

## SECTION 3 POWER TRAIN SYSTEM

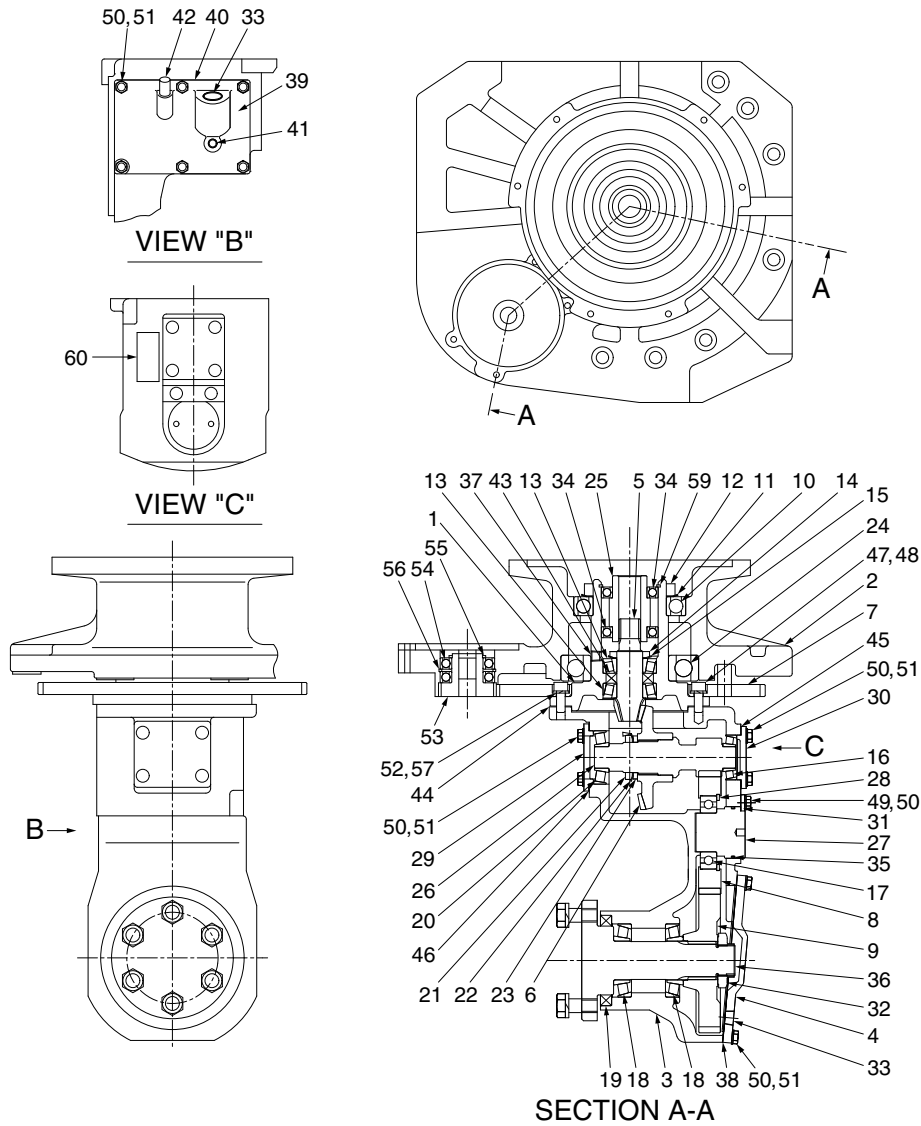
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# SECTION 3 POWER TRAIN SYSTEM

