

PARTS & SERVICE NEWS

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This PARTS & SERVICE NEWS supersedes the previous issue No. AT02120 dated Oct. 18, 2002 which should be discarded.

SUBJECT: MODIFICATION PROCEDURE FOR MODULATION CLUTCH BEARING AND PTO GEAR SPLINE LUBRICATION ON WA1200-3

PURPOSE: To introduce modification procedure to replace the modulation clutch bearing with the reinforced part and to improve the lubricant flow in the spline section of the PTO gear on the WA1200-3 wheel loaders.

APPLICATION: WA1200-3 Wheel Loaders, Serial Nos. 50001 thru 50012
(Torque converter Nos. 1001 thru 1020)

FAILURE CODE: 132DFF

DESCRIPTION:

1-1. Introduction

- (1) Regarding the modulation clutch bearing on the WA1200-3 wheel loaders, an improved part with extended parts life and with increased reliability has been developed.

When this bearing has been damaged, make the modification following the procedure being outlined in this Service News to repair the failure.

- (2) Regarding the pump driving spline section of the PTO gear on the WA1200-3 wheel loaders, an improved part with improved lubricant flow in the spline section and with increased reliability has been developed.

When the spline section of the PTO gear has been worn, make the modification following the procedure being outlined in this Service News to repair the failure.

1-2. Revised places:

1 place. A	Jan. 9, 2003	The error in writing of part No. is corrected.
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2. List of parts

Modification to strengthen the modulation clutch bearing

Part No.	Part Name	Purpose of part	Q'ty	Remarks	
42C-13-10004 (42C-13-10003)	Torqflow Ass'y (Torqflow Ass'y)	Replacement	1 (1)	Modulation clutch bearing with an enlarged size and extended parts life.	
42C-13-11003 (42C-13-11002)	Converter Ass'y (Converter Ass'y)		1 (1)		
42C-13-17360 (06040-06020)	Bearing (Bearing)		1 (1)		
42C-13-17111 (42C-13-17110)	Case (Case)		1 (1)		New case pursuant to the change of the modulation clutch bearing
42C-13-00021 (42C-13-00020)	Cage Ass'y (Cage Ass'y)		1 (1)		
42C-13-17152 (42C-13-17151)	Shaft Ass'y (Shaft Ass'y)		1 (1)		Component part of the 42C-13-00021
195-15-11230 (42C-13-17350)	Plug (Plug)		1 (1)		
04064-08530 (04064-01030)	Snap Ring (Snap Ring)		1		New snap ring pursuant to the change of the modulation clutch bearing
06041-00216 (06041-00215)	Bearing (Bearing)		1 (1)		Modulation clutch bearing with an enlarged size and extended parts life.
42C-13-15132 (42C-13-15131)	Gear (Gear)		1 (1)		New snap ring pursuant to the change of the modulation clutch bearing
04077-00140 (04077-00130)	Snap Ring (Snap Ring)	1 (1)			

The following parts are the consumable parts which need to be replaced when carrying out this modification.

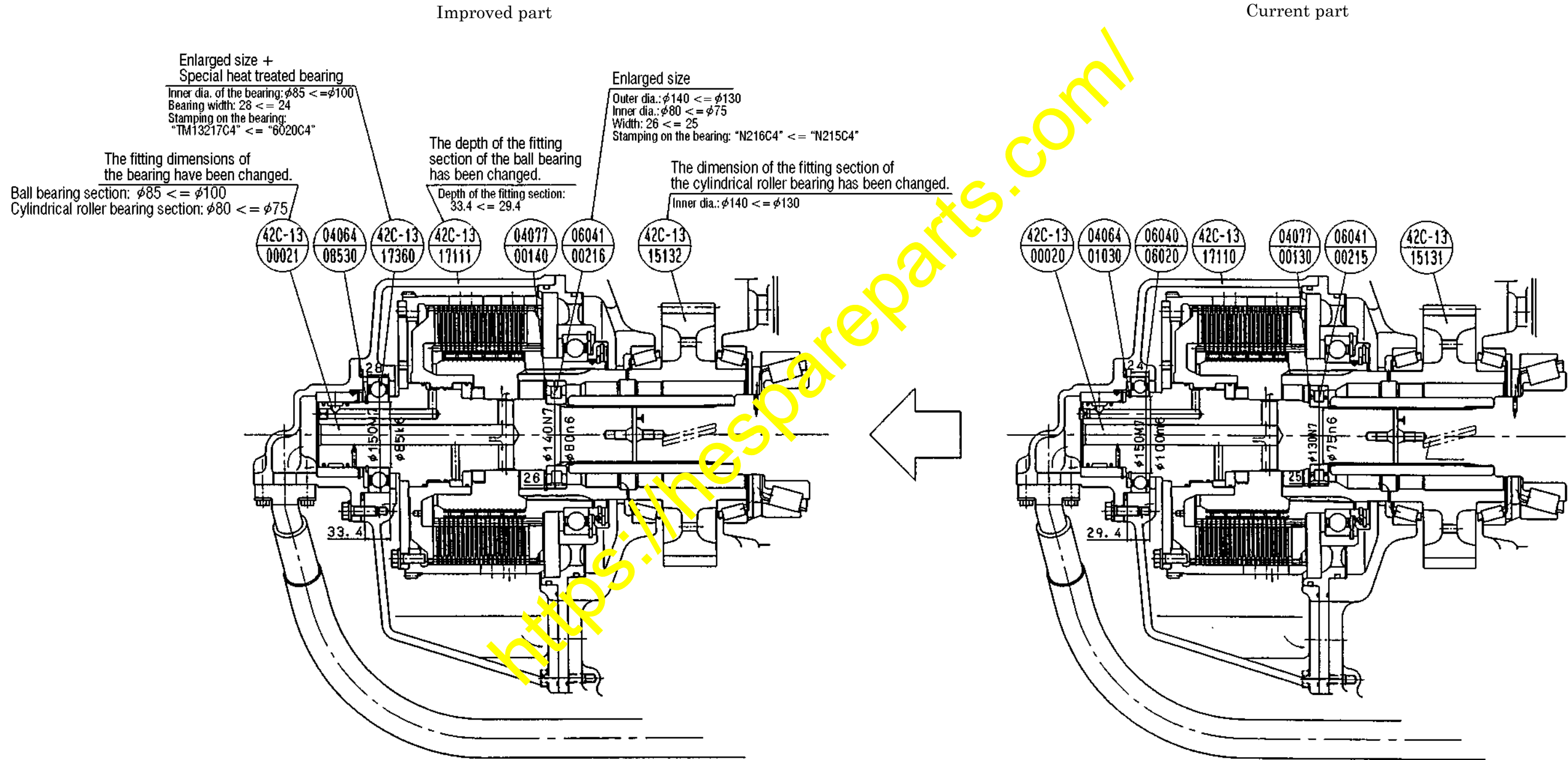
07000-75160	O-ring	1
07000-75355	O-ring	1
07000-72115	O-ring	2
07000-75375	O-ring	1
124-960-2180	Seal Ring	2
714-10-19220	Seal Ring	1
134-15-39260	Seal Ring	2
42C-13-05040	Shim Kit	1

Part No.	Part Name	Purpose of part	Q'ty	Remarks
Consumable parts which need to be replaced when carrying out this modification (continued from page 2)				
421-22-12840	Bearing		2	
19M-13-13340	O-ring		1	
07000-72115	O-ring		1	
07000-72018	O-ring		4	
07043-70312	Plug		3	

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3. Details of the modification

Regarding the modulation clutch bearing, the parts life has been extended by changing the ball bearing to a special heat treated one and by enlarging the size.




