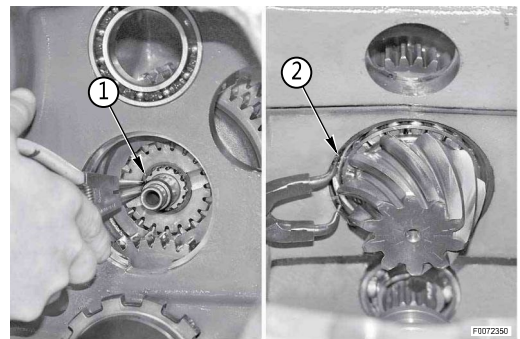


Fig. Pinion - 2-range version

### Disassembly

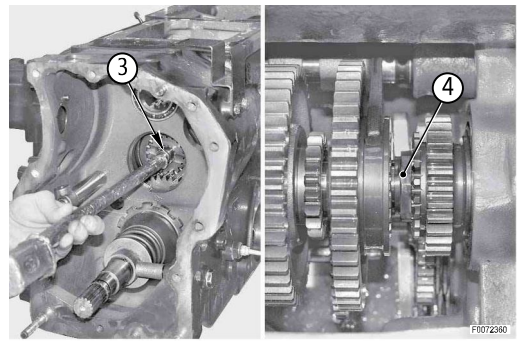
Remove circlips (1) and (2).



1.

#### For versions with 3 ranges only

Using a copper punch and a mallet, drive out pinion shaft (3) far enough to access ringnut (4).

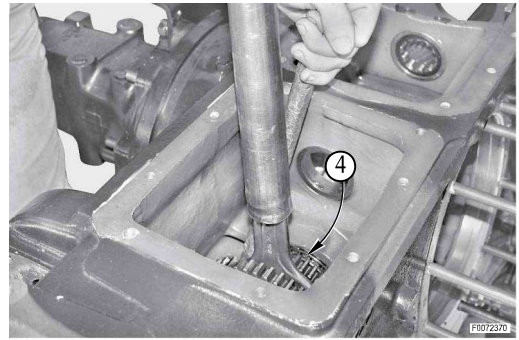


2.

**For all versions**

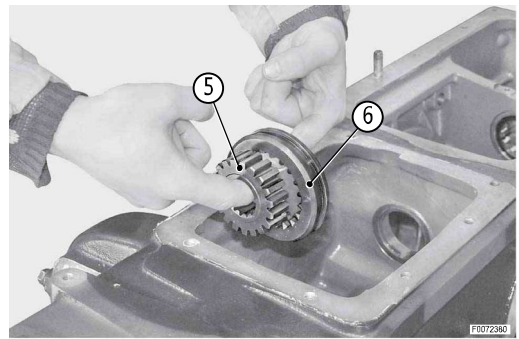
Using a bar made of soft material to hold the shaft against rotation, unscrew ringnut (4) until it comes off the thread.

- o Renew the ringnut (4) on reassembly.



3.

Proceed by withdrawing pinion (3) and remove sleeve (5) and selector (6).

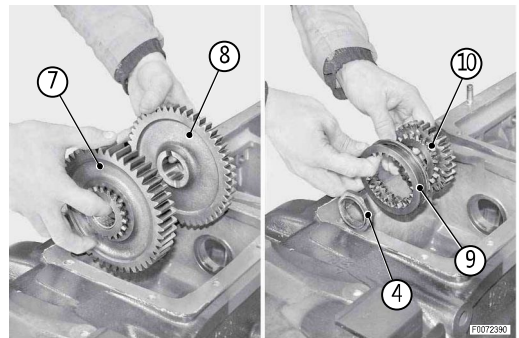


4.

**For versions with 3 ranges only**

Remove gears (7) and (8).

Remove the ringnut (4), selector (9) and gear (10).

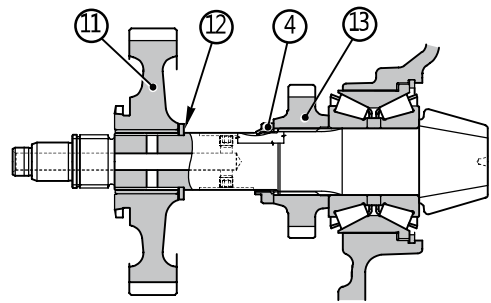


5.

**For versions with 2 ranges only**

Remove gear (11), spacer (12), ringnut (4) and gear (13).

