

# **Manuale di riparazione**

## ***Repair manual***

**SD 10**

**SD 12**

Release: October 2008

Part number **310.01.0077d**

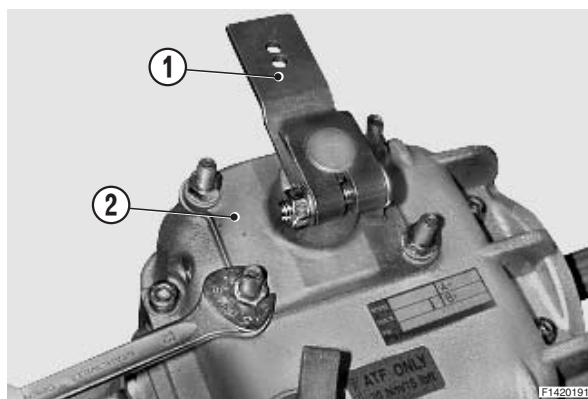
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## Disassembly

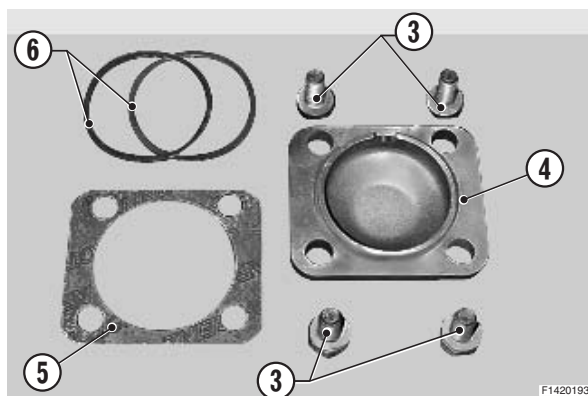
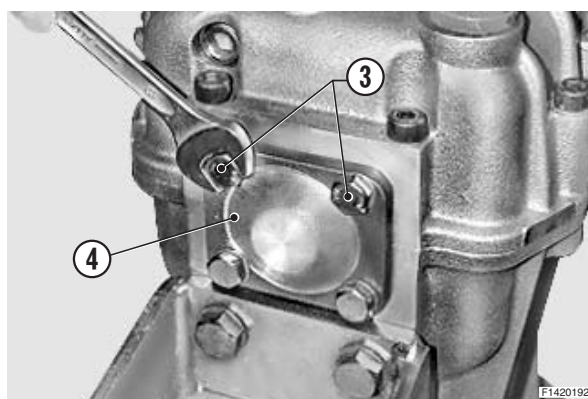
- 1 - Put the shifting lever (1) in neutral
- 2 - Remove the shifting lever cover assy (2).



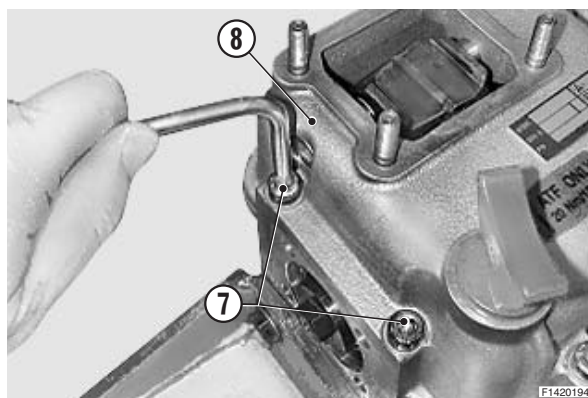
- 3 - Unscrew the 4 bolts (3) , remove the cover (4) , paper gasket (5) and the shims (6).

**NOTE**

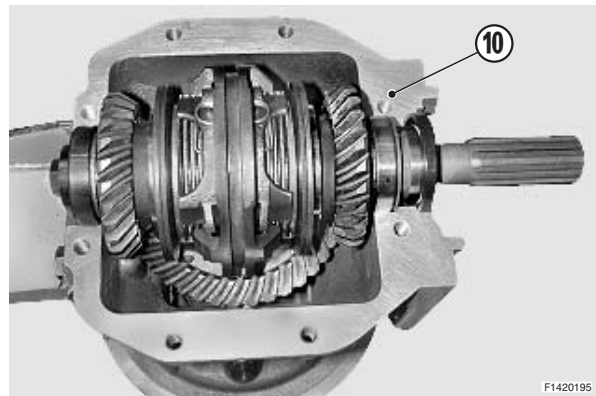
- Take note of the total thickness of shims (6) because during the reassembly they have to be mounted in the original position.



- 4 - Unscrew the 8 screws (7).
- 5 - Remove the upper housing (8).



- 6 - Remove the input shaft assembly (9) from the lower housing (10).

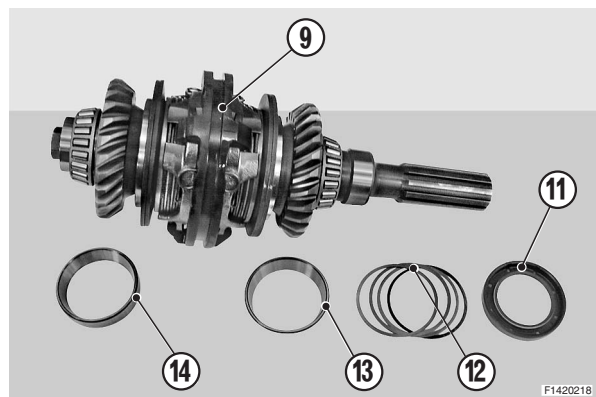


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- 7 - Remove from the input shaft assembly (9) the input shaft seal (11), the shims (12) and the taper roller bearing outer races (13) and (14).

**NOTE**

- Take note of the original shims (12) because during the reassembly they have to put in the original position.
- Mark the input shaft side taper roller bearing outer race (13) to prevent exchange of position on reassembly.

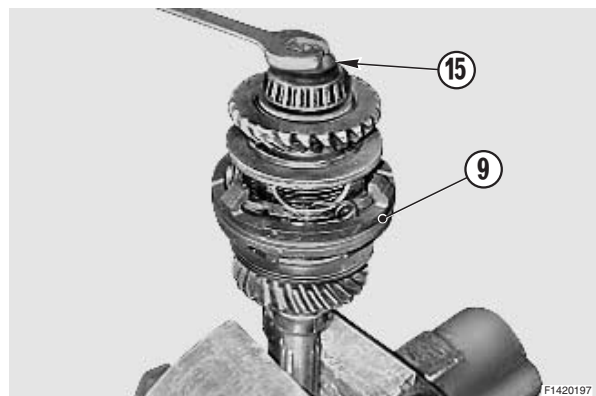


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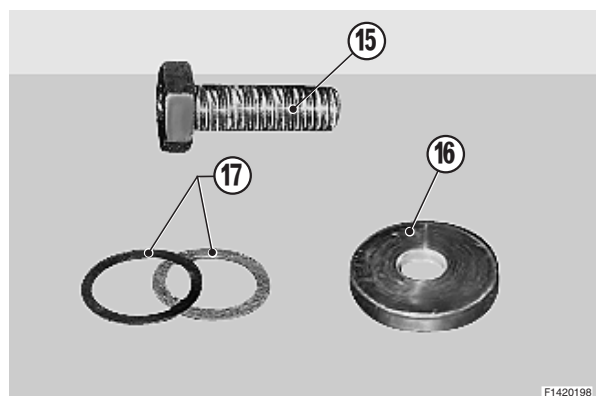
- 8 - Put the input shaft assembly (9) in a vice, unscrew the hex head screw (15) and remove the washer (16) and the shims (17).

**NOTE**

- Take note of the total thickness of the original shims (17) because during the reassembly they have to be mounted in the original position.