## GROUP 1 STRUCTURE AND OPERATION

### 1. DRIVE UNIT

#### 1) STRUCTURE



15PA7DU100

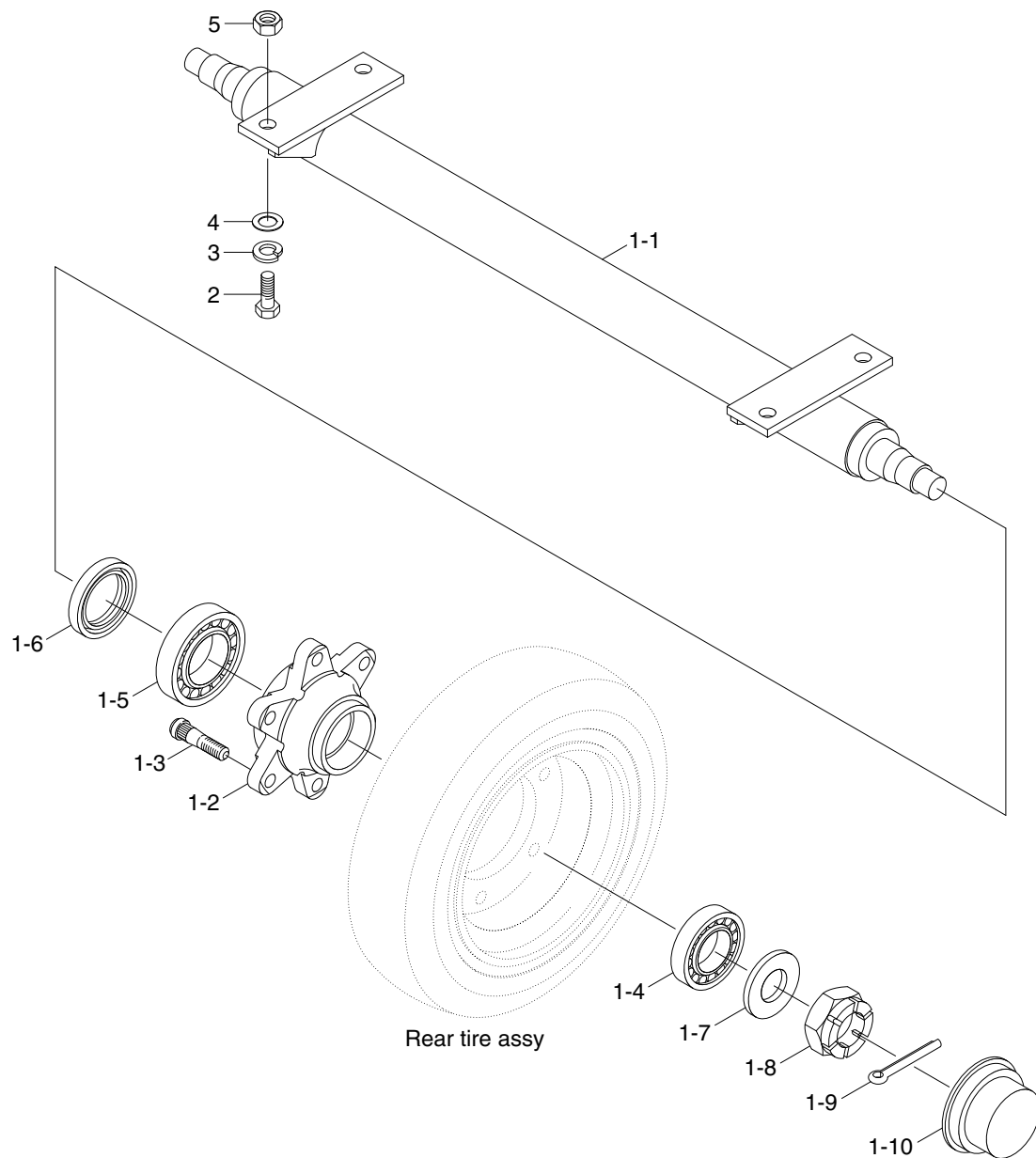
|                         |                         |                      |                  |
|-------------------------|-------------------------|----------------------|------------------|
| 1 Gear case cover       | 16 Bearing              | 31 Lock plate        | 46 Shim          |
| 2 Bracket               | 17 Bearing              | 32 Drive shaft nut   | 47 Hexagon bolt  |
| 3 Gear case             | 18 Bearing              | 33 Taper plug        | 48 Washer        |
| 4 Drive unit cover      | 19 Seal                 | 34 Bearing           | 49 Hexagon bolt  |
| 5 Spiral bevel gear     | 20 Taper roller bearing | 35 O-ring            | 50 Spring washer |
| 6 Spiral bevel gear     | 21 Bearing nut          | 36 Drive wheel shaft | 51 Hexagon bolt  |
| 7 Steering gear         | 22 Bearing washer       | 37 Taper plug        | 52 Hexagon bolt  |
| 8 Idle gear             | 23 Spacer               | 38 Drive unit gasket | 53 Pinion        |
| 9 Gear                  | 24 Bearing              | 39 Cover             | 54 Pinion gear   |
| 10 Bearing              | 25 Sleeve               | 40 Gasket            | 55 Snap ring     |
| 11 Bearing washer       | 26 Pinion shaft         | 41 Plug              | 56 Snap ring     |
| 12 Bearing nut          | 27 Idler gear shaft     | 42 Breather          | 57 Spring washer |
| 13 Taper roller bearing | 28 Snap ring            | 43 Oil seal          | 59 Snap ring     |
| 14 Bearing nut          | 29 Drive unit cover     | 44 Shim              | 60 Name plate    |
| 15 Bearing washer       | 30 Drive unit cover     | 45 Shim              |                  |