- o Note which way round the spacer (12) is installed.



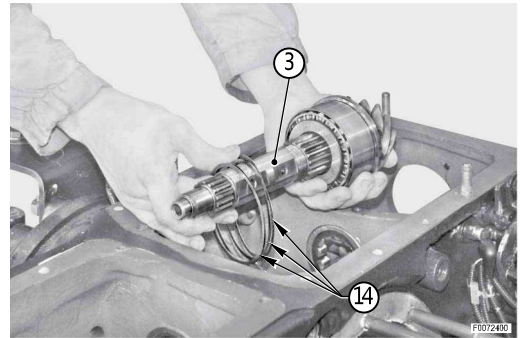
D0021410



6.

**For all versions**

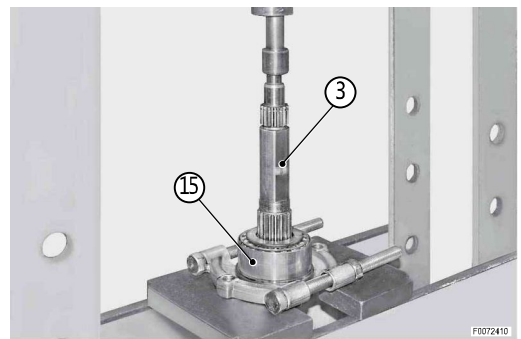
Remove pinion shaft (3) and the shims (14).



7.

**Only if necessary**

Using a press and a suitable puller, remove bearing (15) from pinion (3).



8.

**Assembly**

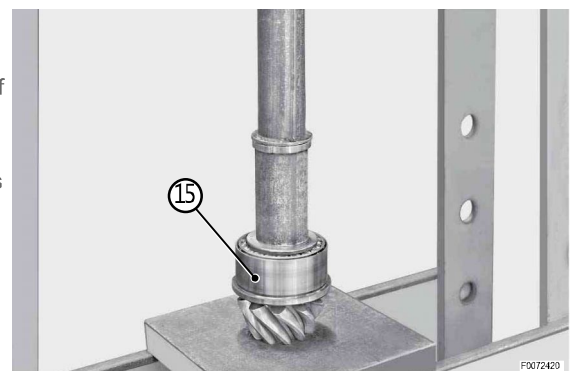
To assemble, follow the disassembly steps in reverse order and use caution in relation to the following procedures:

Procedure 3

- Ringnut: 274+294 Nm (202-217.7 lb.ft.)  
Ringnut: Loctite 270

Procedure 8

- Before installing the bearing on the pinion shaft, lubricate the inner rings of the bearing.
  - Bearing: transmission oil
 During assembly of the bearing (15), rotate the outer ring to bed in the rollers and ensure smooth rotation.





## Differential - Bevel gear pair

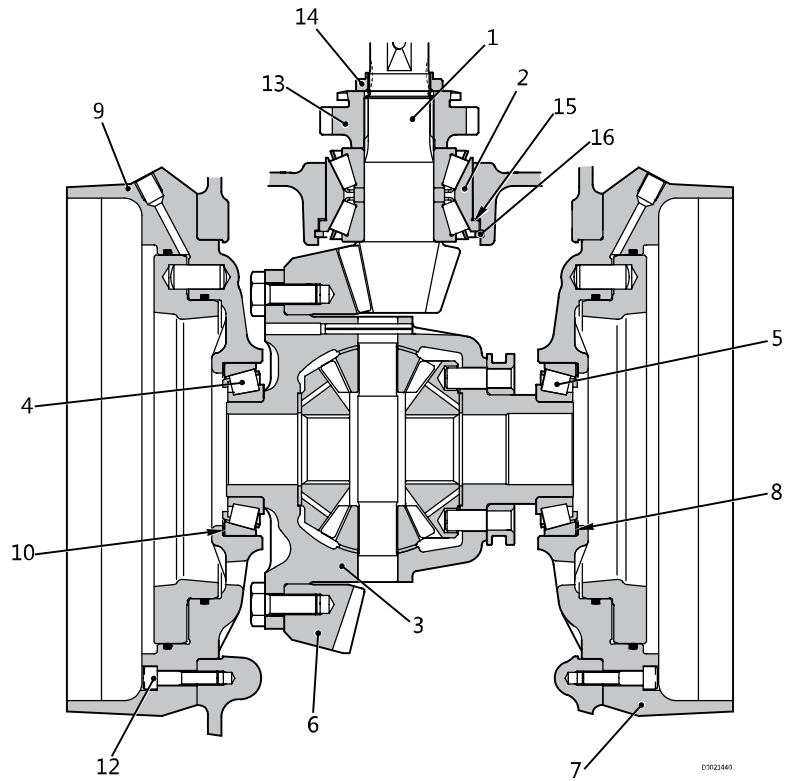
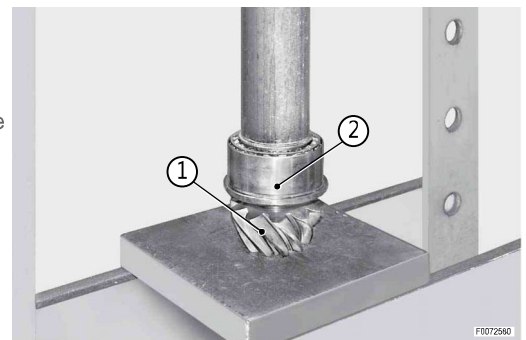