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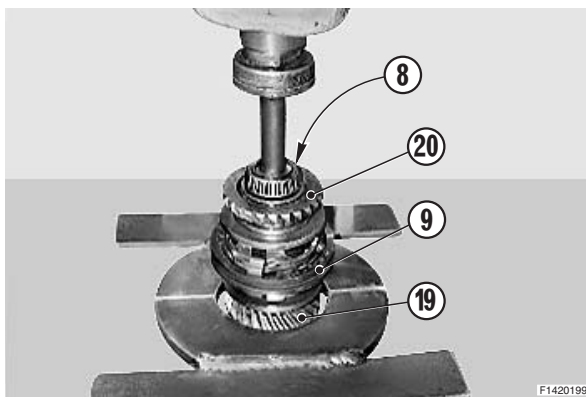


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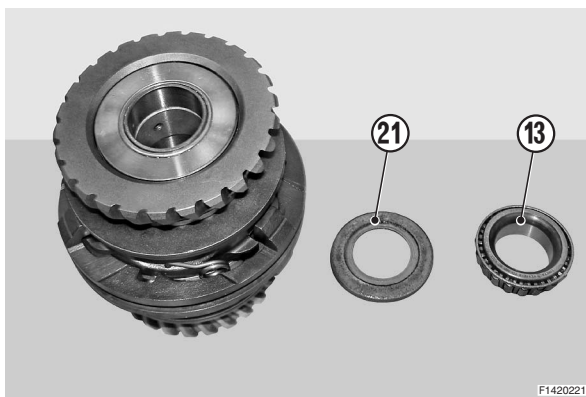
9 - Put the input shaft assembly (9) below a press (spline facing down) and remove the input shaft (8).

**NOTE**

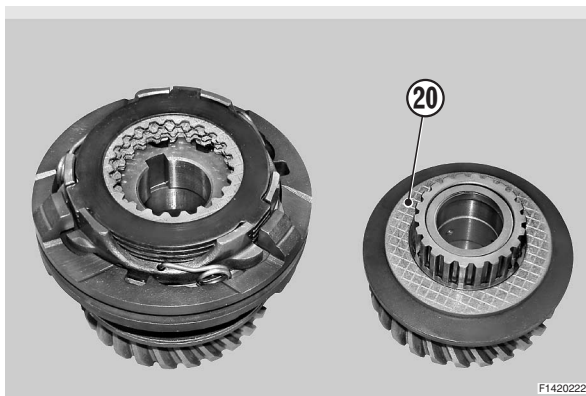
- Half rings have to be positioned only below the gear Z = 26 (19).
- Mark gear (19) and (20) to prevent errors in reassembly.



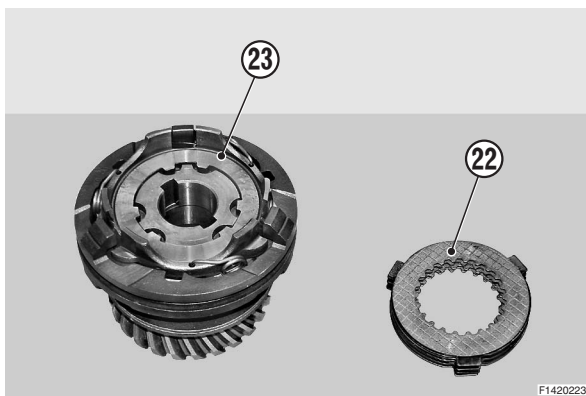
10 - Remove the tapered roller bearing inner race (13), and the butting ring (21).



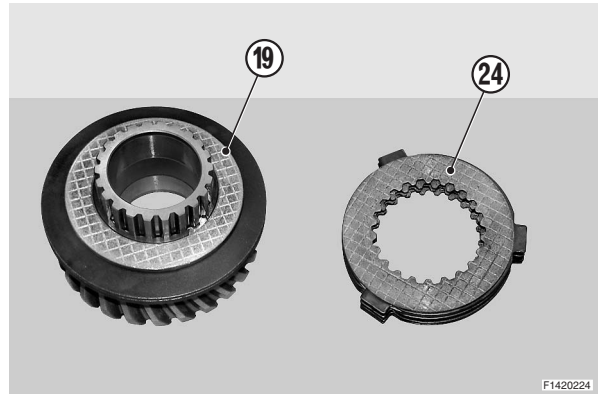
11 - Remove the gear (20).



12 - Remove the clutch pack (22) and the actuating sleeve (23).



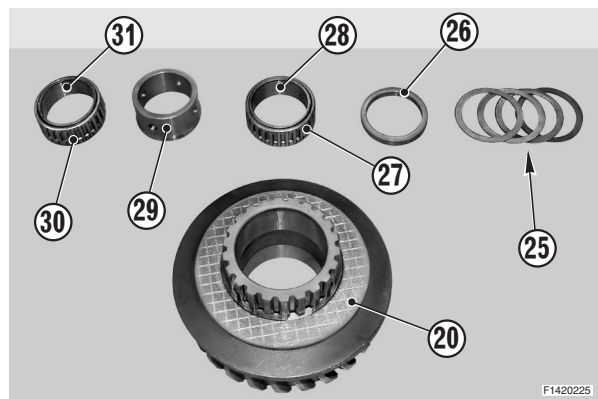
13 - Remove from the gear (19) the clutch pack (24).



14 - Remove from the gear (20) the shims (25), the spacer (26), the needle roller bearing (27) and its inner race (28), the spacer (29) and the needle roller bearing (30) and its inner race (31).

**NOTE**

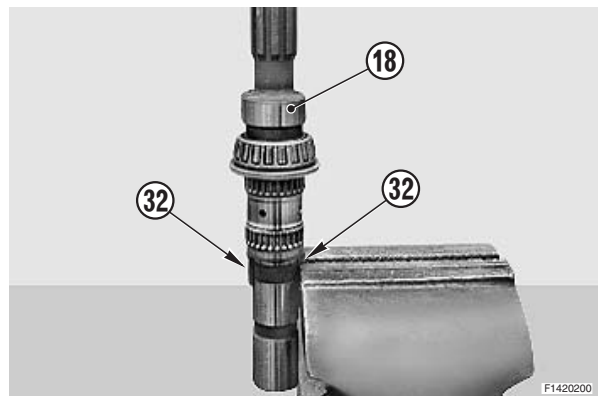
- Do not separate the needle roller bearings (27) and (30) from their related inner races (28) and (31).



15 - Remove the 2 keys (32) from the input shaft (18).

**NOTE**

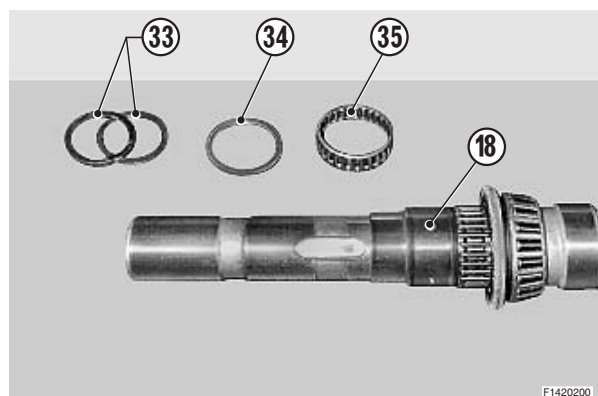
- During removal the keys can be damaged and therefore they have to be replaced every time.



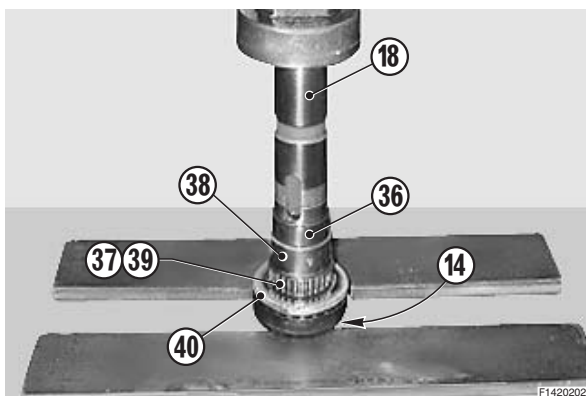
16 - Remove from the input shaft (18) the shims (33), the spacer (34) and the needle roller bearings (35).