## 2) SPECIFICATION

| Item                 | Unit       | Specification |
|----------------------|------------|---------------|
| Max drive input      | kW         | 5.0           |
| Max wheel load       | kg/lb      | 750/1650      |
| Gear ratio           | -          | 20.125        |
| Weight without fluid | kg/lb      | 100/220       |
| Oil quantity         | l /U.S.gal | 1.6/0.42      |

## 2. REAR AXLE

### 1) STRUCTURE



15P9RA01

1-1 Rear axle

1-2 Hub

1-3 Hub bolt

1-4 Taper roller bearing

1-5 Taper roller bearing

1-6 Oil seal

1-7 Plain washer

1-8 Low castle nut

1-9 Split pin

1-10 Hub cap

2 Hexagon bolt

3 Spring washer

4 Plain washer

5 Nut

## GROUP 2 TROUBLESHOOTING

| Problem   | Probable cause   | Remedy   |
|---|--|--|
| <b>Continuous metallic groan</b><br>1) During acceleration<br><br>2) During travelling at uniform speed | <ul style="list-style-type: none"> <li>Worn out gears.</li> <li>Pinion and bevel gear meshed too deeply.</li> <li>Lack of gear oil.</li> <li>Worn out gears.</li> <li>Loose or worn out bearing.</li> <li>Loose bevel gear wheel.</li> </ul> | <ul style="list-style-type: none"> <li>Adjust back-lash or replace gears.</li> <li>Refill</li> <li>Replace</li> <li>Adjust preload or replace.</li> <li>Replace bolts and washers.</li> <li>Tighten new bolts and washer.</li> </ul> |
| <b>Continuous knocking sound</b><br>1) During travelling at uniform speed                               | <ul style="list-style-type: none"> <li>Chipped gear teeth.</li> <li>Foreign matter in axle case.</li> <li>Worn out spline of drive shaft.</li> </ul>   | <ul style="list-style-type: none"> <li>Replace</li> <li>Clean</li> <li>Replace</li> </ul>  |
| <b>Oil leakage</b><br>1) Gear case<br><br>2) Hub, leaks   | <ul style="list-style-type: none"> <li>Oil level too high.</li> <li>Broken oil seal.</li> <li>Mounting bolts for housing loose.</li> <li>Worn out oil seal.</li> <li>Worn out bearing or eccentric rotation due to damage.</li> </ul>        | <ul style="list-style-type: none"> <li>Lower oil level</li> <li>Replace</li> <li>Retighten</li> <li>Replace</li> <li>Replace</li> </ul>  |
| <b>Power is not transmitted</b><br>1) Drive shaft, gear   | <ul style="list-style-type: none"> <li>Broken or slipped out drive shaft.</li> <li>Gear teeth stripped or worn out.</li> <li>Broken sleeve.</li> </ul>   | <ul style="list-style-type: none"> <li>Repair or replace</li> <li>Replace</li> <li>Replace</li> </ul>  |
| <b>Oil leakage on wheel shaft</b>   | <ul style="list-style-type: none"> <li>Radial shaft seal wrongly installed or damaged.</li> <li>Race on wheel shaft damaged.</li> </ul>  | <ul style="list-style-type: none"> <li>Remove wheel shaft and install a new radial shaft seal.</li> <li>Remove wheel shaft. Check wheel shaft race for reusability; if possible, rework.</li> </ul>                                  |
| <b>Oil leakage on drive unit cover</b>  | <ul style="list-style-type: none"> <li>Drive unit cover not sealed.</li> <li>Drive unit cover or case plane face uneven.</li> <li>Bolts not tightened according to the specified tightening torque.</li> </ul>                               | <ul style="list-style-type: none"> <li>Seal drive unit cover with LOCTITE No. 574.</li> <li>Touch up plane faces with oil rubber.</li> <li>Tighten bolts with the specified tightening torque.</li> </ul>                            |