2. List of parts

Modification to improve the lubricant flow in the spline section of the PTO gear

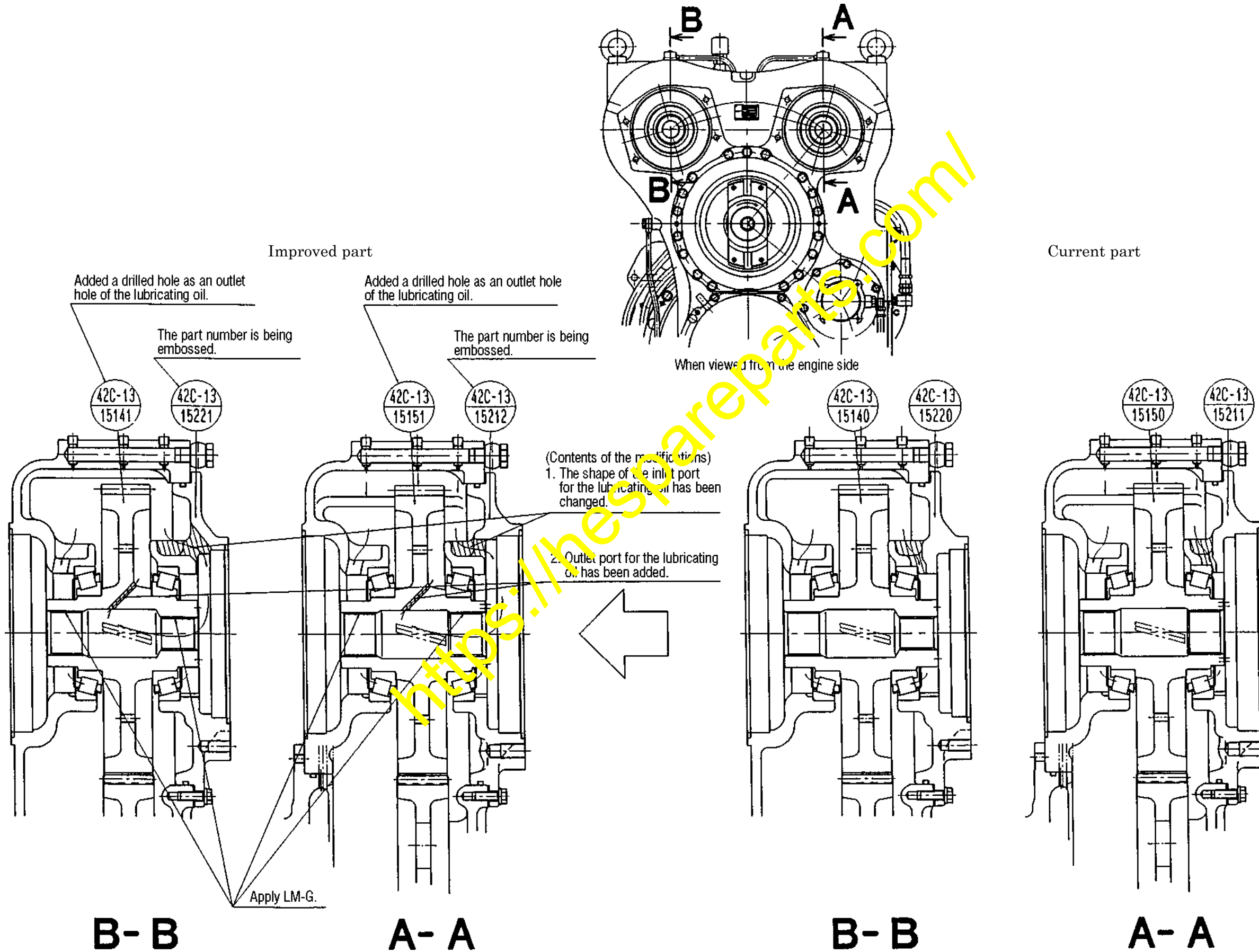
Part No.	Part Name	Purpose of part	Q'ty	Remarks
42C-13-10004 (42C-13-10003)	Torqflow Ass'y (Torqflow Ass'y)	Replacement	1 (1)	To improve lubricant flow for PTO
42C-13-11003 (42C-13-11002)	Converter Ass'y (Converter Ass'y)		1 (1)	
42C-13-15212 (42C-13-15211)	Cage (Cage)		1 (1)	
42C-13-15221 (42C-13-15220)	Cage (Cage)		1 (1)	
42C-13-15141 (42C-13-15140)	Gear (Gear)		1 (1)	
42C-13-15151 (42C-13-15150)	Gear (Gear)		1 (1)	

The following parts are the consumable parts which need to be replaced when carrying out this modification.

42C-13-05010	Shim Kit		1	Consumable parts For pre-load adjustment of the PTO gear section bearing
437-22-11930	Bearing		4	Consumable parts For PTO gear support
07000-75385	O-ring		2	Consumable parts For mounting of the PTO cage
07000-75270	O-ring		3	Consumable parts For mounting of the PTO pump
07000-75230	O-ring		1	
42C-13-05029	Shim Kit		1	Consumable parts For pre-load adjustment of the input shaft bearing
07000-75425	O-ring		1	Consumable parts For mounting of the input shaft cage
07000-75200	O-ring		1	
 07000-57200	O-ring		1	
07005-02012	Seal Washer		6	Consumable parts For the lubricant tube
42C-13-05030	Shim Kit		1	Consumable parts For pre-load adjustment of the idler shaft bearing
07000-75210	O-ring		1	Consumable parts For mounting of the idler shaft cage
07000-72130	O-ring		1	

3. Details of the modification

Regarding the spline section of the PTO gear, the reliability of the spline section has been improved by improving the lubricant flow in the spline section of the PTO gear.



4. Modification procedure

Refer to pages 11 thru 17 and pages 19 thru 21 of this Service News.

4-1. Regarding the modulation clutch section

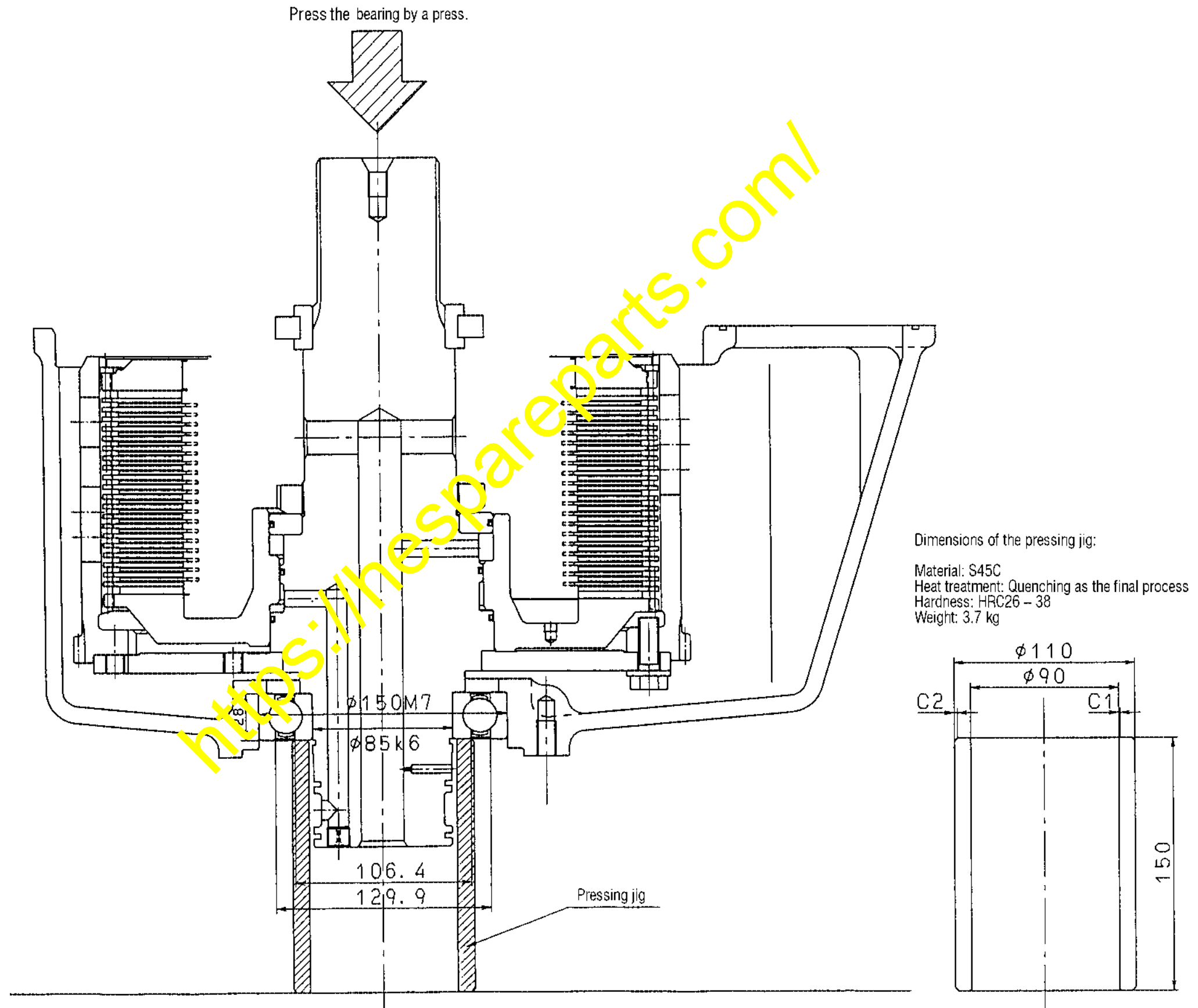
- (1) Remove the modulation clutch ass'y, PTO•transfer ass'y and torque converter ass'y referring to page 14 of this Service News.
(Remove the revolution sensor in advance.)
- (2) Remove the modulation clutch gear (gear E) referring to pages 18 and 19 of this Service News.
- (3) Disassemble the modulation clutch ass'y referring to page 16 of this Service News.
(It is not necessary to disassemble the cover input drum ass'y.)
- (4) Replace the following parts to the improved parts. (Refer to pages 16 and 18 of this Service News.)

Current parts			New parts	
06040-06020	Bearing	→	42C-13-17360	Bearing
42C-13-17110	Case	→	42C-13-17111	Case
42C-13-00020	Cage Ass'y	→	42C-13-00021	Cage Ass'y
04064-01030	Snap Ring	→	04064-08530	Snap Ring
06041-00215	Bearing	→	06041-00316	Bearing
42C-13-15131	Gear	→	42C-13-15132	Gear
04077-00130	Snap Ring	→	04077-00140	Snap Ring

All the bearings, O-rings and seal which have been removed when replacing the above parts need to be changed to new parts.

- (5) Assemble the modulation clutch ass'y referring to pages 16 and 17 of this Service News.
(Note) When assembling the bearing (42C-13-17360), case (42C-13-17111) and cage ass'y (42C-13-00021), use a press machine to install them as per the instructions being given in the Section 4-2.
- (6) Install the modulation clutch gear (gear E) into the case referring to page 20 of this Service News. Conduct the pre-load adjustment as per the instructions being given in the Section 4-4.
 © Do not employ the pre-load adjustment method being described in the Shop Manual.
 (Note 1) When installing the gear into the case, apply 6 cc of oil onto the sliding section of the bearing and turn it for 10 times to smooth out the applied oil as per the instructions being given in the Shop Manual. Also, after finishing the pre-load adjustment, make sure that the turning torque remains within the standard value.
 (Note 2) When installing the revolution sensor, conduct the gap adjustment as per the instructions being given in the Shop Manual.
- (7) Install the modulation clutch ass'y, PTO•transfer ass'y and torque converter ass'y referring to page 15 of this Service News.