**NOTE**

- Take note of the total thickness of the original shims (33) because during the reassembly they have to be mounted in the original position.



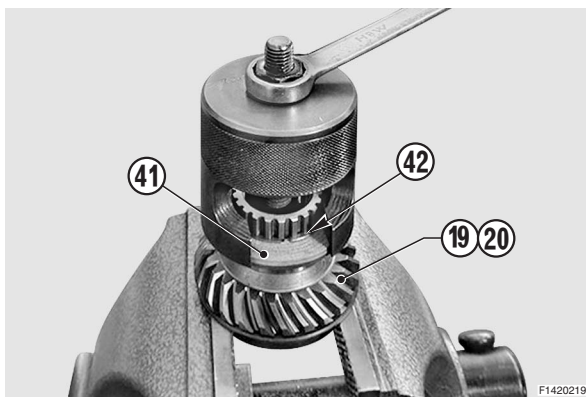
17 - Temporarily mount the taper roller bearing outer race (14) and, using half rings below the taper roller bearing outer race (14), remove from the shaft (18) the inner bearing inner races (36) and (37), the spacer (38), the needle bearing (39), the butting ring (40) and the taper roller bearing (14).



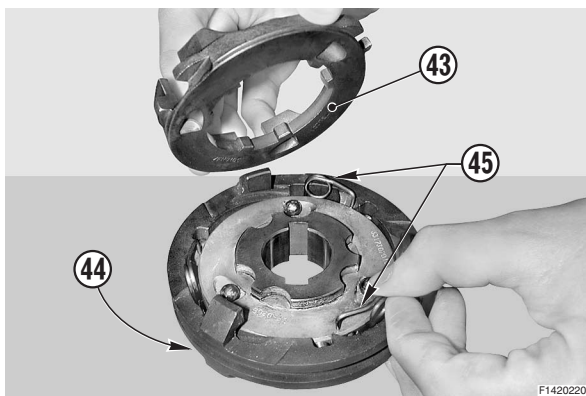
18 - Using a proper tool press the end disc (41) and remove from gears (19) and (20) the snap ring (42) and the end disc (41).

**NOTE**

- Replace the end discs (41) each time the clutch discs are changed.

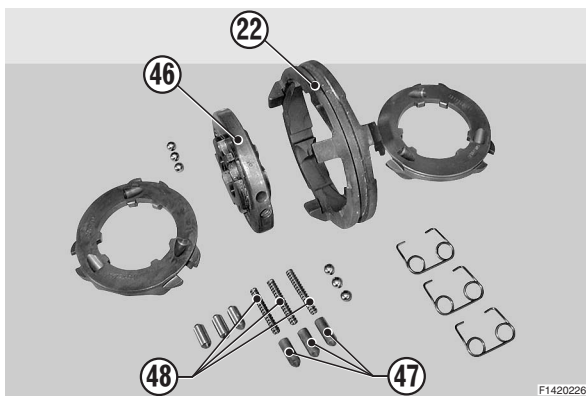


19 - Only if necessary, disconnect from the disc carrier (43) and (44) the springs (45) and remove them.



20 - Place actuating sleeve (22) on a plane surface and press out guide sleeve (46).

21- Watch for detent pins (47) and springs (48) jumping off the guide sleeve. It will be advisable to wrap a rag around the actuating sleeve and the guide sleeve to catch any parts that might jump off.





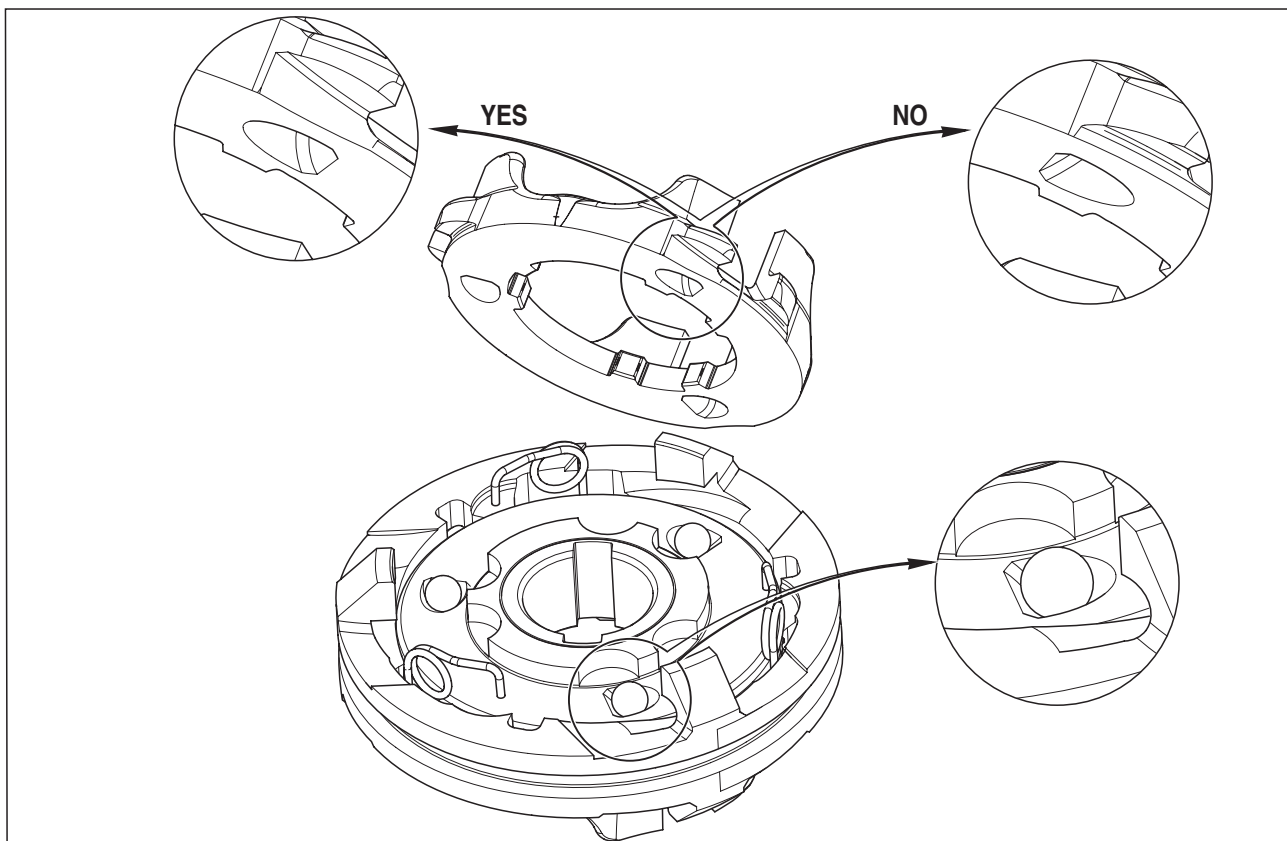
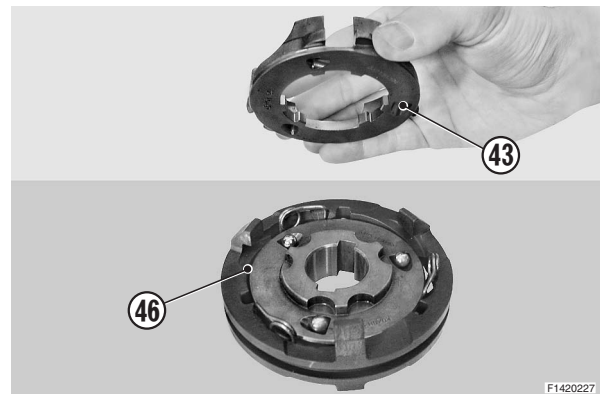
## Reassembly

### CORRECT WAY TO ASSEMBLE THE DISC CARRIER

- 1 - Reassemble the actuating parts taking care that the groove on the disc carrier (43) and (44) and the guide sleeve (46) are facing each other and directed in opposite direction.