Fig. Differential - Bevel gear pair

### Preparation of adjustments

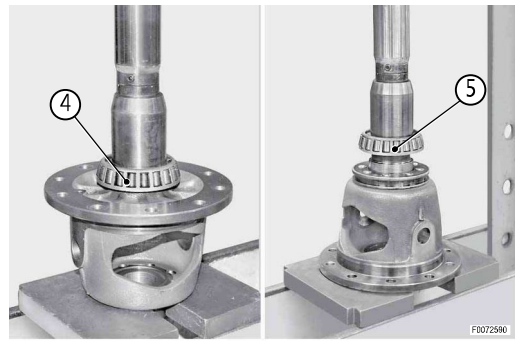
Install bearing (2) on pinion (1).

- Lubricate the bearing.
    - Bearing: transmission oil
- During assembly of the bearing (2), rotate the outer ring to bed in the rollers and ensure smooth rotation.



1.

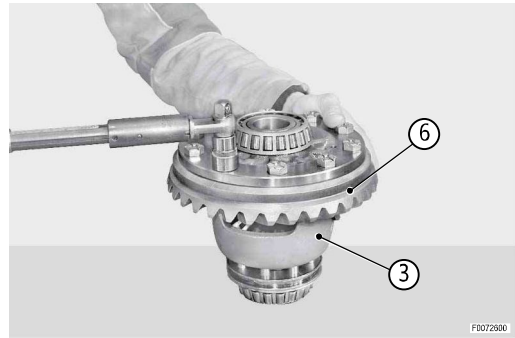
Install the inner races of bearings (4) and (5) in differential housing (3).



2.

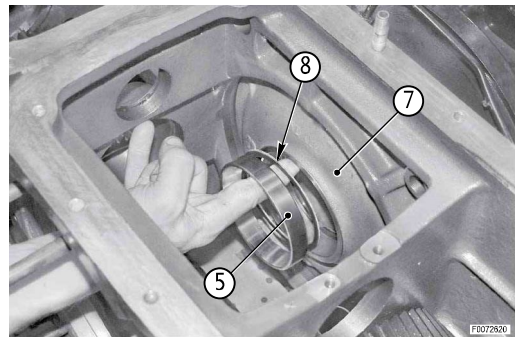
Install crown wheel (6) on differential (3).

- o Screws: 117÷130 Nm (86-96 lb.ft.)
- o Screws: engine oil



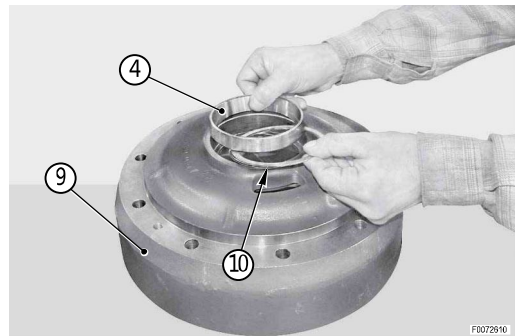
3.

Remove the outer race of bearing (5) with shims (8) from differential carrier (7) on the opposite side to the crown wheel.



4.