- 4-2. How to assemble the bearing (42C-13-17360), case (42C-13-17111) and cage ass'y (42C-13-00021), and the dimensions of the pressing jig
When installing the bearing, press the bearing by a press using the prepared jig.
Do not hammer the bearing to install it.



4-3. Regarding improvement of the lubricant flow in the spline section of the PTO gear

- (1) Remove the torque converter ass'y and the PTO•transfer ass'y referring to page 14 of this Service News.
- (2) Remove the PTO gear 2 (gear C) and the PTO gear 3 (gear B) referring to pages 18 and 19 of this Service News.
- (3) Replace the following parts with the improved parts. (Refer to page 18 of this Service News.)

Current parts			New parts	
42C-13-15211	Cage	→	42C-13-15212	Cage
42C-13-15220	Cage	→	42C-13-15221	Cage
42C-13-15140	Gear	→	42C-13-15141	Gear
42C-13-15150	Gear	→	42C-13-15151	Gear

All the bearings, O-rings and seals which have been removed when replacing the above parts need to be changed to new parts.

- (4) Assemble the above replacing parts referring to page 19 of this Service News. When assembling these parts, conduct the pre-load adjustment for the taper roller bearing as per the instructions being given in the Section 4-4.
 - ◎ Do not employ the pre-load adjustment method being described in the Shop Manual.
 - (Note 1) When installing the gear into the case, apply 6 cc of oil onto the sliding section of the bearing and turn it for 10 times to smooth out the applied oil as per the instructions being given in the Shop Manual. Also, after finishing the pre-load adjustment, make sure that the turning torque remains within the standard value.
 - (Note 2) When installing the revolution sensor, conduct the gap adjustment as per the instructions being given in the Shop Manual.
 - (Note 3) Apply LM-G (grease containing molybdenum disulfide) onto the spline section of the gear.
- (5) Install the torque converter ass'y and the PTO•transfer ass'y referring to page 15 of this Service News.

4-4. Regarding the pre-load adjustment for the taper roller bearing for the transfer

Conduct the pre-load adjustment for the taper roller bearing as per the instructions given below, not as per the instructions being given in the Shop Manual.

(Note)

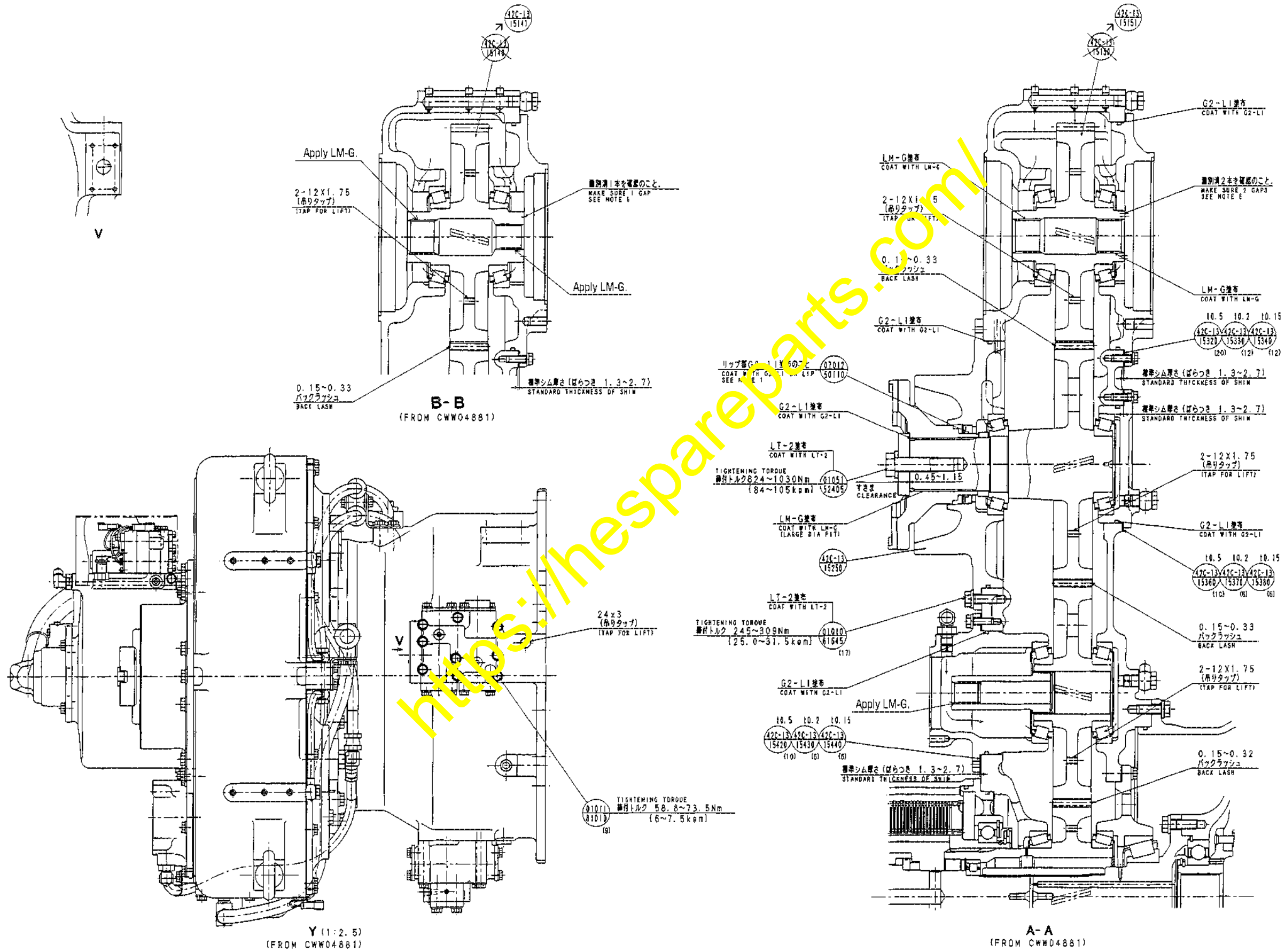
Conduct the pre-load adjustment for the taper roller bearing separately for each shaft.

When there is a mating gear, remove the mating gear before conducting the pre-load adjustment.

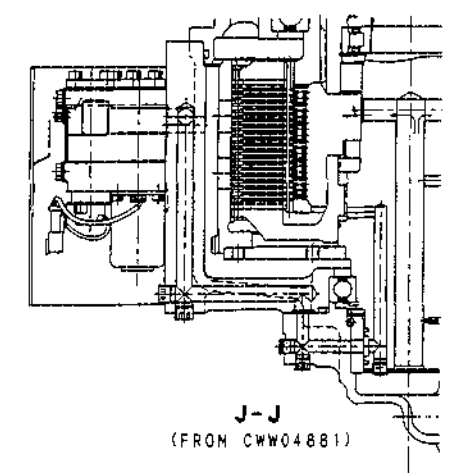
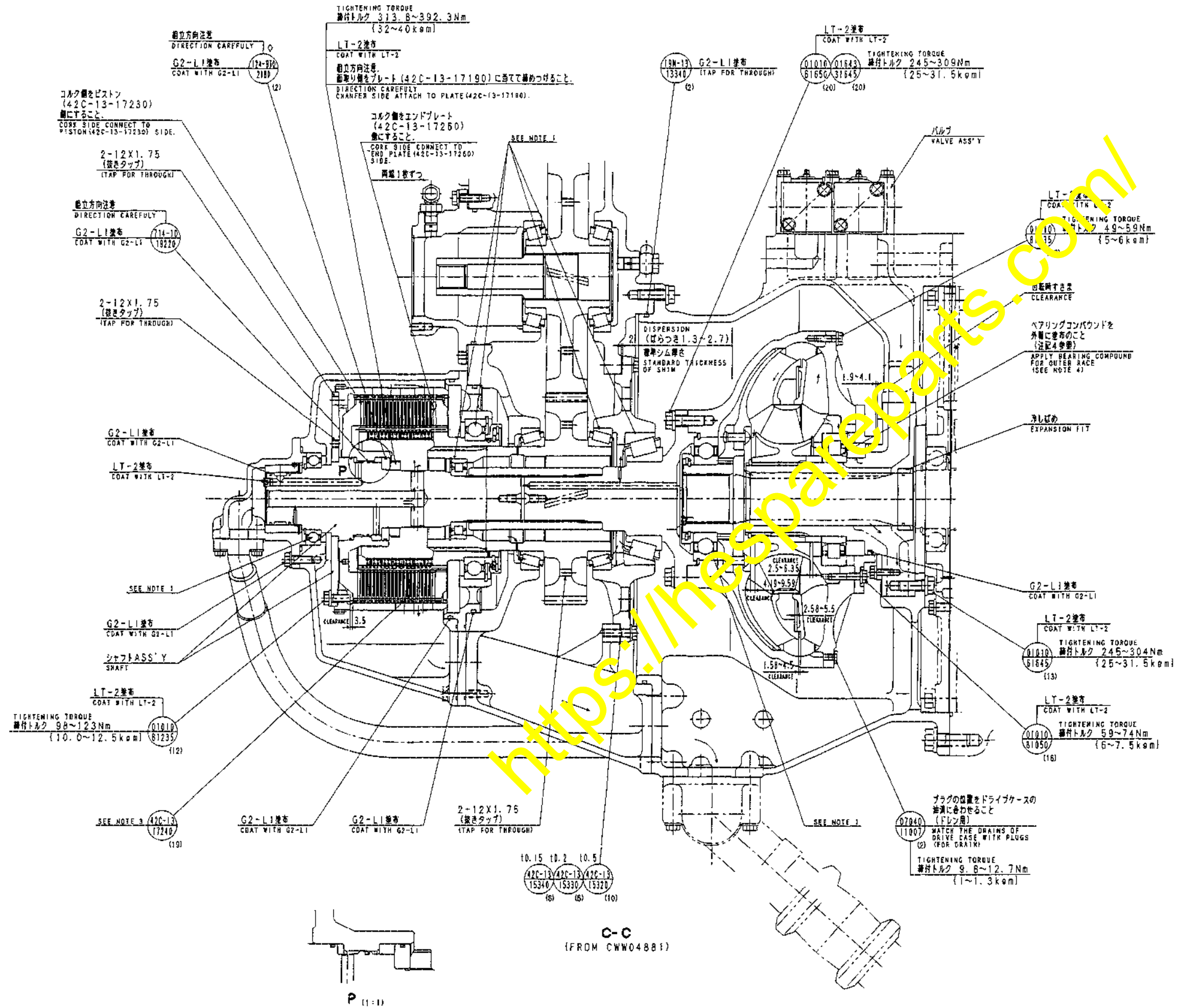
(In the meantime, when removing a gear for which the pre-load adjustment has already been finished, pay sufficient attention to the shim thickness when reinstalling the gear so that it does not change.)