#### **CAUTION**

- The grooves must be positioned in the opposite way.



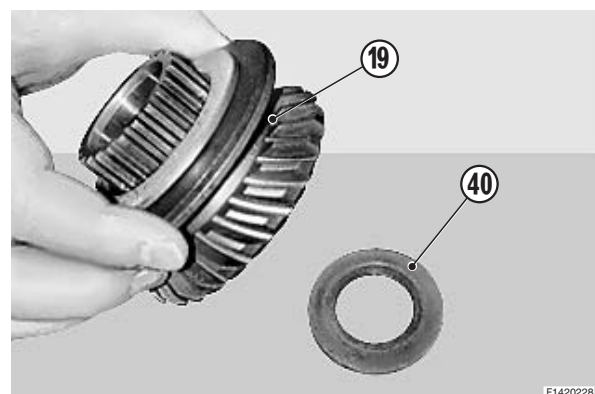
#### NOTE

- If no parts had to be replaced, the previously disassembled shims can be re-used in their former arrangement and positions without any measuring operation. If measuring is required, proceed as follows.

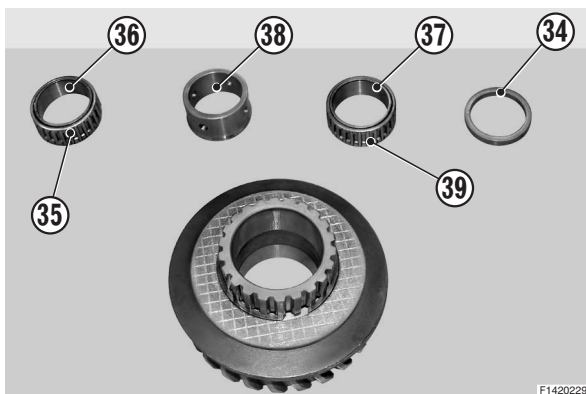
- 1 - Place pre-assembled gear (19) on butting ring (40).

#### NOTE

- Mount the bronze side of the butting ring (40) facing against the gear (19).



2 - Insert needle bearings (35) and (39), needle bearing inner races (36) and (37), spacer (38) and spacer (34) into bore of gear.

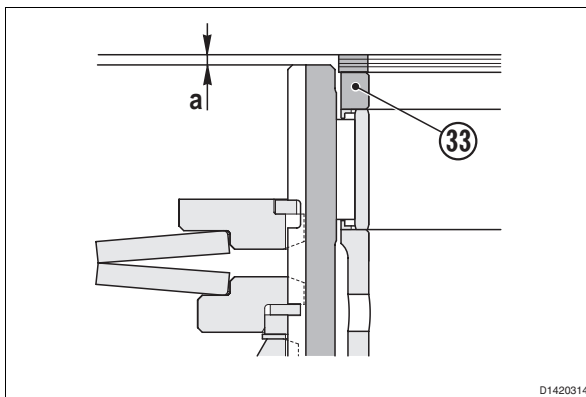


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3 - Fit shims (33) as required until prescribed setting value "a" (distance between the last shim and spline surface) is 0.4 – 0.45 mm.

**NOTE**

- Repeat the procedure above for the other gear (20).



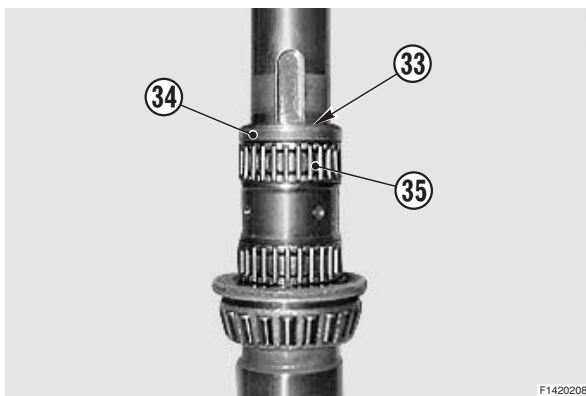
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4 - Put some ATF oil on the shaft. Press the tapered roller bearing inner race (14), the butting ring (40), the needle bearing inner race (37), the needle bearing (39), the spacer (38) and the needle bearing inner race (36).



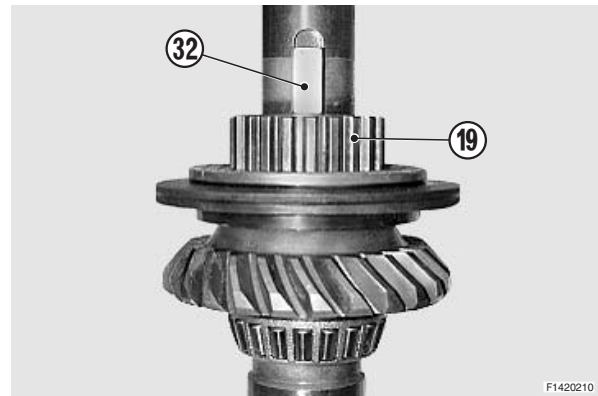
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5 - Fit the needle bearing (35), spacer (34) and the shims (33).



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6 - Fit gear assembly (19) and keys (32) on the shaft.



7 - Install the clutch pack (23) and fit the actuating sleeve assembly (22) through the keys taking care to align the actuating parts in relation to the engine rotation (see sketch).

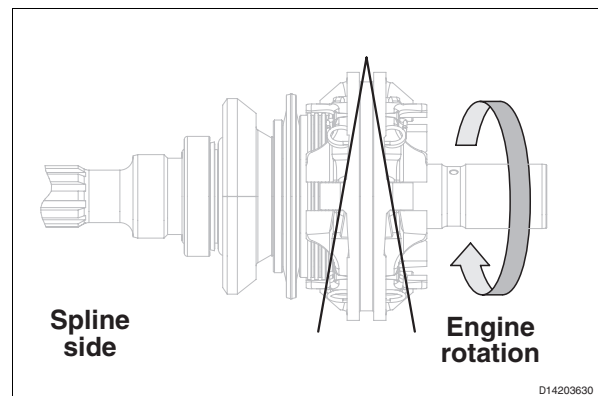
**NOTE**

- Lubricate the friction discs with ATF oil.

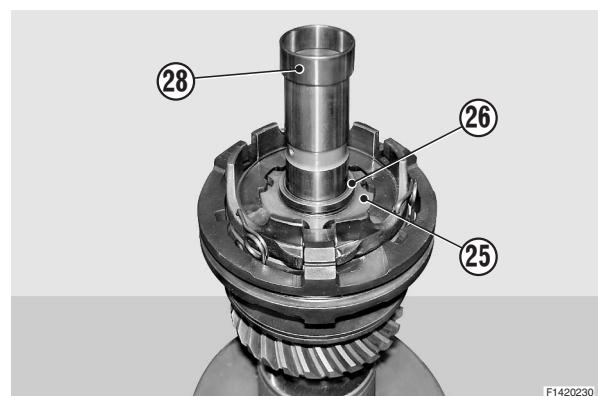


**CAUTION**

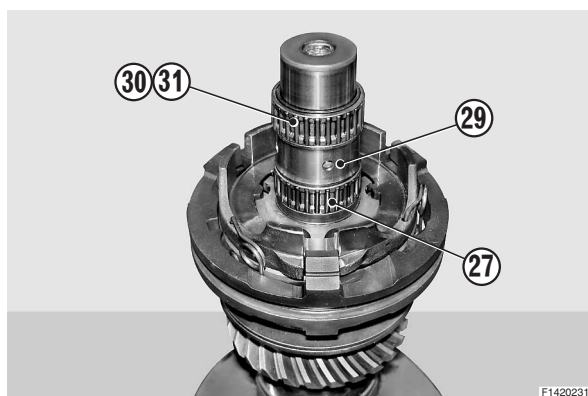
- Align the actuating parts in relation to the engine rotation.