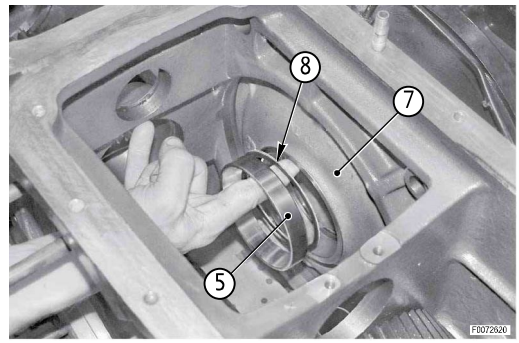
Remove outer race of bearing (4) with the shims (10) from the crown wheel side of differential carrier (9).



5.

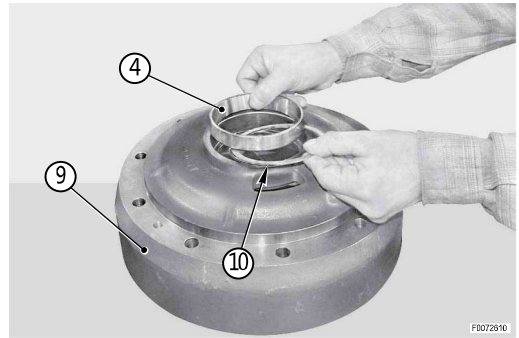
### Adjustment of the differential bearings preload

On the side of differential carrier (7) opposite to the crown wheel, install a 1.5 mm shim pack (8) and the race of the bearing (5).



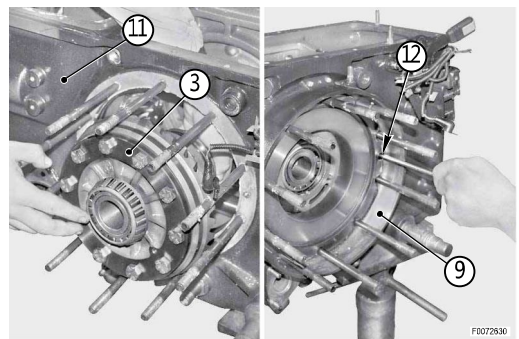
1.

On the crown wheel side of differential carrier (9), install an 0.8 mm shim pack (10) and the outer race of the bearing (4).



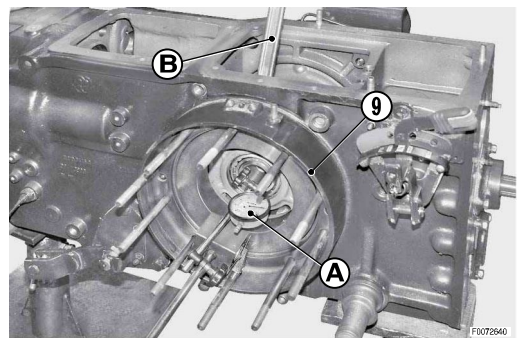
2.

Install the differential assembly (3) in the transmission casing (11) and secure it in position with the differential carrier (9) by tightening screws (12).



3.

Position a dial gauge with magnetic stand "A" on differential carrier (9) and set to zero on the end face of the differential while simultaneously prising it towards the opposite side with a lever "B".



4.

Force the differential towards the crown wheel side and measure the end float.

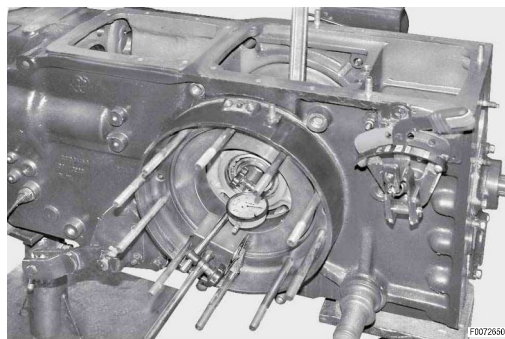
Add 0.1 mm to the measured end float and round up to the nearest 0.05 mm to determine the thickness of the shims to be installed under the outer ring of the bearing (5) on the opposite side to the crown wheel.

Example:

Measured value: 0.18 mm

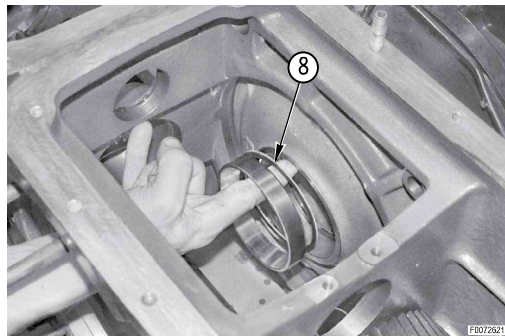
Nominal value:  $0.18+0.10=0.28$  mm

Actual shims thickness: 0.30 mm



5.

Remove the crown wheel side differential carrier (9) and the differential (3) and increase the thickness of the shim pack (8) by the value calculated in the previous step.



6.

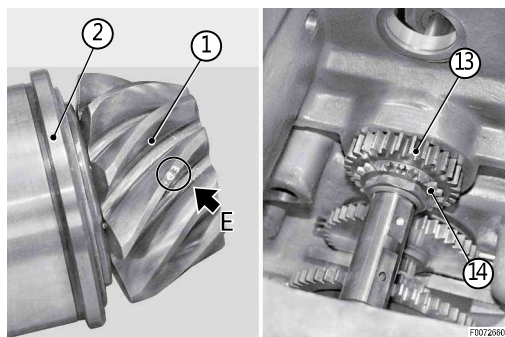
### Adjustment of the pinion position

Install pinion (1) complete with bearing (2) in the transmission casing and drive it fully home.

- o Make a note of the value "E" stamped on a tooth of pinion (1) (in this example + 0.3 mm).

Temporarily fit 4WD gear (13) and ringnut (14).

- o Tighten the ringnut to eliminate bearing play.

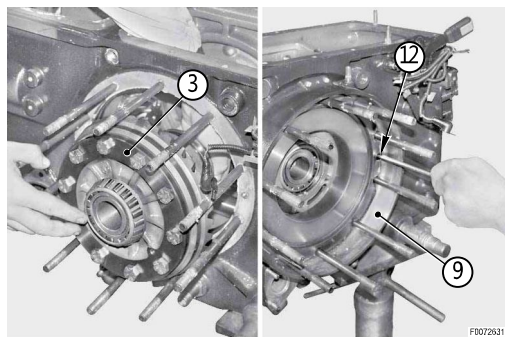


1.

Install complete differential assembly (3) and support (9).

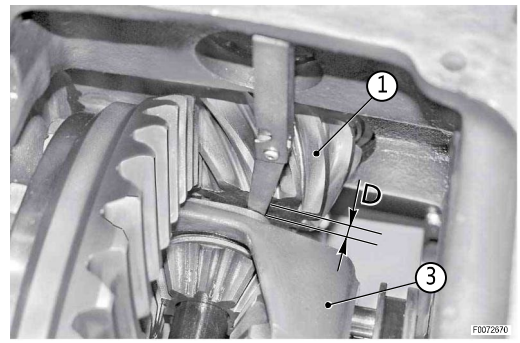
Fix support (9).

- o While tightening the bolts (12), check that there is clearance between the differential and the pinion (1). If the differential is tight up against the pinion, adjust the two shim packs by reducing the shim thickness on the crown wheel side while increasing the thickness on the opposite side.



2.

Use a feeler gauge to measure the distance "D" between the end face of the pinion (1) and the 153 mm Ø section of the differential (3) (in this example 4.25 mm).



3.

4. Calculate the value "R" by adding distance "E" stamped on the tooth of the pinion (1) to the theoretical value of 2.50 mm.

- o If the value "E" is positive, as in the case reported in the figure, it should be added to the theoretical value of 2.50 mm.  $R = 2.50 + E$  i.e.:  $R = 2.50 + 0.30 = 2.80$

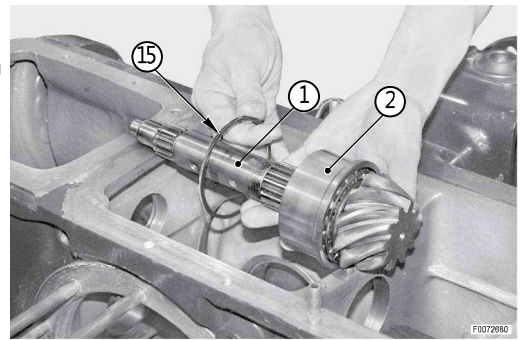
- o If the value "E" is negative, subtract it from the theoretical value of 2.50 mm.  $R = 2.50 - E$  i.e.:  $R = 2.50 - 0.30 = 2.20$

5. If the measured value "D" differs from the calculated value "R", calculate the difference between "D" and "R". The resulting value "S" is the shim thickness to be installed under bearing (2) of pinion (1).

- o Formula:  $S = D - R$  i.e. in the example given:  $S = 4.25 - 2.80 = 1.45$  mm

Remove differential (3) and pinion (1) with bearing (2).

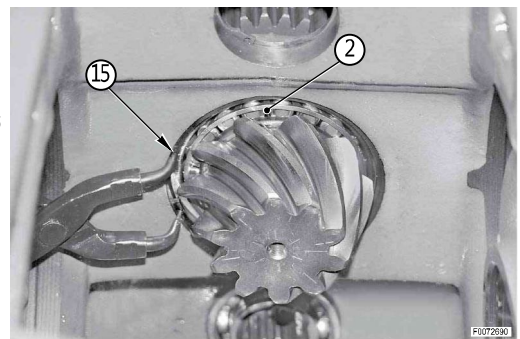
Fit shim pack (15) of the calculated thickness on bearing (2) and install it in the transmission casing.



6.

Secure bearing (2) in position with circlip (16) selected from the available sizes.

- o Select the circlip by applying the following formula: Circlip thickness = "A": Fixed dimension = "K" = 4,30 Shims dimension = "S"  $A = K - S$  i.e. in the example given:  $A = 4.30 - 1.45 = 2.85$  mm. A 2.80 mm thick circlip is therefore required.



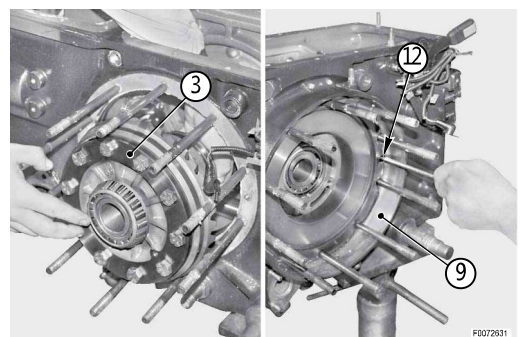
7.

## Adjustment of the pinion and crown wheel

Install complete differential assembly (3) and support (9).

Fix support (9) by tightening screws (12).

- o While tightening the nut, rotate the pinion in both directions and lightly tap the differential housing to help seat the bearings.



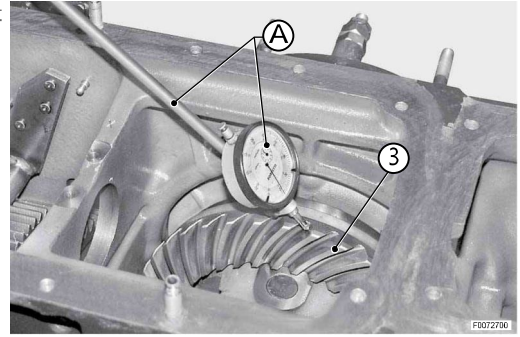


1.

Position a dial gauge "A" on a magnetic stand with the contact point perpendicular to the side of a tooth on the external diameter of the crown wheel.

Preload the gauge by approx. 3 mm and check the backlash "Z" between pinion and crown wheel while turning differential (3) in both directions.

- o Normal backlash:  $0.18 \pm 0.24$  mm  
Take four measurements  $90^\circ$  apart and calculate the average.



2.

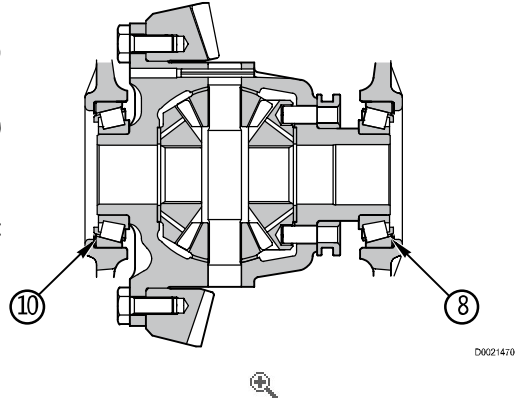
If backlash "Z" is less than 0.10 mm, remove shims from pack (10) (crown wheel side) and add the same thickness to shim pack (8) (opposite side to crown wheel).

If backlash "Z" is greater than 0.15 mm add thickness to shim pack (10) (crown wheel side) and subtract the same thickness from shim pack (8) (opposite side to the crown wheel).

- o The sum total thickness of the shim packs (10) and (8) should not vary from the calculated value.  
Take four measurements  $90^\circ$  apart and calculate the average.

Recheck backlash "Z" and, if necessary, continue to adjust the shims until the backlash is within the specified tolerance limits.

Remove the differential and the pinion and proceed with assembly following the procedures described in this chapter.



3.

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