- (1) Without use of the shims, tighten the cover mounting bolt at a tightening torque of 4.9 Nm (0.5 kgfm).
(Use all the cover mounting bolts.)
- (2) After turning the shaft for 20 times, check the tightening torque.
- (3) When the tightening torque has changed, repeat the procedures described in the above Items (1) and (2).
- (4) After confirming that the tightening torque does not change, insert the shims and tighten the cover mounting bolts (all the cover mounting bolts) at the specified tightening torque.
(The initial insertion shim thickness should be the standard shim thickness. However, in case the target value of the shim thickness is known by the previous experience, the above target value of the shim thickness may also be employed as the initial insertion shim thickness.)
- (5) Measure the turning torque of the shaft and adjust the shim thickness so that the value of the turning torque of the shaft may come within the range of 0.98 – 2.94 Nm (0.1 – 0.3 kgfm).
- (6) After finishing all the pre-load adjustments, make sure that backlash is not occurring with each gear.

CONVERTER Ass'y (3/6)



CONVERTER Ass'y (4/6)

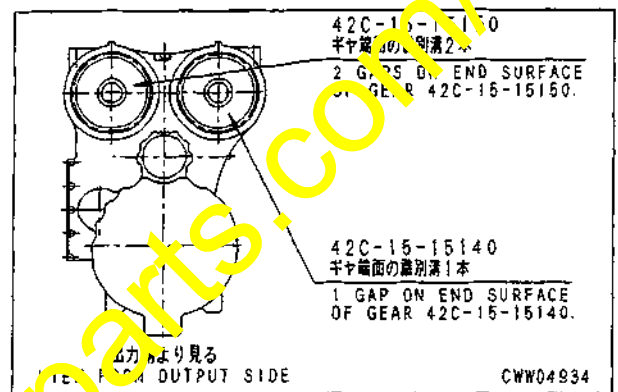
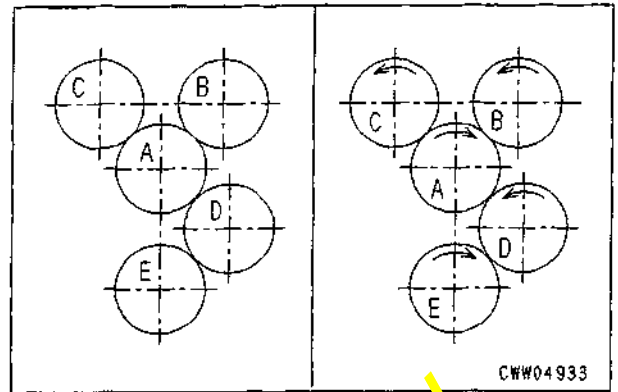


1. ベアリングは部品後E010-CD又はE030-CDを6cc塗りし10回転させること。
 2. 塗布量の確認トルクはRES. 04. 123. 3Cによる。
 3. ディスク(42C-13-17240)は電流値前に2分以上きれいなトランスミッションオイルに浸すこと。
 4. ベアリング塗布要領(左図参照)
ベアリングの外周面4ヶ所に薄く塗りつけ過込みを実施すること。
過込後はみだしたベアリングコンパウンドはベアリング内に入らないようぬぐい取る。
1. BEARING SHALL BE DRIPED WITH ENGINE OIL E030-CD OR E010-CD 6cc. AND TURNED ABOUT 10 TIMES.
2. TIGHTENING TORQUE OF PLUG TO CONFORM TO RES 04. 123. 3.
3. SUBMARGE DISK (42C-13-17240) INTO TRANSMISSION OIL FOR 2 MINUTES PRIOR TO ASSEMBLY.
4. INSTRUCTION OF COATING BEARING (SEE LEFT) COAT OUTER RACE (4PLACES). BEFORE ASSEMBLING, AFTER ASSEMBLING, WIPE TO KEEP OUT BEARING COMPOUND INSIDE

1. When assembling oil seal (07012-50110), coat with LG-5 on fitting face of the housing (42C-13-15250) lightly and after assembling, wipe off the rest completely.
2. Shim is 2 division type. Right and left shims shall be same thickness and pieces.
3. When conducting the pre-load adjustments for the taper roller bearing of the input transfer, follow the instructions given in Section 4-4.

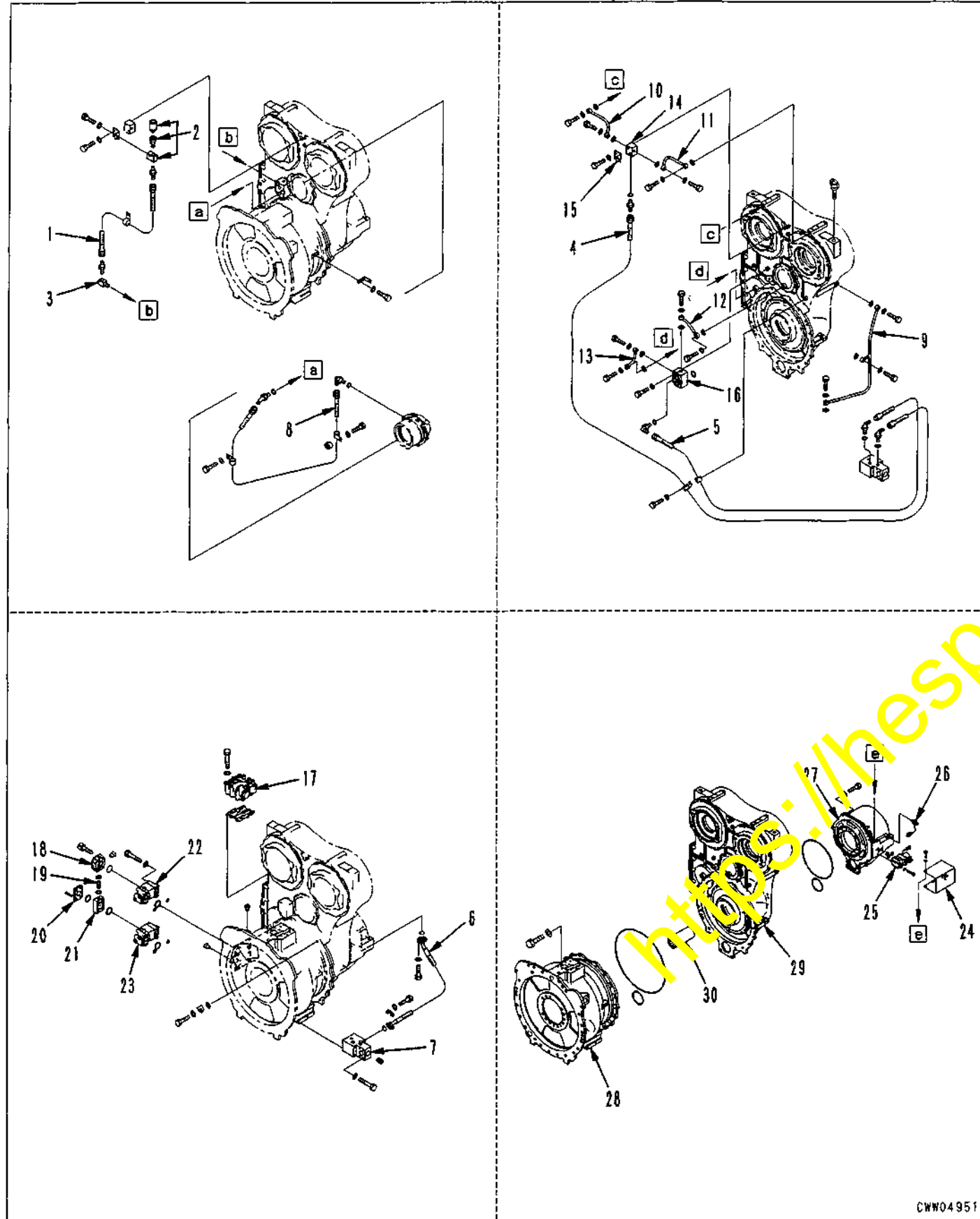
Gear	Speed reduction ratio
A-B	$68/74=0.919$
A-C	$68/74=0.919$
A-D	$68/74=0.919$
A-E	$58/74=0.784$

4. Following right and left assemble position about PTO gear 42C-13-15140 and 42C-13-15150.



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GENERAL DISASSEMBLY, ASSEMBLY OF CONVERTER ASSEMBLY

**Disassembly procedure****1. Breather and breather hose**

- 1) Remove breather hose (1).
- 2) Remove the 2 mounting bolts, then remove breather (2) and the block as one unit.
- 3) Remove elbow (3).