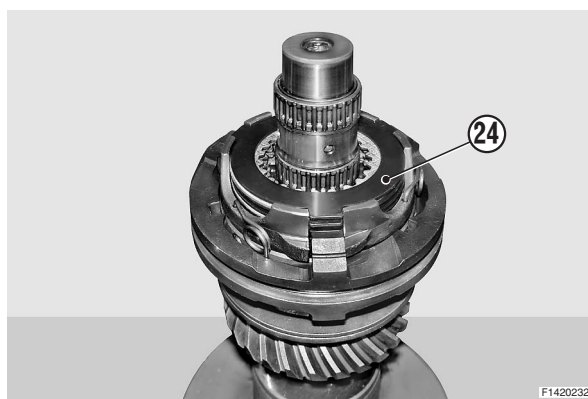
8 - Install the shim (25), the spacer (26) and the needle bearing inner race (28).



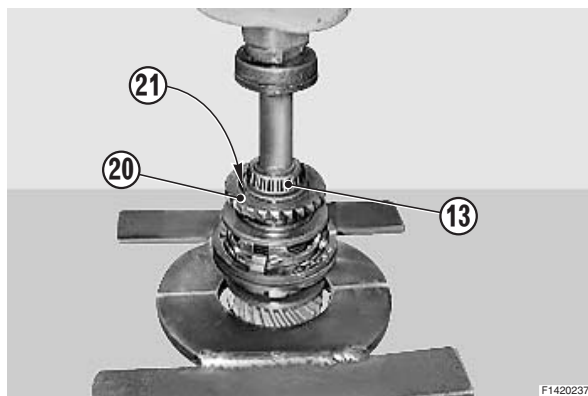
9 - Install the needle bearing (27), the spacer (29), the needle bearing (30) and the needle bearing inner race (31).



10 - Install the clutch pack (24).



11 - Install the gear (20), the butting ring (21) and press the taper roller bearing inner race (13).



12 - Calculate the thickness (B) of shims (17) using the formula below:

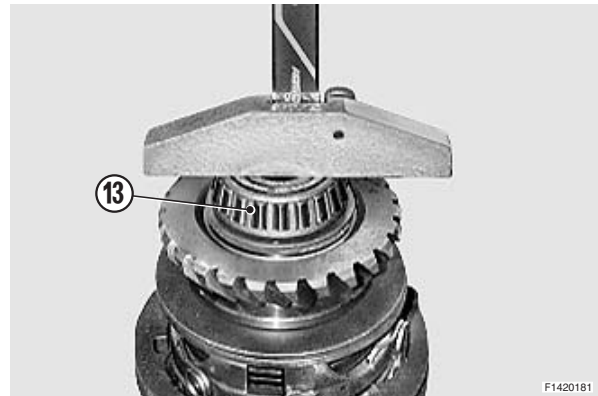
$$B = A - C$$

where:

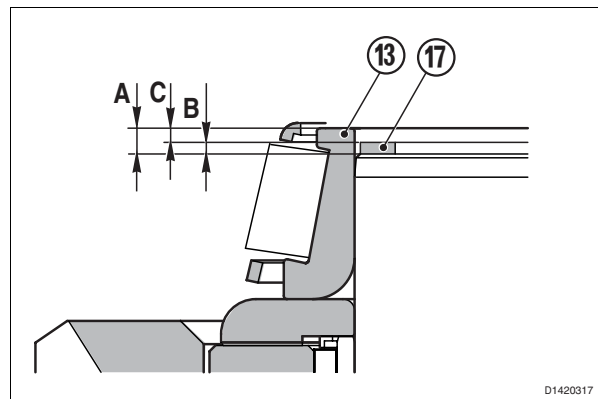
**B**= thickness of shims (17)

**A**= measured distance between shaft and inner race of bearing (13).

**C**= end clearance, from 0.1 mm to 0.15 mm.

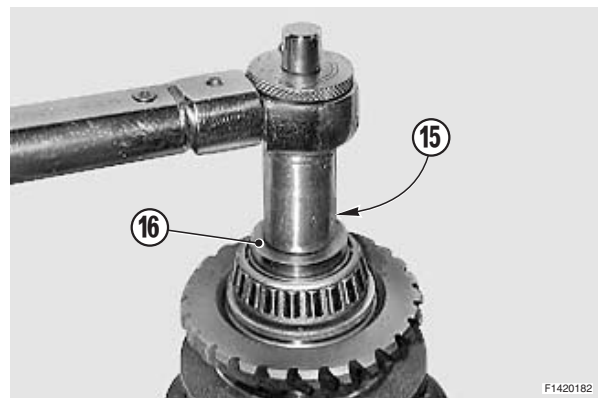


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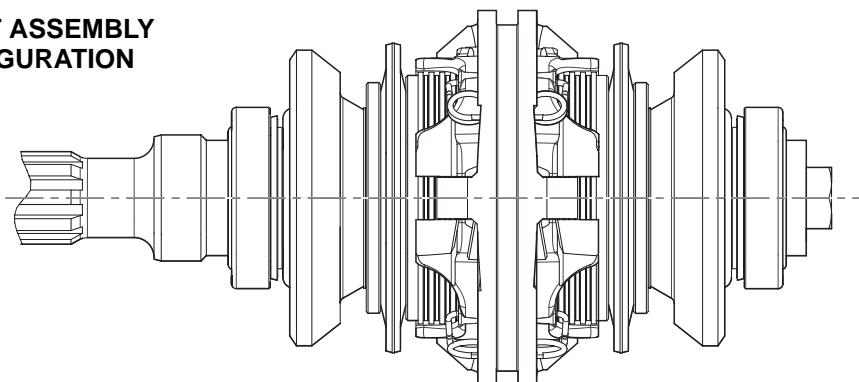
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13 - Replace the screw (15) (M10x30).  
Install the washer (16) and tighten the new screw to 50 Nm.



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**INPUT SHAFT ASSEMBLY  
FINAL CONFIGURATION**



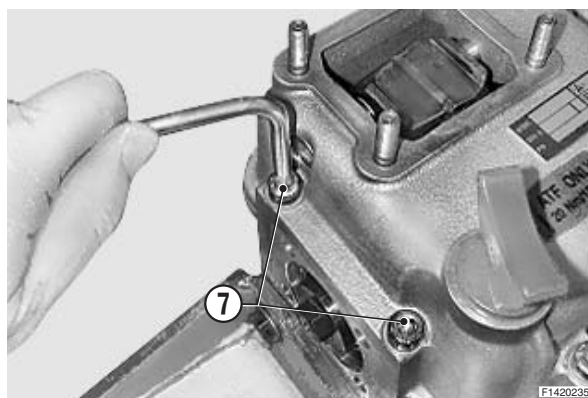
14 - Fit the input shaft assembly in the housing and install the shims (12) and (6) in the original position.



15 - Clean the housing surfaces and seal with Loctite 518. Align the two housing in order to eliminate the step between them.

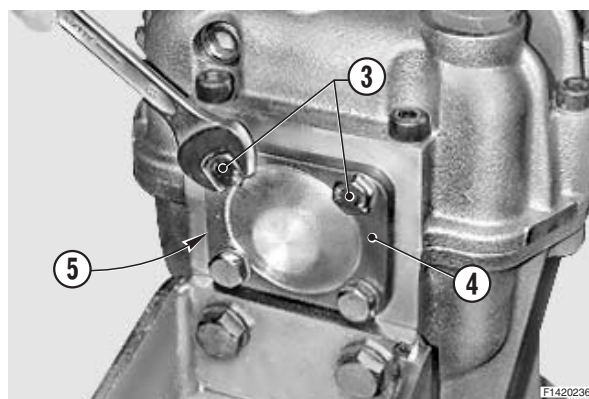


16 - Tighten the screws (7) to 22 Nm.





