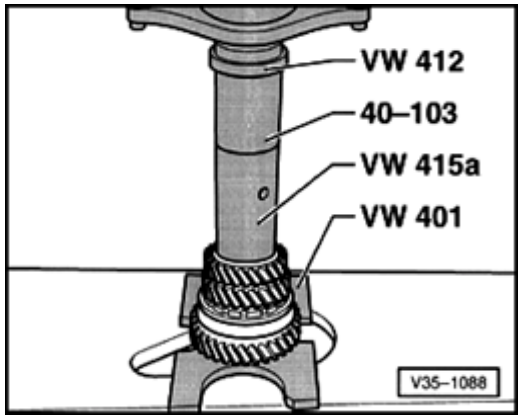


Fig. 20 Pressing on 3rd gear

Allocation: the groove on the gear faces 4th gear.

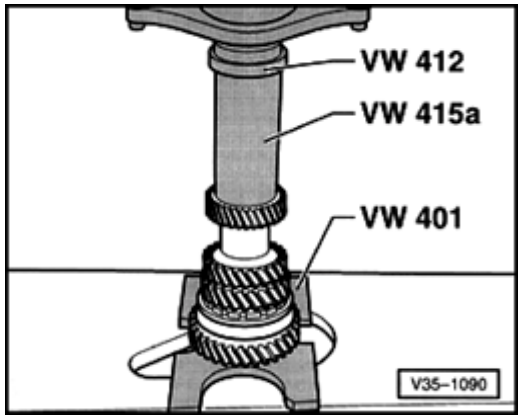


Fig. 21 Pressing on 4th gear

Allocation: higher inner collar faces 3rd gear.

35-42

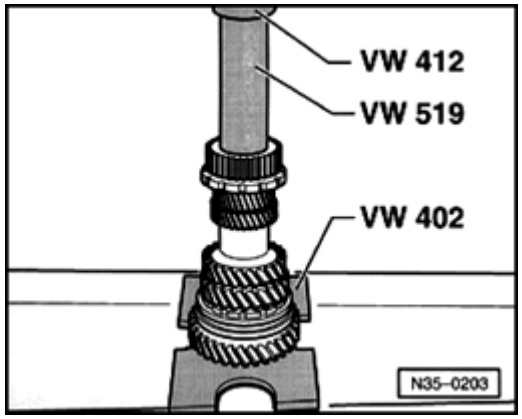


Fig. 22 Pressing on 5th and reverse gear synchronizer hub

Allocation: higher inner collar faces 5th gear.

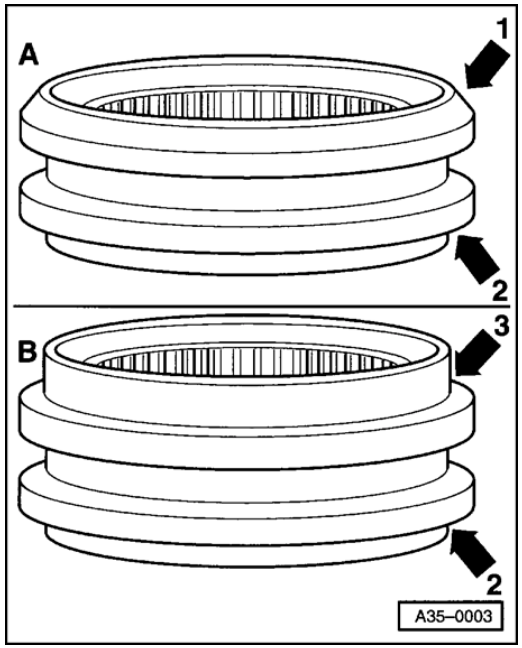


Fig. 23 Allocation of operating sleeve for 5th and reverse gears

Operating sleeves with chamfer -A- as well as operating sleeves with large offset -B- are installed.

Note the location of operating sleeve to reverse idler gear ⇒ Fig. 24 .

Allocation:

- Chamfer (arrow -1-) faces reverse idler gear
- Smaller offset (arrow -2-) faces 5th gear
- Larger offset (arrow -3-) faces reverse idler gear

35-43

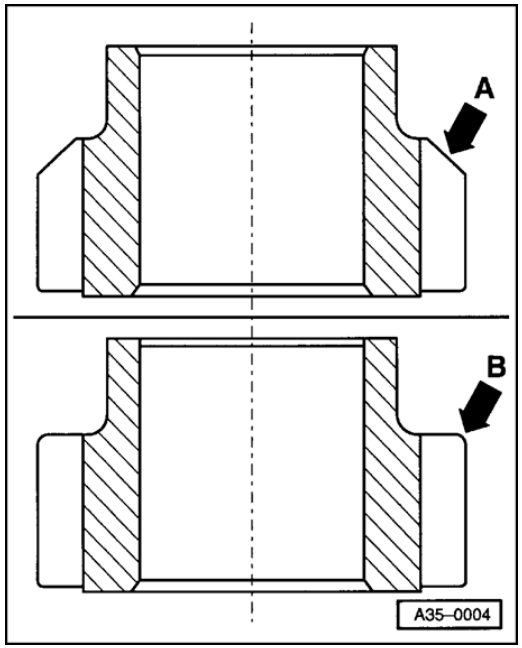


Fig. 24 Allocation of operating sleeve to reverse idler gear

On the reverse idler gear -A- both types of operating sleeves (with chamfer or with large offset) can be installed.

On reverse idler gear -B- without chamfer only operating sleeves with large offset can be installed. Do not install operating sleeves with chamfer.