2. Lubrication hoses and block

- 1) Remove lubrication hoses (4) and (5).
★ Remove the hose clamps, too.
- 2) Remove the 4 mounting bolts, flange, and remove lubrication hose (6).
★ Remove the hose clamp, too.
- 3) Remove the 4 mounting bolts and block (7).
- 4) Remove lubrication hose (8).

3. Lubrication tubes and blocks

- 1) Remove the 3 joints and lubrication tube (9).
- 2) Remove the 2 joints each from lubrication tubes (10), (11), (12), and (13), then remove those tubes.
- 3) Remove the 2 mounting bolts, block (14), and bracket (15).
- 4) Remove the 3 mounting bolts and block (16).

4. Main relief valve and torque converter relief valve assembly

Remove the 7 mounting bolts and main relief valve and torque converter relief valve assembly (17).

5. Torque converter regulator valve assembly

- 1) Remove the 4 mounting bolts and block (18).
- 2) Remove sleeve (19).
- 3) Remove the 4 mounting bolts, cover (20), and block (21).
- 4) Remove the 4 mounting bolts and torque converter regulator valve assembly (22).
- 5) Remove valve block assembly (23).

6. Modulated clutch ECMV assembly

- 1) Remove the 3 mounting bolts and cover (24).
- 2) Remove the 4 mounting bolts and modulated clutch ECMV assembly (25).

7. Rotation sensor

Loosen the locknut and remove rotation sensor (26).

8. Modulated clutch assembly

- Remove the 10 mounting bolts and modulated clutch assembly (27).
- ★ Since the hexagon socket head bolt is not used for mounting, do not remove it.

- ★ Pull out the modulated clutch assembly with forcing screws (12 mm).
- ★ Pull out the modulated clutch assembly horizontally so that the inner race and outer race of the roller bearing will not be tilted when they are disconnected from each other.


 Modulated clutch assembly: 220 kg

- ★ For the disassembly procedure of the modulated clutch assembly, see DISASSEMBLY, ASSEMBLY OF MODULATED CLUTCH ASSEMBLY.

9. Torque converter assembly and PTO and transfer assembly

- 1) Remove the 19 mounting bolts, then remove torque converter assembly (28) from PTO and transfer assembly (29).

 Torque converter assembly: 430 kg


 PTO and transfer assembly: 800 kg

- ★ For the disassembly procedure of the torque converter assembly, see DISASSEMBLY, ASSEMBLY OF TORQUE CONVERTER ASSEMBLY.
 - ★ For the disassembly procedure of the torque converter assembly, see DISASSEMBLY, ASSEMBLY OF PTO AND TRANSFER ASSEMBLY.
- 2) Remove coupling (30) from torque converter assembly (28).

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Assembly procedure**1. Torque converter assembly and PTO and transfer assembly**


- 1) Install coupling (30) to torque converter assembly (28).
- 2) Fit the O-ring to the connecting parts of torque converter assembly (28) and PTO and transfer assembly (29).

 O-ring: **Grease (G2-LI)**

- 3) Install torque converter assembly (28) to PTO and transfer assembly (29) with the 19 bolts.


★ Since the outer race and inner race of the tapered roller bearing are coupled with each other, drop about 6 cc of engine oil (EO30-CD or EO10-CD) onto the sliding surfaces of the rollers.

 Torque converter assembly: **430 kg**

 PTO and transfer assembly: **800 kg**

2. Modulated clutch assembly

Fit the O-ring and install modulated clutch assembly (27) with the 10 bolts.

 O-ring: **Grease (G2-LI)**

★ Since the outer race and inner race of the roller bearing are coupled with each other, drop about 6 cc of engine oil (EO30-CD or EO10-CD) onto the sliding surfaces of the rollers and insert the modulated clutch assembly horizontally, taking care not to tilt it.

 Modulated clutch assembly: **220 kg**


3. Rotation sensor

Install rotation sensor (26) and secure it with the locknut.

 Threaded part of sensor:


Gasket sealant (LG-5)

★ Put the rotation sensor tip lightly against the gear tooth tip in the modulated clutch and return by 1/2 – 1 turn and secure with the locknut.

 Locknut: **49.0 – 68.6 Nm {5 – 7 kgm}**

4. Modulated clutch ECMV assembly


- 1) Fit the O-ring and install modulated clutch ECMV assembly (25) with the 4 bolts.

 Mounting bolt:
27.4 – 34.3 Nm {2.8 – 3.5 kgm}


- 2) Install cover (24) with the 3 bolts.

5. Torque converter regulator valve assembly

- 1) Fit the O-ring and install valve block assembly (23) with the 4 bolts.


 Mounting bolt:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}

- 2) Fit the O-ring and install torque converter regulator valve assembly (22) with the 4 bolts.

 Mounting bolt:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}

- 3) Fit the O-ring and install block (21) and cover (20) with the 4 bolts.


- 4) Fit the O-ring and install sleeve (19).

 O-ring: **Grease (G2-LI)**

- 5) Fit the O-ring and install block (18) with 4 bolts.

6. Main relief valve and torque converter relief valve assembly

Fit the gasket and install main relief valve and torque converter relief valve assembly (17) with the 9 bolts.

 Mounting bolt:
58.8 – 73.5 Nm {6.0 – 7.5 kgm}

7. Lubrication tubes and blocks


- 1) Fit the O-ring and install block (13) with the 3 bolts.

- 2) Install bracket (15) and block (14) with the 2 bolts.

- 3) Fit the gasket and install lubrication tubes (13), (12), (11), and (10) with the 2 joints each.

 Joint:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}

- 4) Fit the gasket and install lubrication tube (9) with the 3 joints.

 Joint:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}

8. Lubrication hoses and block

- 1) Install lubrication hose (8).

★ Secure the hose with the hose clamp.

- 2) Install block (7) with the 4 bolts.

- 3) Fit the O-ring and install lubrication hose (6) with the 4 bolts and the flange.

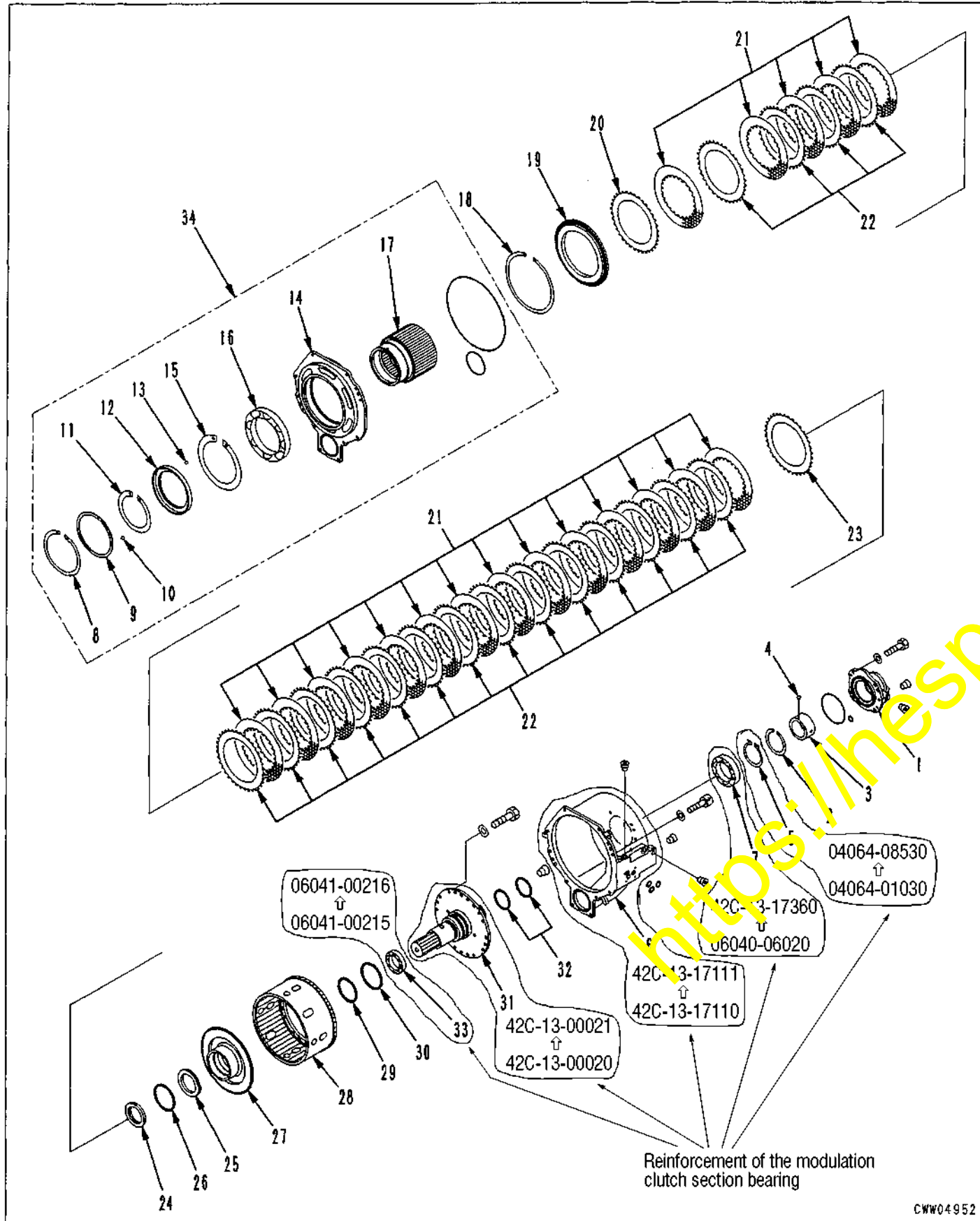
- 4) Install lubrication hoses (5) and (4).