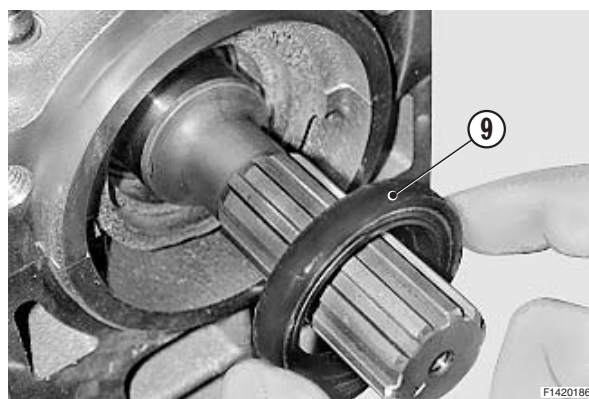
17 - Replace the paper gasket (5) fit the cover (4) and tighten the 4 bolts (3) to 14 Nm.



18 - Replace the input shaft seal (9) and put some Loctite 574 on the external diameter before putting it into place.  
Adjust the shifting lever cover assembly following this procedure.

**NOTE**

- Always fit the shifting lever cover using the procedure described in the next chapter.

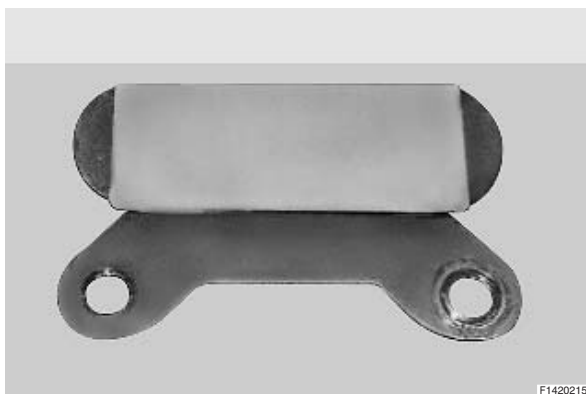


## Procedure to adjust the shifting lever cover

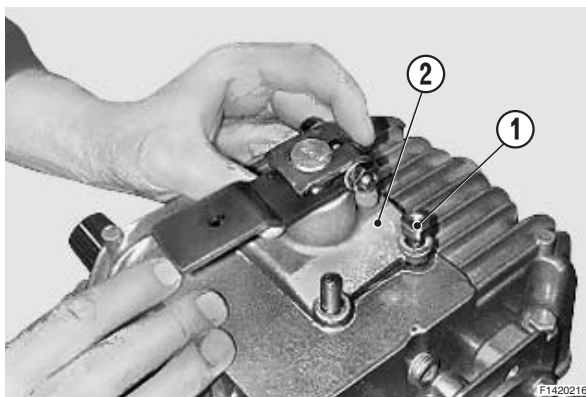
New bracket p/n 20.4039.02 to adjust the shifting lever cover

**NOTE**

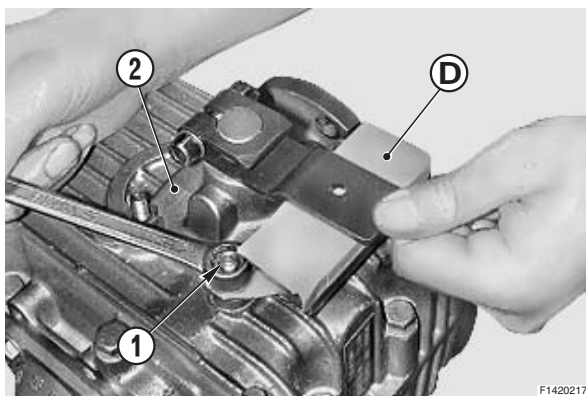
- Before mounting the cover (2) clean the mating surfaces and adjust the shifting lever to the neutral position.
- Put Loctite 574 (or alternatively 518) on the cover (2) surface and position it with the lever in neutral.



1 - Lightly tighten two nuts (1).



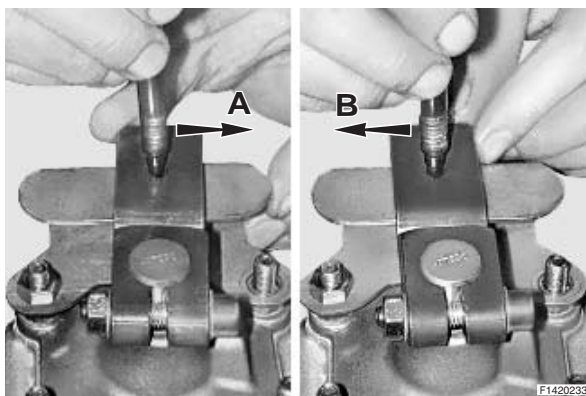
- 2 - Adjust the cover (2) roughly in the middle.
- 3 - Fit the adjusting bracket "D" (p/n 20.4039.02) using only one nut (1) lightly tighten; the cover (2) must be free to move with light hammer tabs.



4 - Move the lever toward the detent A without engaging the clutch and mark the position. Repeat the same for the detent B.

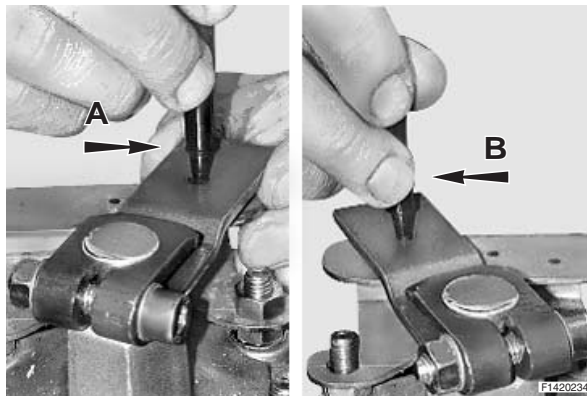
**NOTE**

- If the shifting lever has two holes refer to the inner hole.





- 5 - Engage the clutch in position "A", turn back the lever to the engaging point and mark the position. Repeat the same procedure for position "B".



- 6 - Consider the centre line between the internal marks and measure the distance from this line and the center of the external marks.  
 7 - The maximum distance between the centre line and the external marks must be 24 mm. The maximum difference between the two measurements must be less than 3 mm.

**NOTE**

- A must be always < 24
- B must be always < 24

$A - B < 3$

Example:

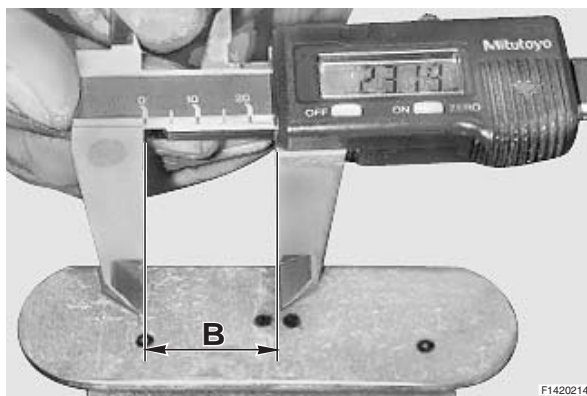
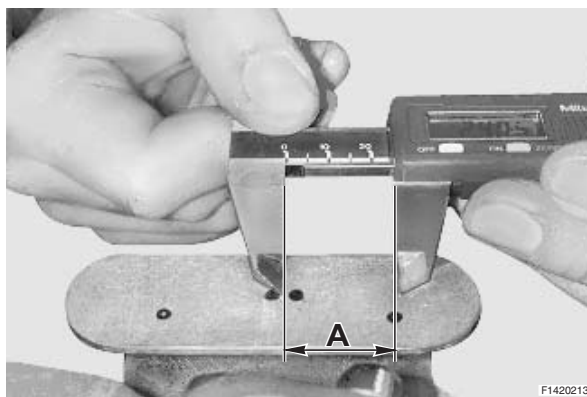
$A = 20; B = 24 \rightarrow A - B = 4 > 3$  NO