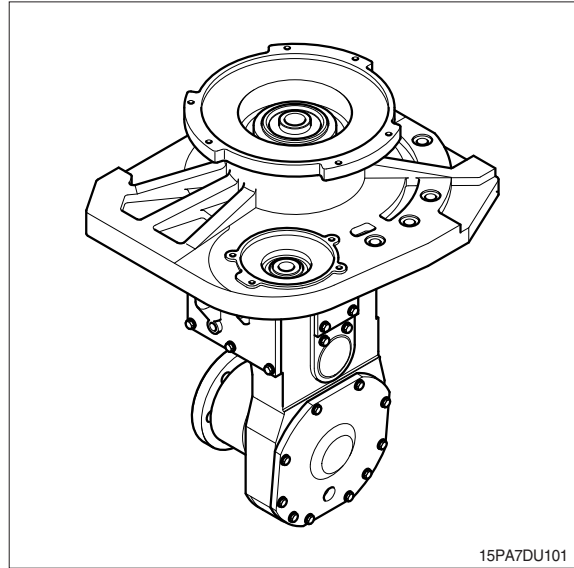
| Problem   | Probable cause   | Remedy   |
|---|--|--|
| <b>Oil leakage on oil filler or oil drain plug</b>                      | <ul style="list-style-type: none"> <li>• Dirt between sealing ring and housing.</li> <li>• Old sealing ring was used.</li> <li>• Bolts not tightened according to the specified tightening torque.</li> </ul>  | <ul style="list-style-type: none"> <li>• Cleaning required.</li> <li>• Use new sealing ring</li> <li>• Tighten bolts with the specified tightening torque.</li> </ul>  |
| <b>Oil leakage between housing and top section</b>                      | <ul style="list-style-type: none"> <li>• Seal faces not sealed or uneven.</li> <li>• Burrs on cylinder pin.</li> <li>• Bolts not tightened according to the specified tightening torque.</li> </ul>  | <ul style="list-style-type: none"> <li>• Apply LOCTITE 574 onto seal faces.</li> <li>• Touch up seal faces with oil rubber.</li> <li>• Use a new cylinder pin.</li> <li>• Tighten bolts with the specified tightening torque.</li> </ul>                   |
| <b>Oil leakage on top section within gear stage / input</b>             | <ul style="list-style-type: none"> <li>• Too much oil in drive unit.</li> <li>• O-ring on cover defective.</li> <li>• Breather valve defective.</li> </ul>   | <ul style="list-style-type: none"> <li>• Check oil level.</li> <li>• Install new O-ring.</li> <li>• Replace breather valve.</li> </ul>   |
| <b>Beating noise at gear stage</b>                                      | <ul style="list-style-type: none"> <li>• Teeth on input pinion and/or gear damaged by false installation.</li> </ul>   | <ul style="list-style-type: none"> <li>• Check tooth flanks for damage and touch up damaged spots with oil rubber.</li> </ul>  |
| <b>Ringing noise</b>  | <ul style="list-style-type: none"> <li>• Gear stage running without oil.</li> </ul>  | <ul style="list-style-type: none"> <li>• Check oil level.</li> <li>• Refill oil.</li> </ul>  |
| <b>Grinding noise</b>   | <ul style="list-style-type: none"> <li>• Bearing preload or backlash not correctly adjusted.</li> </ul>  | <ul style="list-style-type: none"> <li>• Checking and new adjustment.</li> </ul>   |
| <b>Bearing damage on input pinion</b>                                   | <ul style="list-style-type: none"> <li>• No axial play.</li> </ul>   | <ul style="list-style-type: none"> <li>• Install new bearing and adjust axial play.</li> </ul>   |
| <b>Pivoting bearing is difficult to rotate or backlash recognizable</b> | <ul style="list-style-type: none"> <li>• Cover disc loosened and dirt entered into the bearing.</li> <li>• Cage segments are damaged.</li> <li>• Plastic deformation of balls or ball race.</li> <li>• Bearing not relubricated.</li> <li>• Grease not distributed.</li> </ul> | <ul style="list-style-type: none"> <li>• Replace pivoting bearing.</li> <li>• Replace pivoting bearing.</li> <li>• Replace pivoting bearing.</li> <li>• Relubricate pivoting bearing.</li> <li>• Rotate pivoting bearing several times by hand.</li> </ul> |

## GROUP 3 DISASSEMBLY AND ASSEMBLY

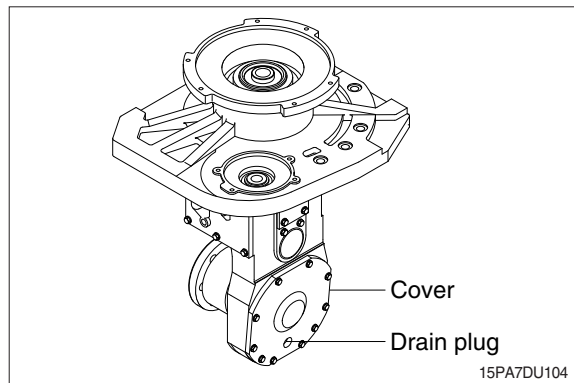
### 1. DISASSEMBLY

※ Before starting disassembly check the backlash and tooth contact for use as reference during assembly.

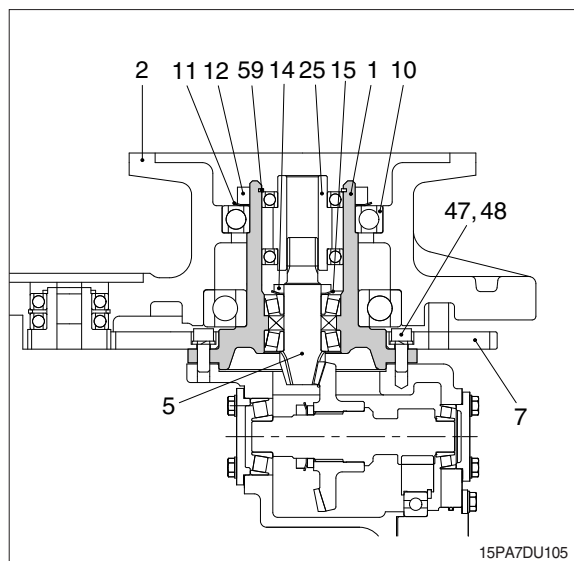
- 1) Stabilize the drive unit assembly by using wooden block.



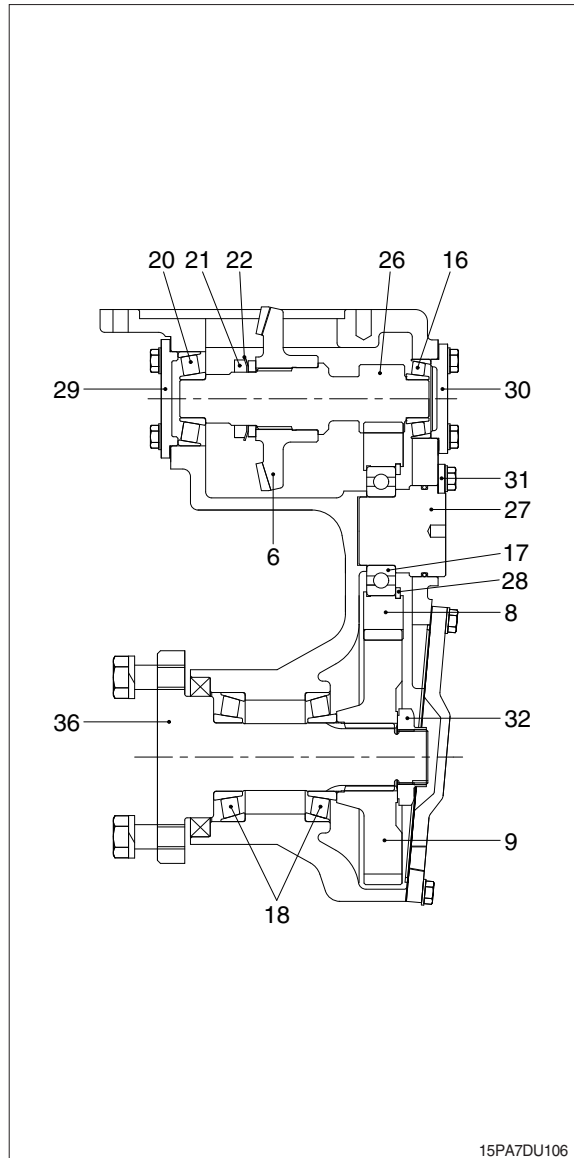
- 2) Remove the plug and drain out the oil.  
Remove the gear case cover and drain out the oil.



- 3) Loosen the lock nut and remove the lock nut (12) and washer (11).
- 4) Remove drive unit bracket (2). Remove the bearing (10) from bracket.
- 5) Remove bolts (47) and remove the steering gear (7).
- 6) Remove bolts (10EA).
- 7) Remove the cover (1) of gear case with spiral bevel pinion (5).
- 8) Remove the snap ring (59).
- 9) Remove bearing (34) and sleeve (25) from gear case cover (1).
- 10) Remove bearing nut (14) by straightening the locking part of the bearing washer (15), and remove the spiral bevel pinion (5) from the cover (1) of gear case.



- 11) Remove the end cover (29, 30).
- 12) Remove the bearing (16, 20) installed on the side of spiral bevel gear (6) for pinion shaft (26).  
Loose the nut for spiral bevel gear (6) by straightening the locking of the washer and remove the nut (21) and the washer (22).  
When loosening the nut, lock the pinion shaft by putting capper for between the idle gear (8) and the pinion shaft (26).
- ※ After removing the idle gear (8) remove the pinion shaft (26) and spiral bevel gear (6).
- 13) Support drive shaft (36) at drive wheel side not to rotate.  
Remove the lock nut (32) of drive gear and pull out the drive shaft (36) to drive wheel side.  
Remove the bearing (18) from drive shaft.
- 14) Remove the locking plate (31) for idle gear shaft and remove idle gear shaft (27).  
Pull out the idle gear from the side of drive gear (9).
- 15) After removing the snap ring (28), remove the bearing (17) for idle gear.
- 16) Pull out the pinion shaft (26) and the spiral bevel gear (6).



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## 2. INSPECTION

- 1) Inspect the gear case for cracks, bearing insertion parts for injuries, oil seals for damage and for other defects. Replace if found defective.  
Inspect for gear case cracks visually and by use of flaw penetrants.
- 2) Inspect the drive unit bracket for cracks, bearing insertion parts for injuries, bushings for damage, and other defects. Replace if found defective.
- 3) Inspect the gear case cover for cracks, bearing insertion parts for injuries and for other defects. Replace if found defective.
- 4) Inspect the spring adjuster and spring bracket for damage and spring for deterioration. Replace parts found defective.
- 5) Inspect the tooth part and spline part of steering pinion for damage and the bearing for damage, and replace the parts found defective.
- 6) Inspect the bearing and oil seal of steering part for damage, and replace the parts found defective.
- 7) Inspect the steering gear for damage, and replace parts found defective.
- 8) Inspect the spiral pinion shaft, counter gear shaft and idle gear shaft for tooth damage and shaft bend, and the bearings for damage. Replace the parts if found defective.
- 9) Inspect the spiral bevel pinion shaft for tooth damage and shaft bend, and the bearing holder and bearing for damage. Also inspect spiral bevel gear for damage. Replace the parts if found defective.
- 10) Inspect the drive wheel shaft for cracks, splines for wear and damage, and the bearings for damage. Replace the parts found defective.

### 3. ASSEMBLY

- 1) Assemble the oil seal to the cover of gear case, assemble the bearing to spiral bevel pinion shaft. Assemble the spiral bevel pinion shaft bearing, washer and nut to the cover of gear case, and screw on the locking nut.

Tighten the locking nut while measuring starting torque required to start the bevel pinion turning.

Bevel pinion starting torque. 2.7~3.0 kgf · cm (0.2~0.22 lbf · ft)

- 2) Assemble the drive wheel shaft to the gear case, assemble the spur gear from opposite side and screw on the locking nut. Tighten the locking nut while measuring starting torque required to start the spur gear turning. Spur gear starting torque. 23.6~26.3 kgf · cm (1.7~1.9 lbf · ft)

- 3) Measure A1, A2 of the gear case and B of the gear case cover, and adjust C to be 69.00~69.10 by shim.

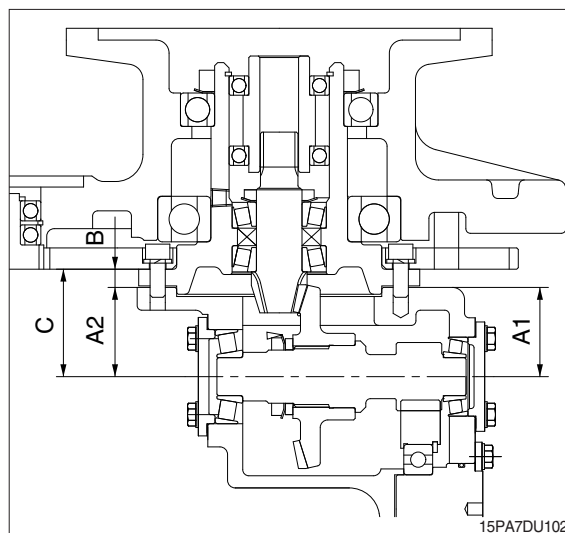
#### Shim thickness

XKCJ-00043 ..... 0.10 mm

XKCJ-00044 ..... 0.20 mm

XKCJ-00045 ..... 0.30 mm

XKCJ-00043 ..... 0.50 mm



- 4) On the adjusting the tooth contact of spiral bevel gear, if changing the shim, idle of decrease the shim inserting between the cover of shaft both side and the gear case shim thickness.

| Idle gear side |                | Drive tire side |                |
|----------------|----------------|-----------------|----------------|
| No.            | Shim thickness | No.             | Shim thickness |
| XKCJ-00047     | 0.10 mm        | XKCJ-00052      | 0.10 mm        |
| XKCJ-00048     | 0.15 mm        | XKCJ-00053      | 0.15 mm        |
| XKCJ-00049     | 0.2 mm         | XKCJ-00054      | 0.2 mm         |
| XKCJ-00050     | 0.3 mm         | XKCJ-00055      | 0.3 mm         |
| XKCJ-00051     | 0.5 mm         | XKCJ-00056      | 0.5 mm         |

- 5) Adjust the backlash between spiral bevel pinion and bevel gear.

Mount the dial gauge on gear case and read the backlash while rotating the drive wheel shaft.

Backlash 0.15~0.20 mm

If the backlash is not within the specified range, readjust the bevel gear shims. Increase the shim thickness if the backlash is too large, and decrease if too small.

- 6) Check the contact between the drive pinion and bevel gear tooth.

Clean the gear tooth and apply red lead of the surfaces of 8 or 9 bevel gear tooth.

Turn the bevel gear in both forward and reverse directions and determine by the patterns made on the tooth face whether the tooth is contacting properly.

#### 4. INSTALLATION

Perform the removal in reverse order.

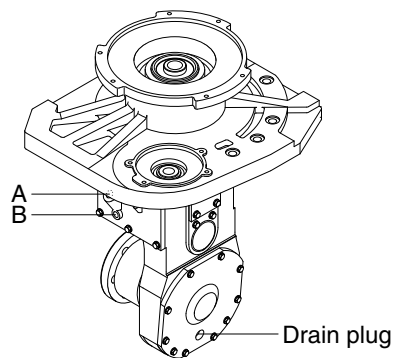
#### 5. LUBRICATION PROCEDURES

Lubrication of drive unit gear case is performed as follows :

※ **Cover the brakes and drive motor with waste to prevent the gear oil from splashing on these parts.**

1) Fill in oil through the filler hole A.

2) After operating the vehicle for several hours, remove plug B and check the oil level. Replenish it now.



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