★ Secure the hoses with the hose clamps.

9. Breather and breather hose

- 1) Install elbow (3).
 - 2) Install breather (2) with the 2 bolts.
 - 3) Install breather hose (1).
- ★ Secure the hose with the hose clamp.

DISASSEMBLY, ASSEMBLY OF MODULATED CLUTCH ASSEMBLY



Disassembly procedure

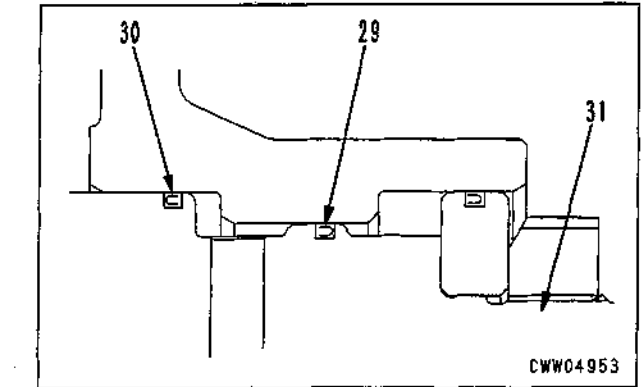
- 1. Cage**
 - 1) Remove the 4 mounting bolts and cage (1).
 - ★ Pull out the cage with forcing screws (12 mm).
 - 2) Remove snap ring (2), then remove bushing (3) and ball (4) from cage (1).
- 2. Case**
 - 1) Remove snap ring (5).
 - 2) Remove the 2 mounting bolts and case (6).
 - 3) Remove ball bearing (7) from case (6).
 - ★ Use a press to remove the ball bearing.
- 3. Cover and input drum assembly**
 - 1) Remove cover and input drum assembly (34).
 - 2) Remove snap ring (8), plate (9), and ball (10).
 - 3) Remove snap ring (11), cover (12), and ball (13).
 - 4) Remove input drum (17) from cover (14).
 - 5) Remove snap ring (15) and ball bearing (16).
 - ★ Use a press to pull out the ball bearing.
- 4. Discs and plates**
 - 1) Remove snap ring (18) and plate (19).
 - 2) Remove damper (20).
 - 3) Remove 19 discs (21) and 18 plates (22) alternately.
 - 4) Remove damper (23).
- 5. Piston**
 - 1) Using tool C4, remove nut (24).
 - 2) Remove plate (25).
 - 3) Remove seal ring (26) from plate (25).
 - 4) Remove piston (27).
 - ★ Push out the piston from the shaft side with forcing screws (12 mm).
- 6. Output drum**

Remove the 12 mounting bolts and drum (28).

 - ★ Push out the drum from the shaft side with forcing screws (12 mm).
- 7. Shaft**
 - 1) Remove seal rings (29) and (30) from shaft (31).
 - 2) Remove 2 seal rings (32) from shaft (31).
 - 3) Remove the inner race of roller bearing (33) from shaft (31).
 - ★ Use a bearing puller to pull out the bearing.

Assembly procedure

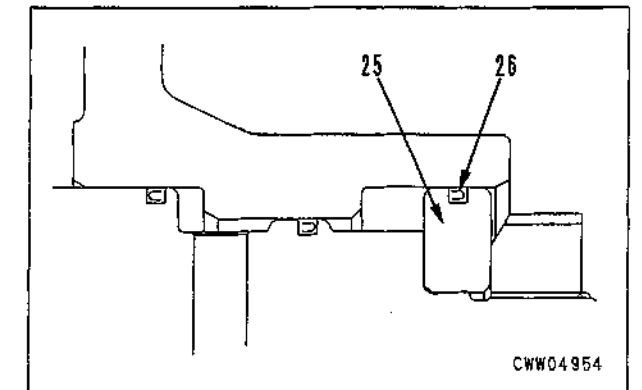
- 1. Shaft**
 - 1) Press fit the inner race of roller bearing (33) to shaft (31).
 - ★ Using a press, fit the bearing until the end of its inner race touches the shoulder of the shaft.
 - 2) Install seal ring (32) to shaft (31).
 - Seal ring: Grease (G2-LI)
 - 3) Install seal rings (30) and (29) to shaft (31).
 - Seal ring: Grease (G2-LI)
 - ★ Install the seal rings as shown in the following figure.





- 2. Output drum**

Install drum (28) with the 12 bolts.

 - Threaded parts:
 - Liquid adhesive (LT-2)
 - Mounting bolt: 98 - 123 Nm (10.0 - 12.5 kgm)
- 3. Piston**
 - 1) Install piston (27).
 - 2) Install seal ring (26) to plate (25).
 - Seal ring: Grease (G2-LI)
 - ★ Install the seal ring as shown in the following figure.



- 3) Install plate (25).
- 4) Using tool **C4**, install nut (24).
 Threaded parts of nut:
Liquid adhesive (LT-2)
 ★ Install the nut with the chamfered periphery to plate (25).

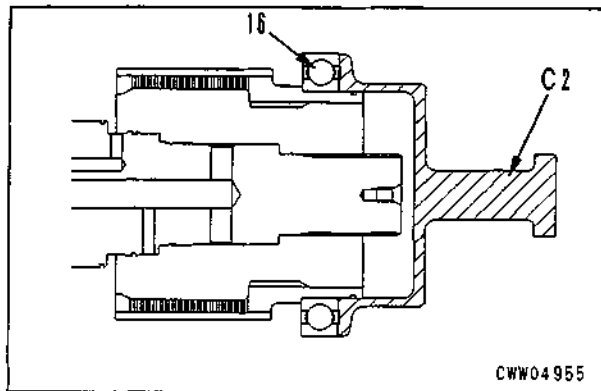
 Nut:
313.8 – 392.3 Nm (32 – 40 kgm)

4. Discs and plates

- 1) Install damper (23).
 ★ Install the damper with the cork side to the piston.
- 2) Install 19 discs (21) and 18 plates (22) alternately.
 ★ Soak the discs in clean engine oil (EO30-CD or EO10-CD) for at least 2 minutes before installing them.
- 3) Install damper (20).
 ★ Install the damper with the cork side to plate (19).
- 4) Install plate (19) and secure it with snap ring (18).


5. Cover and input drum assembly

- 1) Using tool **C2**, install ball bearing (16) to cover (14) and secure it with snap ring (15).
 ★ Press fit the bearing until the end of its outer race touches the shoulder of the cover.
 ★ After press fitting the bearing, drop about 6 cc of engine oil (EO30-CD or EO10-CD) onto the sliding parts and rotate the bearing 10 turns to spread the oil.




- 2) Install input drum (17) to cover (14).
- 3) Install ball (13) and cover (12) and secure them with snap ring (11).
 ★ Put the ball in the ball hole of the drum, then install the cover, matching its ball groove to the ball.
- 4) Install ball (10) and plate (9) and secure them with snap ring (8).
 ★ Put the ball in the ball hole of the cover, then install the plate, matching its ball groove to the ball.
- 5) Install cover and input drum assembly (34).

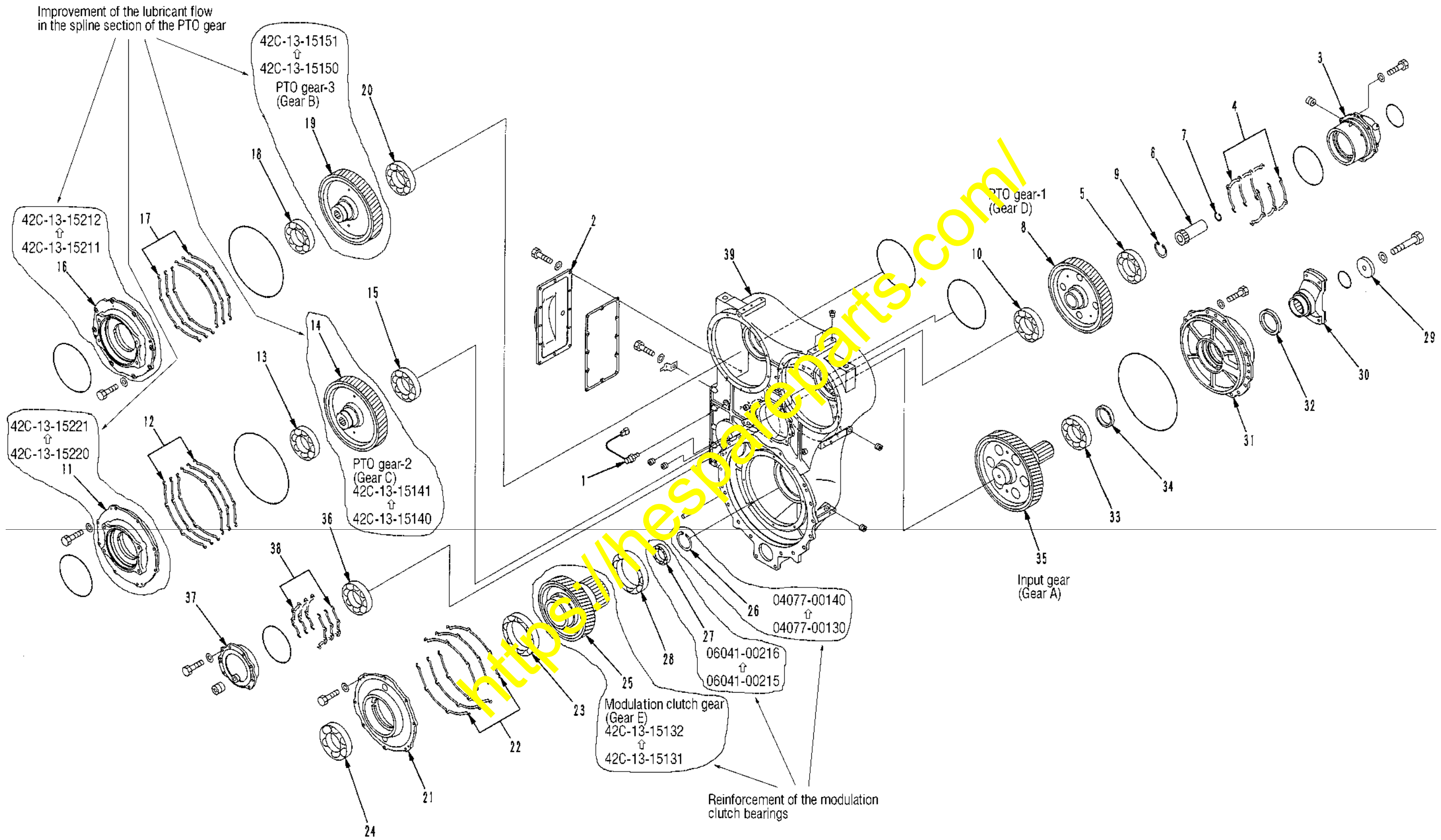
6. Case

- 1) Install ball bearing (7) to case (6).
 ★ Using a press, fit the bearing until the end of its outer race touches the shoulder of the cover.
 ★ After press fitting the bearing, drop about 6 cc of engine oil (EO30-CD or EO10-CD) onto the sliding parts and rotate the bearing 10 turns to spread the oil.
- 2) Fit the O-ring to the cover and install case (6) to shaft (31) and secure them with the 2 bolts.
 O-ring: **Grease (G2-LI)**
 ★ Push the inner race of ball bearing (7) with a press until its end touches the shoulder of the shaft.
 ★ Check that the ball bearing is fitted perfectly, then tighten the 2 bolts.
- 3) Install snap ring (5).

7. Cage

- 1) Install ball (4) and bushing (3) to cage (1) and secure them with snap ring (2).
 ★ Put the ball in the ball hole of the bushing, then install the cage, matching its ball groove to the ball.
- 2) Fit the O-ring and install cage (1) with the 4 bolts.
 O-ring: **Grease (G2-LI)**

DISASSEMBLY, ASSEMBLY OF PTO AND TRANSFER ASSEMBLY



Disassembly procedure**1. Rotation sensor**

Loosen the locknut and remove rotation sensor (1).

2. Cover

Remove the 12 mounting bolts and cover (2).

3. PTO gear 1 (Gear D)

1) Remove the 6 mounting bolts, cage (3), and shims (4).

★ Check the thickness and quantity of the shims.

2) Remove the outer race of tapered roller bearing (5) from cage (3).

★ Use a bearing puller to pull out the outer race.

3) Remove coupling (6).

4) Remove snap ring (7) from coupling (6).

5) Remove gear (8).

6) Remove snap ring (9) from gear (8).

7) Remove the inner races of tapered roller bearings (5) and (10) from gear (8).

★ Use a bearing puller to pull out the inner races.

4. PTO gear 2 (Gear C)

1) Remove the 8 mounting bolts, cage (11), and shims (12).

★ Check the thickness and quantity of the shims.

2) Remove the outer race of tapered roller bearing (13) from cage (11).

★ Use a bearing puller to pull out the outer race.

3) Remove gear (14)

4) Remove the inner races of tapered roller bearings (13) and (15) from gear (14).

★ Use a bearing puller to pull out the inner races.

5. PTO gear 3 (Gear B)

1) Remove the 8 mounting bolts, cage (16), and shims (17).

★ Check the thickness and quantity of the shims.

2) Remove the outer race of tapered roller bearing (18) from cage (16).

★ Use a bearing puller to pull out the outer race.

3) Remove gear (19)

4) Remove the inner races of tapered roller bearings (18) and (20) from gear (19).

★ Use a bearing puller to pull out the inner races.

6. Modulated clutch gear (Gear E)

1) Remove the 8 mounting bolts, cage (21), and shims (22).

★ Check the thickness and quantity of the shims.

2) Remove the outer races of tapered roller bearings (23) and (24) from cage (21).

★ Use a bearing puller and a press to pull out the outer races.

3) Remove gear (25).

4) Remove snap ring (26), then remove the outer race of roller bearing (27) from gear (25).

★ Use a bearing puller to pull out the outer race.

5) Remove the inner races of tapered roller bearings (23) and (28) from gear (25).

★ Use a bearing puller to pull out the inner races.

7. Input gear (Gear A)

1) Remove the mounting bolts and holder (29).

2) Remove coupling (30).

3) Remove the 17 mounting bolts and cage (31).

4) Remove oil seal (32) from cage (31).

5) Remove the outer race of tapered roller bearing (33) from cage (31).

★ Use a bearing puller to pull out the outer race.

6) Remove spacer (34).

7) Lift off gear (35).

8) Remove the inner races of tapered roller bearings (33) and (36) from gear (35).

★ Use a bearing puller to pull out the inner races.

9) Remove the 8 mounting bolts, cage (37), and shims (38).

★ Check the thickness and quantity of the shims.

10) Remove the outer race of tapered roller bearing (36) from cage (37).

★ Use a bearing puller to pull out the outer race.

8. Case

Remove the outer races of tapered roller bearings (10), (15), and (20) from case (39).

★ Use a bearing puller to pull out the outer races.

Assembly procedure**1. Case**

Install the outer races of tapered roller bearings (20), (15), and (10) to case (39).

★ Push each outer race with a press until its end touches the shoulder of the case.

2. Input gear (Gear A)

1) Install the outer race of tapered roller bearing (36) to cage (37).

★ Push the outer race with a press until its end touches the shoulder of the cage.

2) Fit the O-ring and install shims (38) and cage (37) with the 8 bolts.

★ The shims are of 2-piece split type. Set them to the standard thickness temporarily on each side.

★ Standard thickness of shims: 2.0 mm

3) Install the inner races of tapered roller bearings (36) and (33) to gear (35).

★ Push each inner race with a press until its end touches the shoulder of the gear.

4) Install gear (35).

5) Install spacer (34).

6) Install the outer race of tapered roller bearing (33) to cage (31).

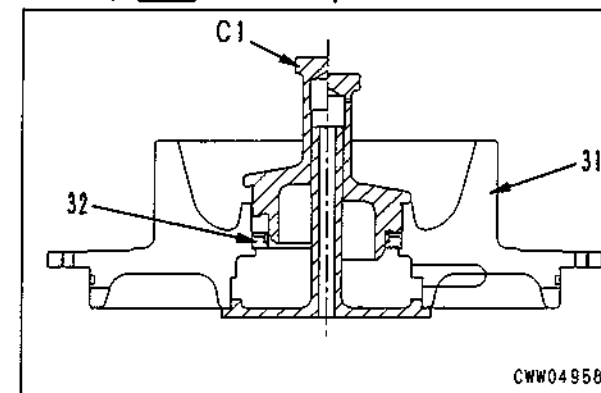
★ Push the outer race with a press until its end touches the shoulder of the cage.

7) Using tool C1, press fit oil seal (32) to cage (31).

★ Thinly apply gasket sealant (LG-5) to the oil seal fitting part of the cage. After fitting the oil seal, wipe off the projected sealant.

★ Press fit the oil seal until the flange of tool C1 touches the cage.

Oil seal lip: Grease (G2-LI)



8) Install cage (31) with the 17 bolts.

Threaded parts of mounting bolt:
Liquid adhesive (LT-2)

Mounting bolt:
245 – 309 Nm (25.0 – 31.5 kgm)

9) Using a push-pull scale, check that the rotational force at the gear tooth tip is within the standard range. ※ Follow the instructions given in Section 4-4.

★ Rotational force of gear:
0.98 – 2.94 Nm {0.1–0.3 kgfm} (Separately)

★ If the rotational force is out of the standard range, adjust it by changing the shim thickness.

★ Adjustment range of shim thickness:
1.3 – 2.7 mm

★ Types of shims:
0.15 mm, 0.2 mm, 0.5 mm

10) Fit the O-ring and install coupling (30).

11) Install holder (29) with the mounting bolts.

Threaded parts of mounting bolt:
Liquid adhesive (LT-2)

Mounting bolt:
824 – 1,030 Nm (84 – 105 kgm)

3. Modulated clutch gear (Gear E)

1) Install the inner races of tapered roller bearings (28) and (23) to gear (25).

★ Push each inner race with a press until its end touches the shoulder of the gear.

2) Install the outer race of roller bearing (27) to gear (25) and secure it with snap ring (26).

★ Push the outer race with a press until its end touches the shoulder of the gear.

3) Install gear (25).

★ Drop about 6 cc of engine oil (EO30-CD or EO10-CD) onto the sliding parts of the bearing and rotate the bearing 10 turns to spread the oil.

4) Install the outer races of tapered roller bearings (24) and (23) to cage (21).

★ Push each outer race with a press until its end touches the shoulder of the cage.

5) Install shims (22) and cage (21) with the 8 bolts.

★ Drop about 6 cc of engine oil (EO30-CD or EO10-CD) onto the sliding parts of the bearing and rotate the bearing 10 turns to spread the oil.

- ★ The shims are of 2-piece split type. Set them to the standard thickness temporarily on each side.
- ★ Standard thickness of shims: 2.0 mm

6) Using a push-pull scale, check that the rotational force at the gear tooth tip is within the standard range. ※ Follow the instructions given in Section 4.4.

- ★ Rotational force of gear: 0.98 – 2.94 Nm {0.1 – 0.3 kgfm}(Separately)
- ★ If the rotational force is out of the standard range, adjust it by changing the shim thickness.
- ★ Adjustment range of shim thickness: 1.3 – 2.7 mm
- ★ Types of shims: 0.15 mm, 0.2 mm, 0.5 mm

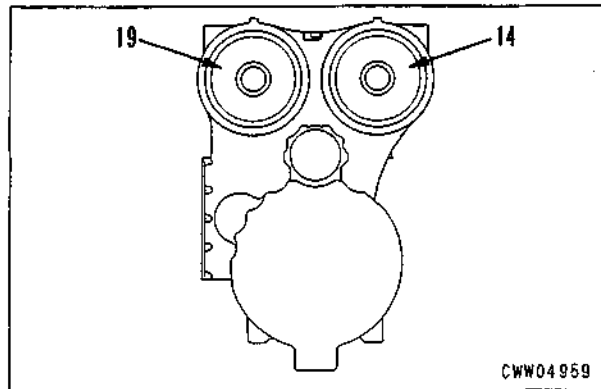
4. PTO gear 3 (Gear B)

1) Install the inner races of tapered roller bearings (20) and (18) to gear (19).

- ★ Push each inner race with a press until its end touches the shoulder of the gear.

2) Install gear (19).

- ★ PTO gear 2 and PTO gear 3 are different parts and they must be installed in the correct directions respectively. There are 2 identification grooves on the end of gear (19). Install gear (19) with those identification grooves on the cage side (torque converter side). (The following figure is the gear seen from the torque converter side.)



3) Install the outer race of tapered roller bearing (18) to cage (16).

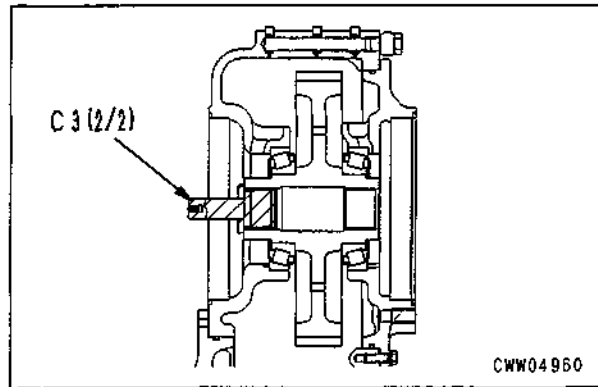
- ★ Push the outer race with a press until its end touches the shoulder of the cage.

4) Fit the O-ring and install shims (17) and cage (16) with the 8 bolts.

- ★ The shims are of 2-piece split type. Set them to the standard thickness temporarily on each side.
- ★ Standard thickness of shims: 2.0 mm

5) Using tool C3 (2/2), check that the rotational force at the center of the gear is within the standard range. ※ Follow the instructions given in Section 4.4.

- ★ Rotational force of gear: 0.98 – 2.94 Nm {0.1 – 0.3 kgfm}(Separately)
- ★ If the rotational force is out of the standard range, adjust it by changing the shim thickness.
- ★ Adjustment range of shim thickness: 1.3 – 2.7 mm
- ★ Types of shims: 0.15 mm, 0.2 mm, 0.5 mm



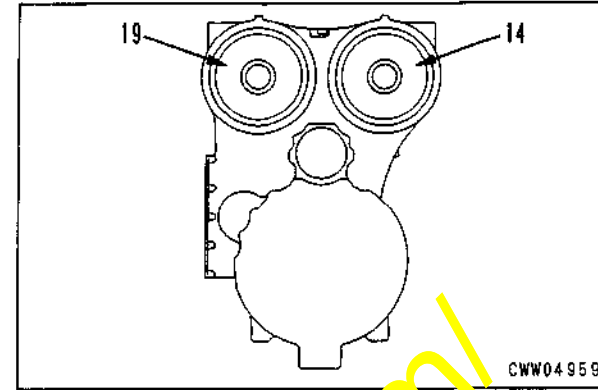
5. PTO gear 2 (Gear C)

1) Install the inner races of tapered roller bearings (15) and (13) to gear (14).

- ★ Push each inner race with a press until its end touches the shoulder of the gear.

2) Install gear (14).

- ★ PTO gear 2 and PTO gear 3 are different parts and they must be installed in the correct directions respectively. There is 1 identification groove on the end of gear (14). Install gear (14) with those identification grooves on the cage side (torque converter side). (The following figure is the gear seen from the torque converter side.)



3) Install the outer race of tapered roller bearing (13) to cage (11).

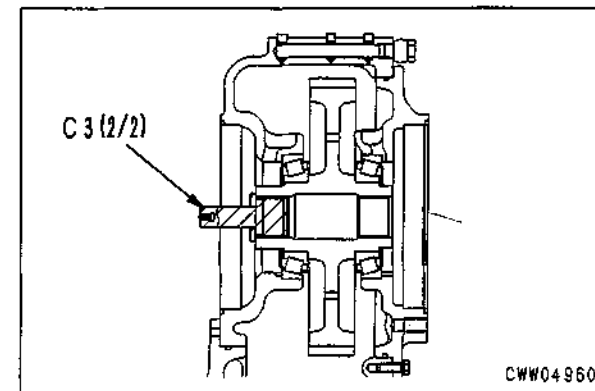
- ★ Push the outer race with a press until its end touches the shoulder of the cage.

4) Fit the O-ring and install shims (12) and cage (11) with the 8 bolts.

- ★ The shims are of 2-piece split type. Set them to the standard thickness temporarily on each side.
- ★ Standard thickness of shims: 2.0 mm

5) Using tool C3 (2/2), check that the rotational force at the center of the gear is within the standard range. ※ Follow the instructions given in Section 4.4.

- ★ Rotational force of gear: 0.98 – 2.94 Nm {0.1 – 0.3 kgfm}(Separately)
- ★ If the rotational force is out of the standard range, adjust it by changing the shim thickness.
- ★ Adjustment range of shim thickness: 1.3 – 2.7 mm
- ★ Types of shims: 0.15 mm, 0.2 mm, 0.5 mm



6. PTO gear 1 (Gear D)

1) Install the inner races of tapered roller bearings (10) and (5) to gear (8).

- ★ Push each inner race with a press until its end touches the shoulder of the gear.

2) Install snap ring (9) to gear (8).

3) Install gear (8).

4) Install snap ring (7) to coupling (6).

5) Install coupling (6).

6) Press fit the outer race of tapered roller bearing (5) to cage (3).

- ★ Push the outer race with a press until its end touches the shoulder of the cage.

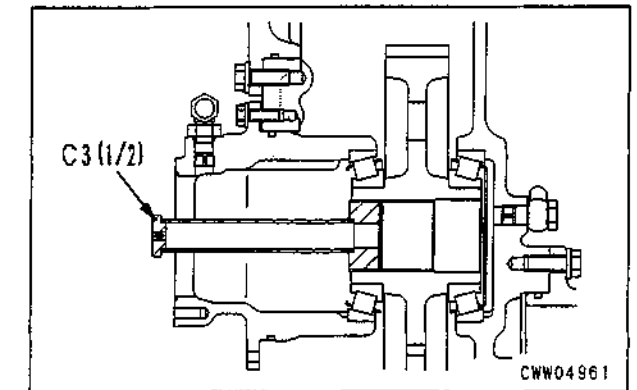
7) Fit the O-ring and install shims (4) and cage (3) with the 6 bolts.

⚠ O-ring: Grease (G2-LI)

- ★ The shims are of 2-piece split type. Set them to the standard thickness temporarily on each side.
- ★ Standard thickness of shims: 2.0 mm

8) Using tool C3 (1/2), check that the rotational force at the center of the gear is within the standard range. ※ Follow the instructions given in Section 4.4.

- ★ Rotational force of gear: 0.98 – 2.94 Nm {0.1 – 0.3 kgfm}(Separately)
- ★ If the rotational force is out of the standard range, adjust it by changing the shim thickness.
- ★ Adjustment range of shim thickness: 1.3 – 2.7 mm
- ★ Types of shims: 0.15 mm, 0.2 mm, 0.5 mm




7. Cover

Fit the gasket and install cover (2) with the 12 bolts.


8. Rotation sensor

Install rotation sensor (1) and secure it with the locknut.

 Threaded parts of sensor:

Gasket sealant (LG-5)

- ★ Put the rotation sensor tip lightly against the side of the input gear in the PTO and transfer assembly and return by 1/2 – 3/4 turns and secure with the locknut.

 Locknut: **49.0 – 68.6 Nm (5 – 7 kgm)**

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