$A = 21; B = 23 \rightarrow A - B = 2 < 3$  YES

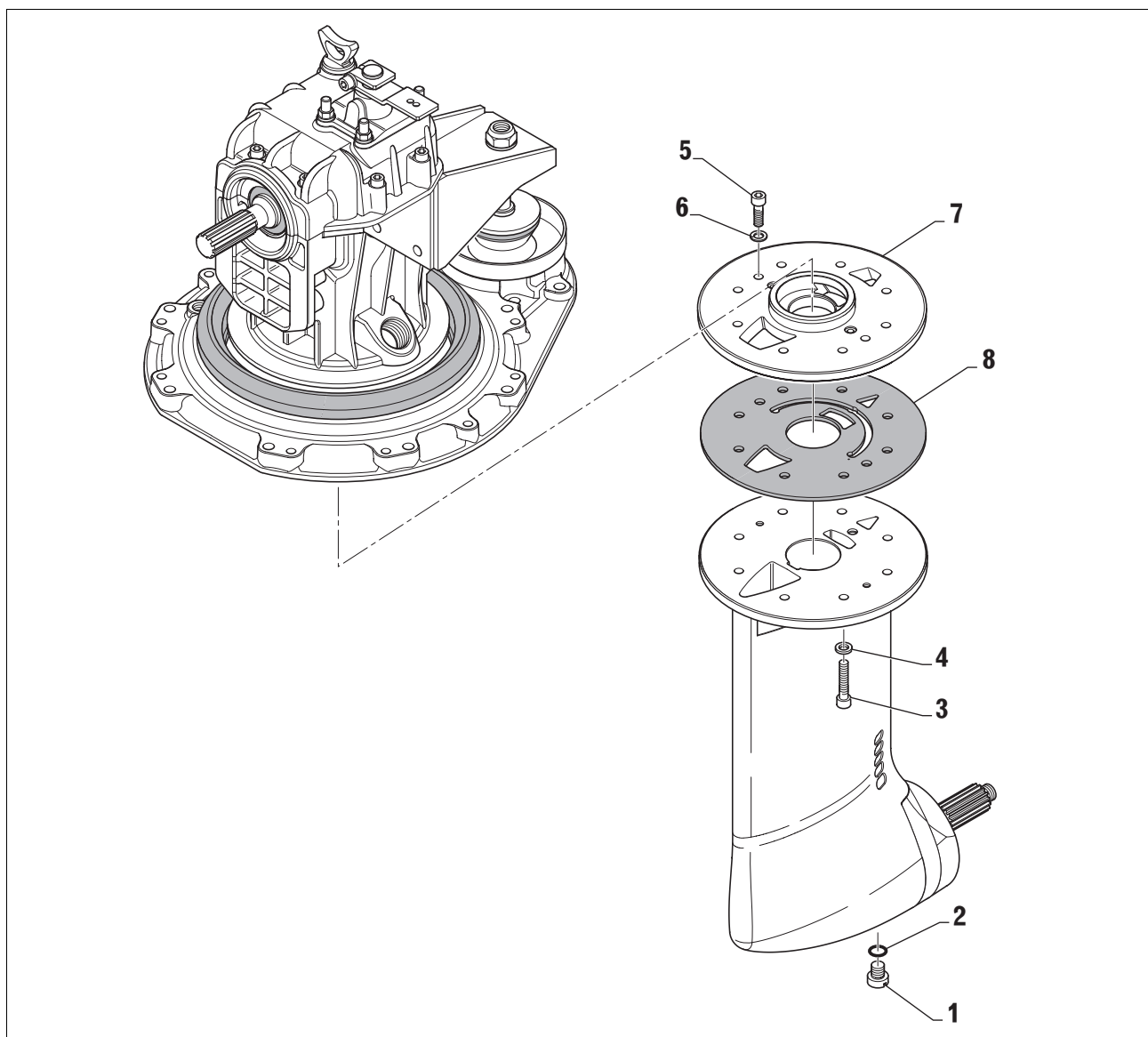
If the above conditions are not reached move the cover toward the opposite direction where the measurement is largest by light hammer pats and repeat the marking operation.

If it is not possible to adjust the cover to maximum 24 mm, the gearbox needs to be completely over hauled.

- 8 - After the correct adjusting measurement is reached remove the adjusting bracket "D" tighten the four nuts with 22 Nm torque.

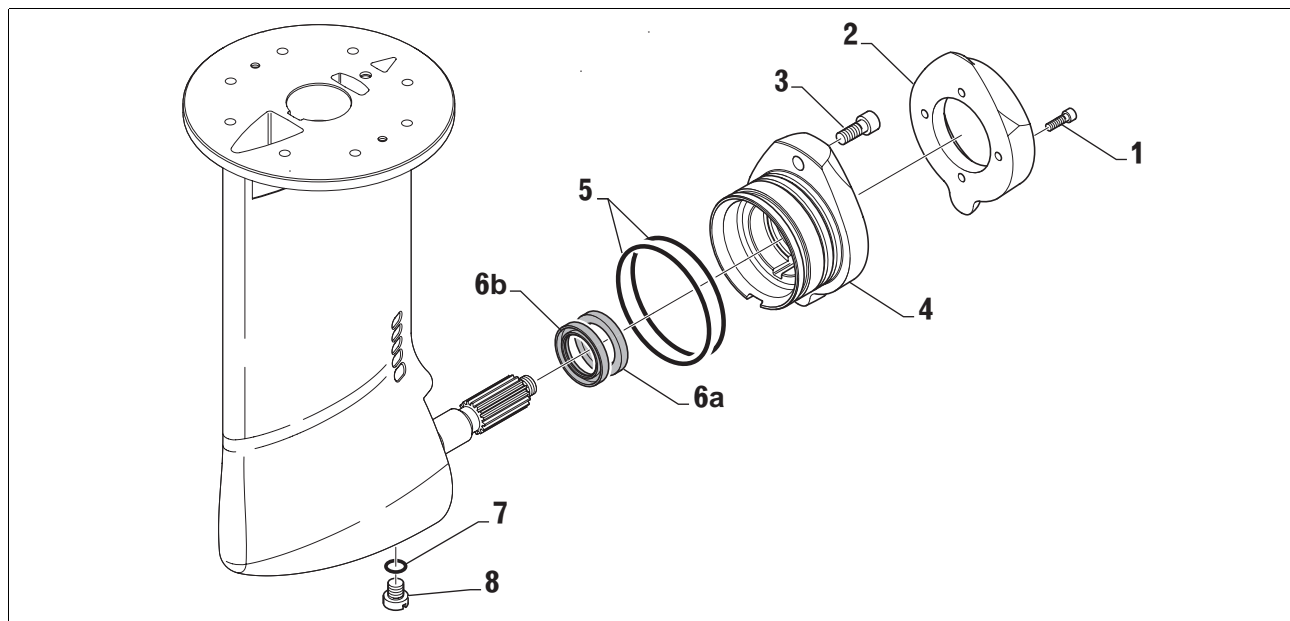


## Replacement of the paper gasket



- 1 - Install drive on the fixture.
- 2 - Clean the outside of the upper and lower gear housings.
- 3 - Remove the drain plug (1) and let the oil flow the proper hole.
- 4 - Scrap the oil drain plug O-Ring (2).
- 5 - Remove all screws M8x40, 8 pcs (3) together with the relative washers (4) below the division line of the drive.
- 6 - Split the drive.
- 7 - Remove the two screws M8x25 (5) together with the relative washers (6) and remove the adapter plate (7).
- 8 - **Save the shims and note the thickness of the shims.**
- 9 - Scrap the gasket (8).
- 10 - Oil the new gasket (8) with ATF fluid.
- 11 - Put the new gasket on the lower gear housing. Align the gasket in the correct way (*with the sign turned to the top*).
- 12 - Install the adapter plate (7) on the lower gear housing.
- 13 - Tighten the two screws M8x25 (5) together with the relative washers (6) to 20 Nm.
- 14 - Put the lower leg and the upper gear housing together.
- 15 - Apply MOLYCOTE G-n PLUS to the screws M8x40, 8 pcs (3).
- 16 - Tighten the screws M8x40, 8 pcs (3) together with the relative washers (4) to 20 Nm.

## Replacement of the zinc anode, o-rings & seal rings



- 1 - Install lower gear housing on fixture, if this has not been done previously.
- 2 - Unscrew the four screws M6x20 (1) and remove the zinc anode (2).
- 3 - Scrap the zinc anode (2).
- 4 - Unscrew the two screws M10x25 (3). Remove carefully the propeller bearing support (4) using an appropriate tool.
- 5 - Remove two O-Rings (5).
- 6 - Scrap the O-Rings.
- 7 - Remove the bearing race out using an appropriate tool.

### NOTE

- Take note of the original shims because during the reassembly they have to be mounted in the original position.

- 8 - Tap the seal rings (6a - 6b) out of the propeller bearing support (4), using a screwdriver.
- 9 - Install the outer seal ring (6a) in the propeller bearing support using an appropriate tool.

### NOTE

- Install the seal ring dry and aligned so that the spring comes outwards.

- 10 - Install the inner seal ring (6b) in the propeller bearing support using an appropriate tool.

### NOTE

- Install the seal ring dry and aligned so that the spring comes inwards.

- 11 - Place the original shims in the propeller bearing support.

- 12 - Press the bearing race in with an appropriate tool.
- 13 - Install new O-Rings (5) on the propeller bearing support (4).
- 14 - Using a brush to lubricate the O-Rings (5) with ATF fluid.
- 15 - Brush a thin layer of sealant, Permatex 80726 Loctite, on the lower housing surface.

### ⚠ CAUTION

- We recommend to clean carefully the mating surface with Loctite 7063 cleaner before applying the Permatex 80726 Loctite.

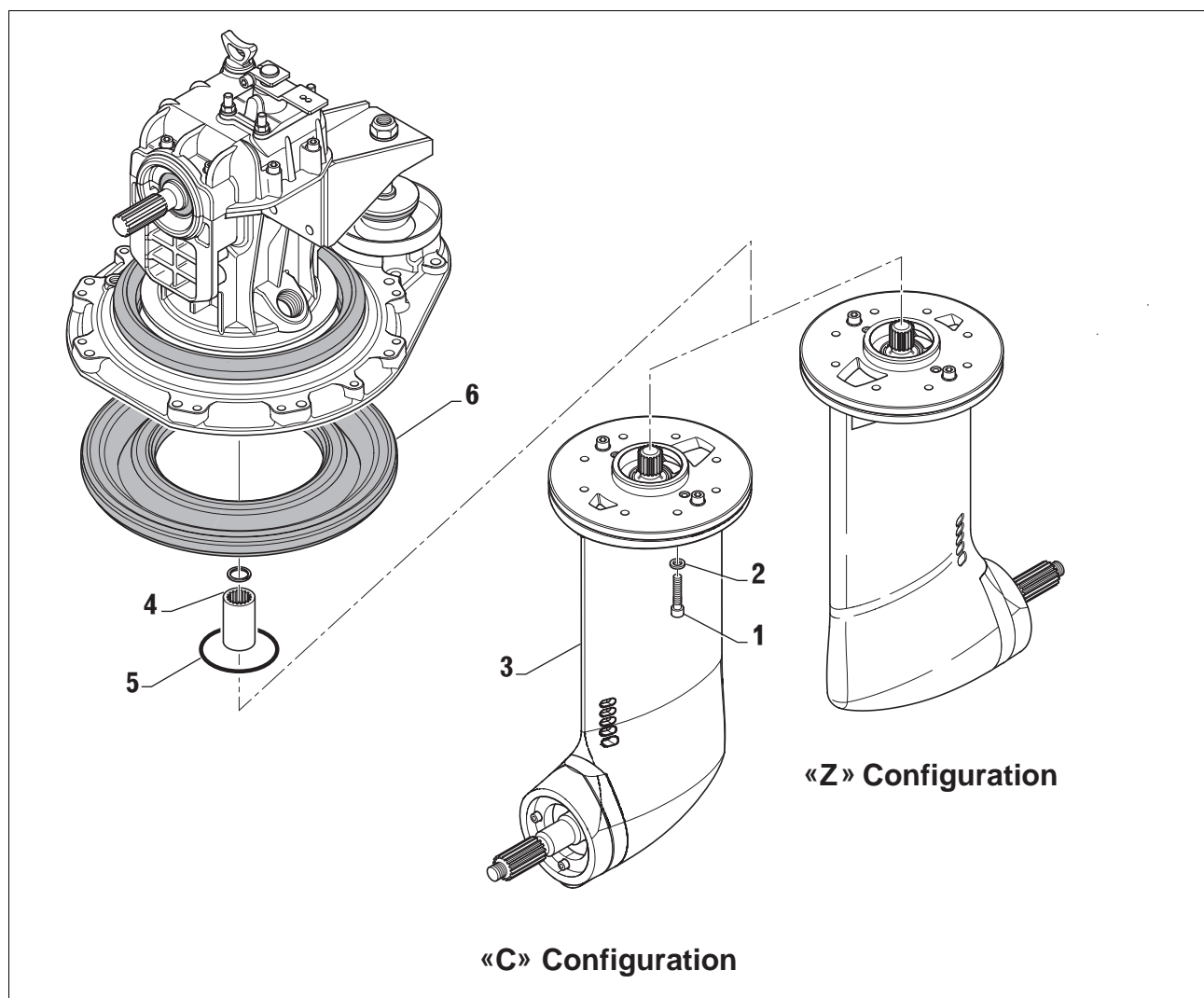
- 16 - Apply thin coat of KLUEBER STABURAGS NBU 30 grease on internal periphery / lip of the seal rings (6a - 6b).
- 17 - Put the propeller bearing support (4) in place.

### ⚠ CAUTION

- Be careful to ensure that the splines do not scratch the seal rings (6a - 6b).

- 18 - Tighten the two screws M10x25 (3). Torque 40 Nm
- 19 - Scrape the mating surface clean and install the zinc anode (2).
- 20 - Tighten the four screws M6x20 (1). Torque 12 Nm.
- 21 - Install new O-Ring (7) on the oil drain plug (8). Torque the oil drain plug (8) to 10 Nm.

## Rotation (180°) of the lower leg assembly, from “Z” to “C” configuration



The connection between the upper gear housing and the lower leg housing is made by means of eight screws M8x40 (1).

The rotation of the lower leg housing is easily made:

- 1 - Remove all the connection screws M8x40, 8 pcs, (1) together with the relative washers (2) below the division line of the drive.
- 2 - Split the drive.
- 3 - Rotate the lower leg housing 180° (3).
- 4 - Put the lower leg housing and the upper gear housing together.
- 5 - Apply MOLYCOTE G-n PLUS to the screws M8x40, 8 pcs (1).

6 - The spline sleeve (4) is put in vertical position, thus it can fall down.

7 - Be sure that the O-Ring (5) that seals the head with the leg stays attached to the leg when taking it out. Pay attention not to damage the O-Ring when putting the leg in the new position.

8 - When extracting the leg, the rubber seal (6), of the entire Sail Drive, gets loose. Pay attention not to damage this rubber when put the leg back in position.

9 - When putting the leg in the new position, be smooth and use manual adjustment of the propeller shaft in order to easily mate the teeth of the spline sleeve.

### **⚠ CAUTION**

- In the reversing operation pay attention to four points: