

## SECTION 3 POWER TRAIN SYSTEM

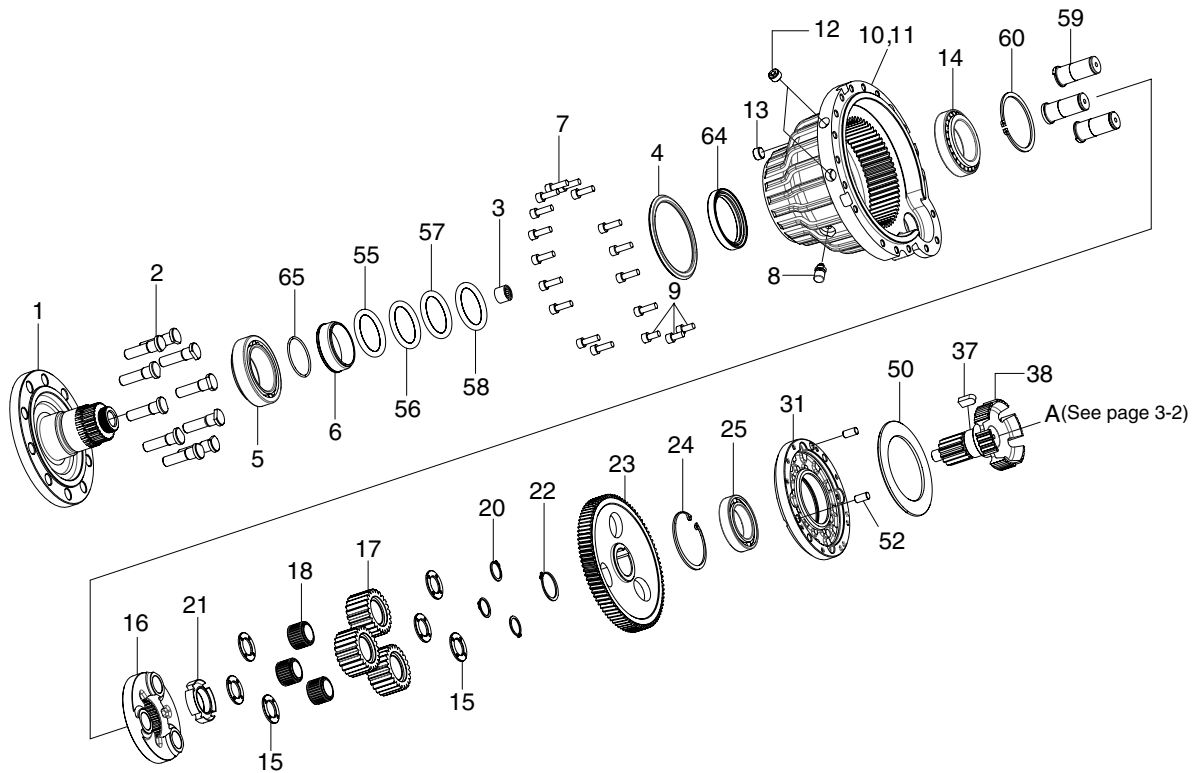
|                                        |     |
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# SECTION 3 POWER TRAIN SYSTEM

## GROUP 1 STRUCTURE AND OPERATION

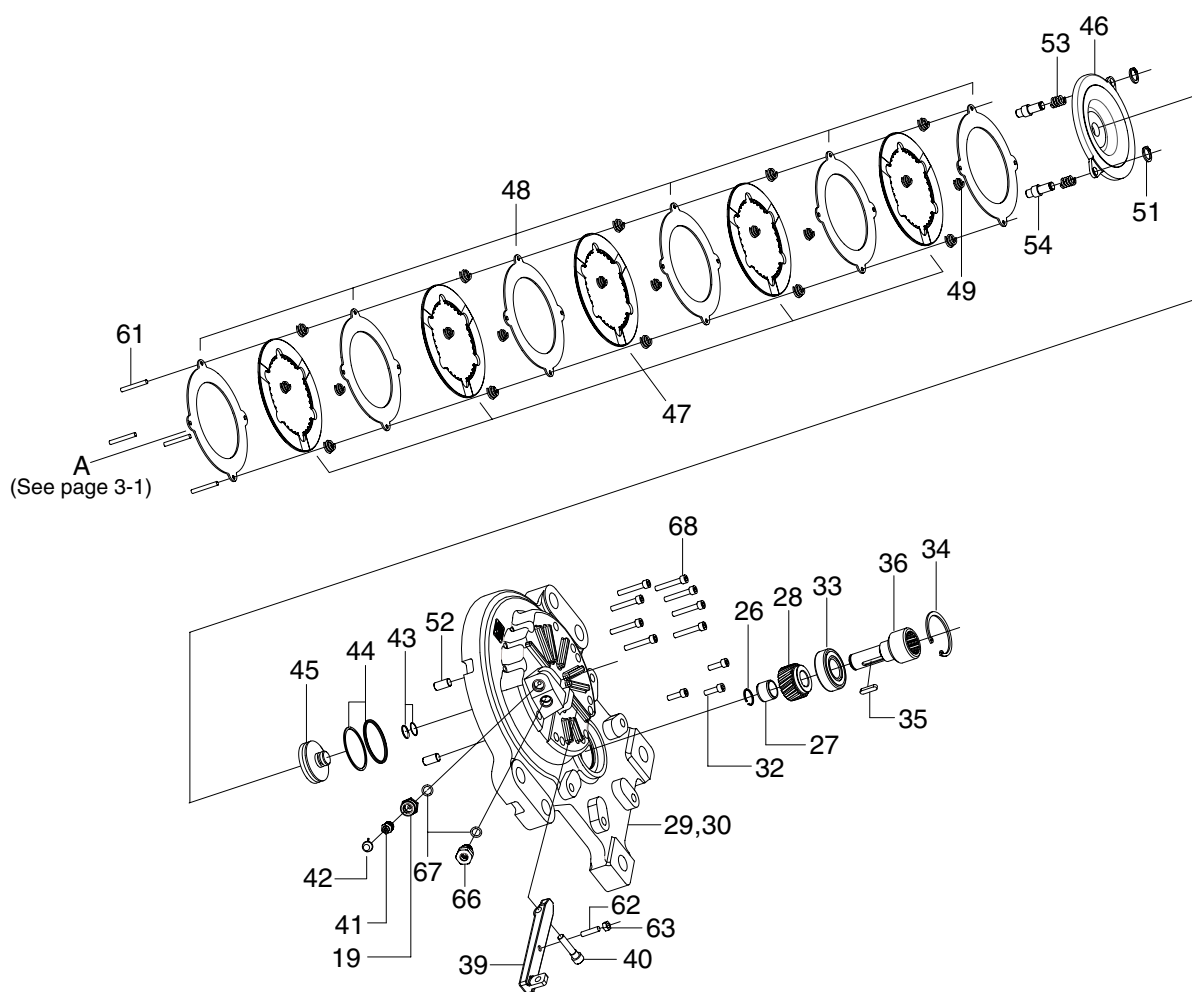
### 1. DRIVE UNIT

#### 1) STRUCTURE



22B7PT01

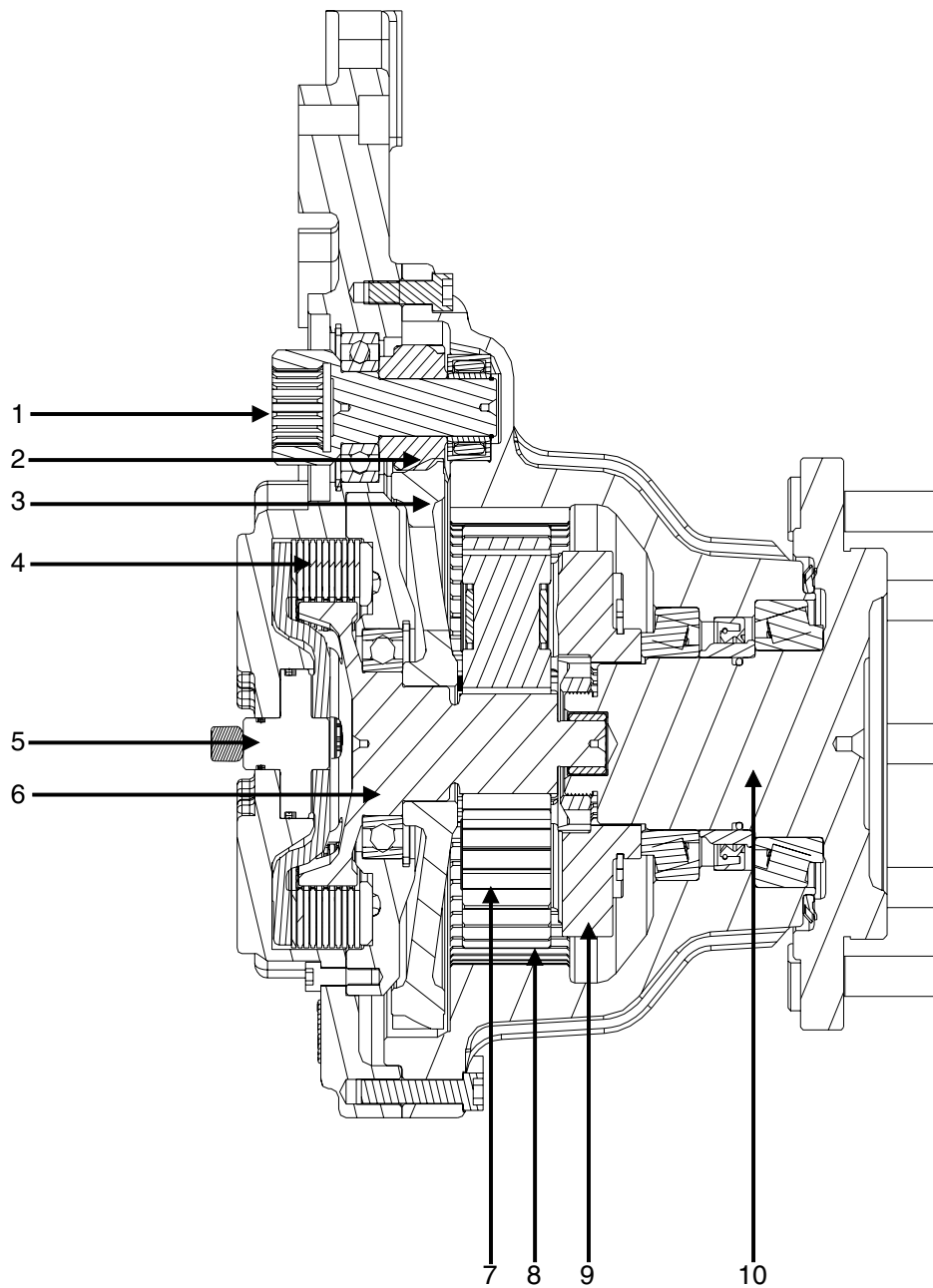
|    |                      |    |                      |    |                |
|----|----------------------|----|----------------------|----|----------------|
| 1  | Wheel hub            | 13 | Magnetic plug        | 31 | Inner cover    |
| 2  | Hub bolt             | 14 | Taper roller bearing | 37 | Key            |
| 3  | Needle bearing       | 15 | Thrust washer        | 38 | Sun pinion     |
| 4  | Gamma seal           | 16 | Planet carrier       | 50 | Support disk   |
| 5  | Taper roller bearing | 17 | Planet gear          | 55 | Shim           |
| 6  | Spacer               | 18 | Needle bearing       | 56 | Shim           |
| 7  | Bolt                 | 20 | Retaining ring       | 57 | Shim           |
| 8  | Air breather         | 21 | Lock nut             | 58 | Shim           |
| 9  | Socket screw         | 22 | Retaining ring       | 59 | Carrier pin    |
| 10 | Housing-LH           | 23 | Gear                 | 60 | Retaining ring |
| 11 | Housing-RH           | 24 | Retaining ring       | 64 | Oil seal       |
| 12 | Plug                 | 25 | Ball bearing         | 65 | O-ring         |



22B7PT02

|    |                 |    |                    |    |                |
|----|-----------------|----|--------------------|----|----------------|
| 19 | Bleeder fitting | 39 | Lever              | 51 | Retaining ring |
| 26 | Retaining ring  | 40 | Lever pin          | 52 | Parallel pin   |
| 27 | Needle cage     | 41 | Bleeding valve     | 53 | Spring         |
| 28 | Input pinion    | 42 | Bleeding valve cap | 54 | Stud           |
| 29 | Outer cover-LH  | 43 | Glyd ring          | 61 | Parallel pin   |
| 30 | Outer cover-RH  | 44 | Step seal          | 62 | Set screw      |
| 32 | Socket screw    | 45 | Piston             | 63 | Nut            |
| 33 | Ball bearing    | 46 | Elastic disk       | 66 | Brake plug     |
| 34 | Retaining ring  | 47 | Friction disk      | 67 | O-ring         |
| 35 | Key             | 48 | Steel disk         | 68 | Socket screw   |
| 36 | Input shaft     | 49 | Cone spring        |    |                |

## 2) OPERATION

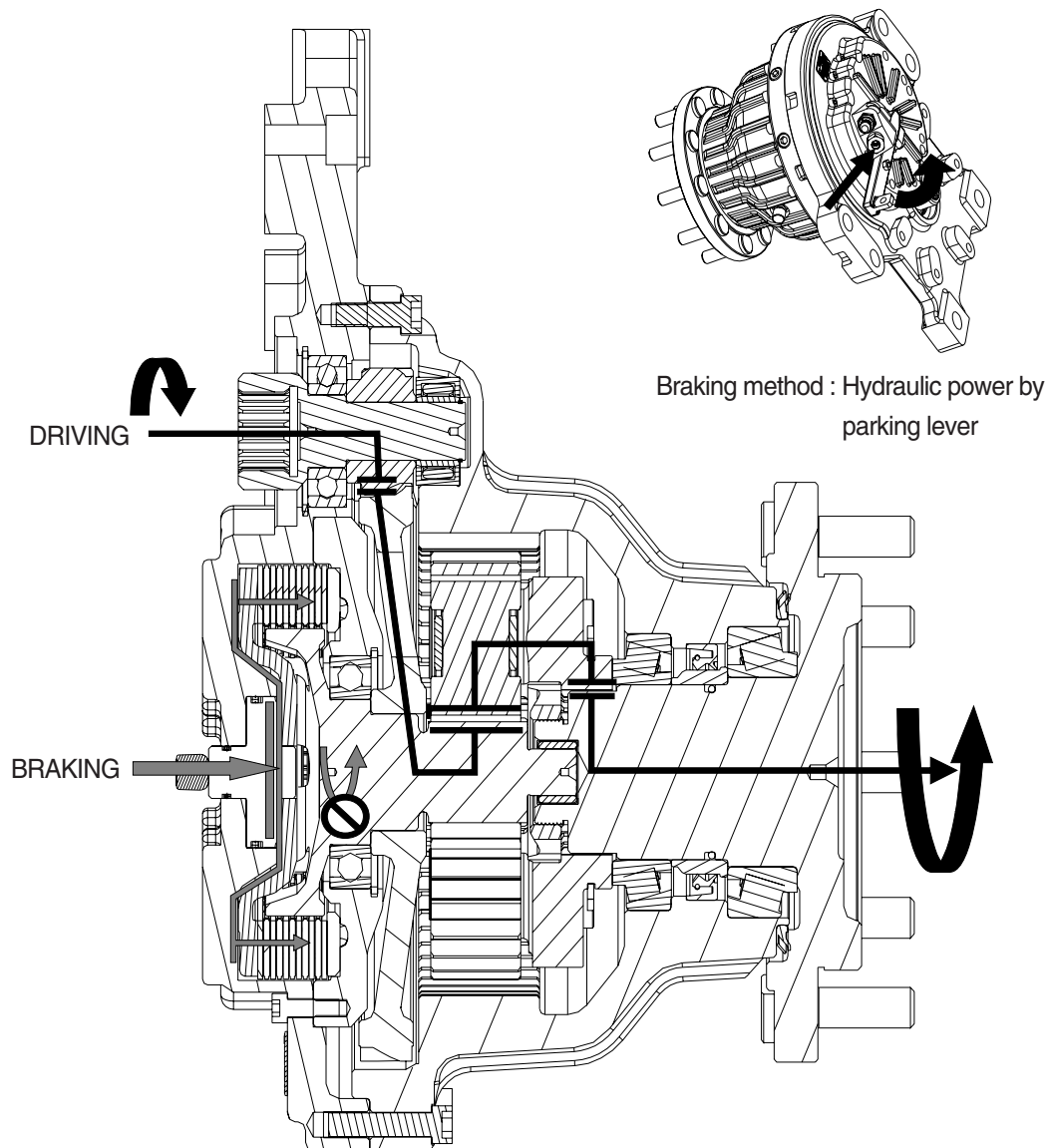


DRIVE UNIT 1

- |   |             |   |                    |    |                |
|---|-------------|---|--------------------|----|----------------|
| 1 | Input shaft | 5 | Brake piston       | 9  | Planet carrier |
| 2 | Drive gear  | 6 | Sun gear           | 10 | Wheel hub      |
| 3 | Driven gear | 7 | Planetary gear     |    |                |
| 4 | Brake pack  | 8 | Drive unit housing |    |                |

Driving : Rotation power of the motor → Input shaft → Drive gear → Driven gear → Sun gear → Planetary gear → Planet carrier → Wheel hub → Driving wheel

Braking : Pressurization hydraulic power through the brake port (or Formation hydraulic power by the parking lever) → Moving the brake piston → Moving the elastic disc → Contact the friction disc to the steel disc → Formation the braking power → Holdback rotation of the sun gear → Holdback rotation of the planetary gear → Holdback rotation of the planet carrier → Holdback rotation of the wheel hub → Holdback driving power



DRIVE UNIT 2

## 2) SPECIFICATION

| Item                 | Unit         | Specification |
|----------------------|--------------|---------------|
| Max wheel load       | kg/lb        | 4500/9921     |
| Gear ratio           | -            | 24.18         |
| Weight without fluid | kg/lb(EA)    | 62.3/137      |
| Oil quantity(ATF)    | l /U.S. · qt | 1.2/1.26      |

## GROUP 2 TROUBLESHOOTING

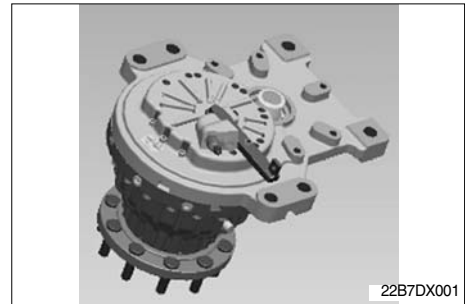
| Problem                                                                                                            | Cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Remedy                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Noise</b><br>1) Knocking conditional on speed<br>2) Singing noise<br>3) Muffled grinding noise               | <ul style="list-style-type: none"> <li>• Gearing of helical gear steep has been damaged when mounting motor.</li> <li>• Motor connection is not correct.</li> <li>• Motor bearing is faulty.</li> <li>• Wheel bearings faulty.               <ul style="list-style-type: none"> <li>- Due to insufficient fluid level.</li> <li>- Inadmissibly high prestress of bearings.</li> </ul> </li> <li>• Gearing of planetary step is damaged               <ul style="list-style-type: none"> <li>- Due to insufficient fluid level.</li> <li>- Due to excessive bearing clearance of wheel.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>- Dismount electric motor. Check drive pinion and helical gear for damage.</li> <li>- Check motor connection.</li> <li>- Check motor bearing.</li> <li>- Have bearings checked in a workshop.</li> <li>- Have gear set of planetary step and wheel bearings checked in a workshop.</li> </ul>                                                                                |
| <b>2. Leakage</b><br>1) Breather valve<br>2) Motor<br>3) Wheel shaft<br>4) Brake lever<br>5) Transmission warms up | <ul style="list-style-type: none"> <li>• Excessive fluid level.</li> <li>• O-ring seal faulty.</li> <li>• Bearing seal of electric motor faulty.</li> <li>• Sealing ring of wheel shaft faulty.</li> <li>• Sealing ring of brake lever faulty.</li> <li>• Fluid level is either too high or too low.</li> <li>• Wheel bearings with an excessive pretension.</li> </ul>                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>- Check fluid level.</li> <li>- Dismount electric motor, check O-ring and sealing surfaces for damages.</li> <li>- Check sealing ring and wheel shaft for damages in the sealing area.</li> <li>- Check sealing ring and straight pin for damages in the sealing area. Consult workshop.</li> <li>- Check fluid level.</li> <li>- Check clearance of wheel shaft.</li> </ul> |

## GROUP 3 DISASSEMBLY AND ASSEMBLY

### 1. DRIVE UNIT

#### 1) DISASSEMBLY

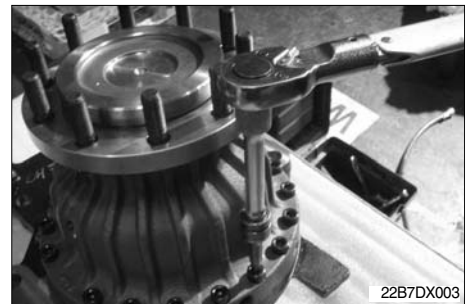
(1) Drive unit assembly.



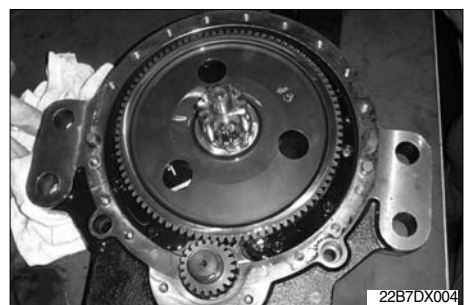
(2) Loosen the drain plug and drain oil.



(3) Remove the housing bolt.



(4) Remove the cover from the housing.



(5) Remove the retaining ring.



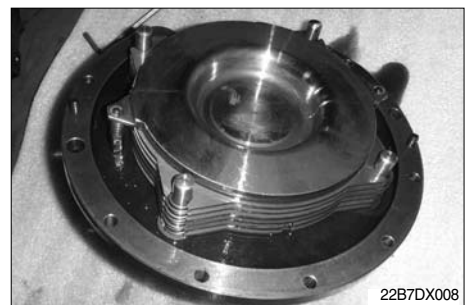
(6) Remove the input shaft sub.



(7) Remove the brake pack bolt.



(8) Remove the brake pack from the cover.



(9) Remove the piston sub from the cover.



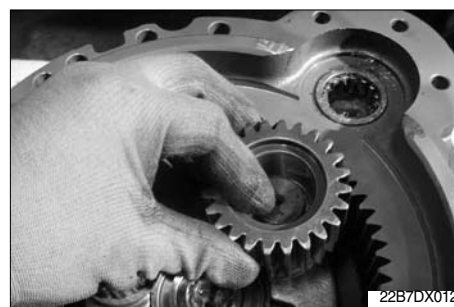
(10) Housing sub.



(11) Remove the retaining ring of planetary gear.



(12) Remove the washer and the planetary gear.



(13) Remove the needle bearing.



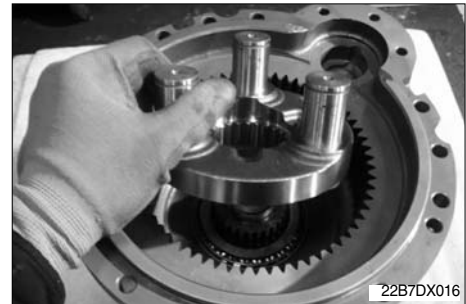
(14) Remove the inner race of bearing.



(15) Remove the lock nut.



(16) Remove the planetary carrier.



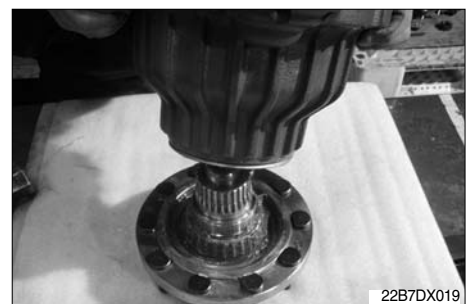
(17) Remove the bearing.



(18) Remove the shim.



(19) Remove the housing and the wheel hub.



## 2) ASSEMBLY

### (1) Wheel-housing sub assembly

#### Wheel hub sub assembly

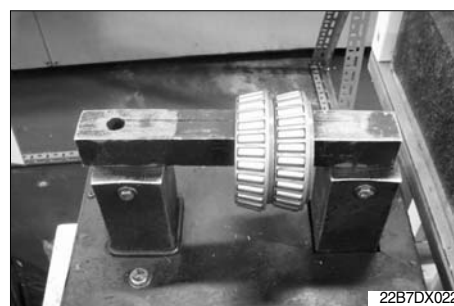
##### ① Wheel hub.



##### ② Prepare the bearing for assembling.



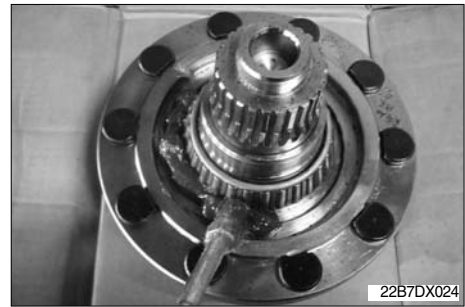
##### ③ Heat the bearing.



##### ④ Fit the bearing to wheel hub.



- ⑤ Fill in the hub with grease more than 70% of the space .



- ⑥ Apply grease on the O-ring and assemble the O-ring.



- ⑦ Assemble the space.



- ⑧ Prepare the housing.



- ⑨ Apply the loctite #592 on the oil seal and assemble it by special tool.



- ⑩ Apply the grease on the inner wheel of oil seal.



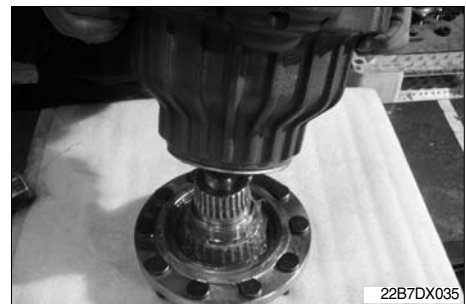
- ⑪ Apply the loctite #609 on the gamma seal and assemble it by the special tool.



- ⑫ Assemble the bearing cup by the special tool.



- ⑬ Assemble the hub and the housing.

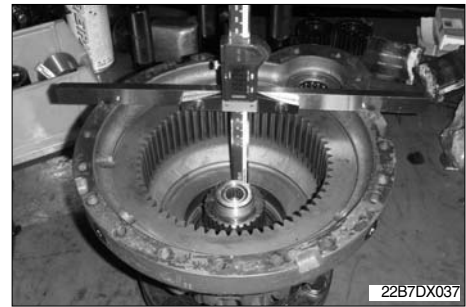


**Determine shim and confirm pre-load value**

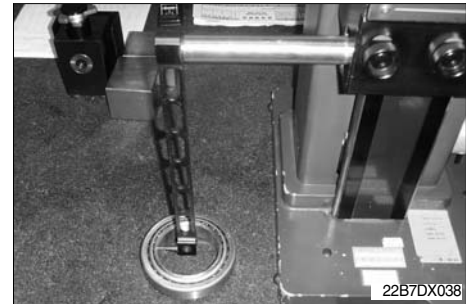
- ① Prepare the housing sub.



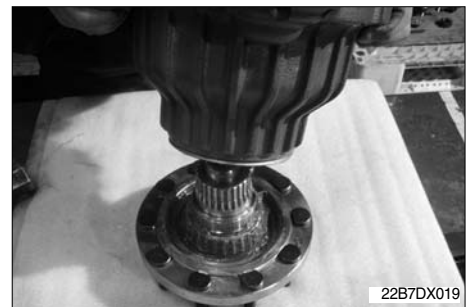
- ② Measure difference in height between housing and spacer.



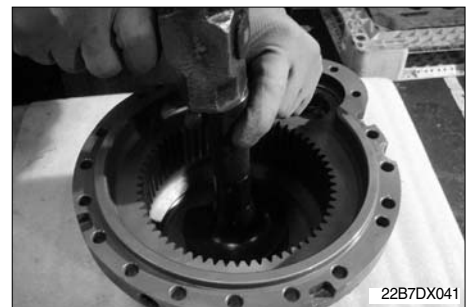
- ③ Measure difference in height between bearing.



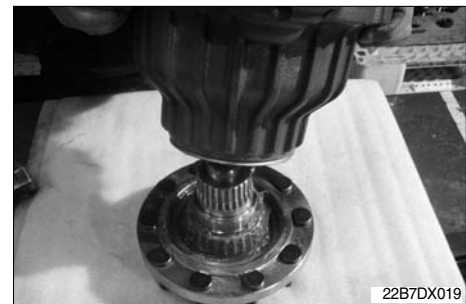
- ④ Remove the hub and housing.



- ⑤ Assemble the bearing cup by the special tool.



- ⑥ Assemble the hub and housing.



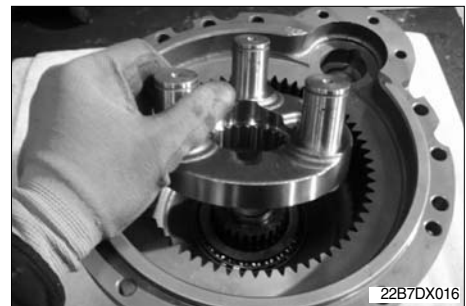
- ⑦ Assemble the shim.



- ⑧ Assemble the bearing and apply the oil on the bearing.



- ⑨ Temporarily assemble the carrier.



- ⑩ Fit the carrier by the special tool.



- ⑪ Tighten the lock nut by the special tool.  
· Tightening torque : 21~25kgf · m(152~181lbf · ft)

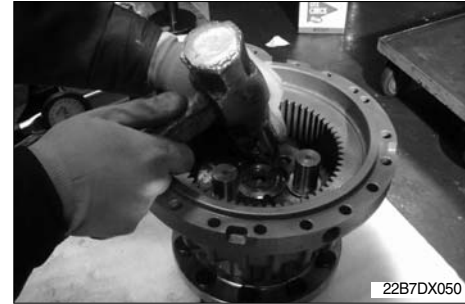


- ⑫ Confirm pre-load value.  
• Torque : 0.15~0.25kgf · m(1.08~1.8lbf · ft)



### Planetary gear

- ① Cock the lock nut.



- ② Assemble the needle bearing by the special tools.



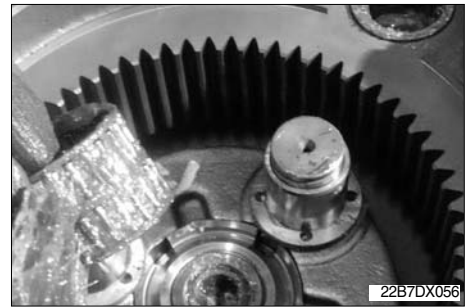
- ③ Assemble the needle bearing by the special tool.



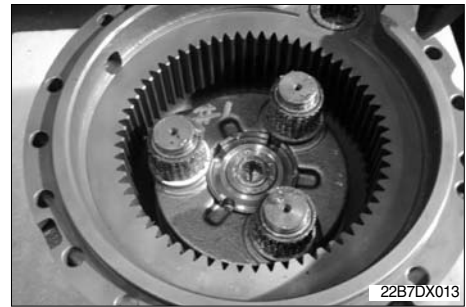
- ④ Assemble the washer.



- ⑤ Assemble the needle bearing.



- ⑥ Needle bearing is now assembled.



- ⑦ Assemble the planetary gear.



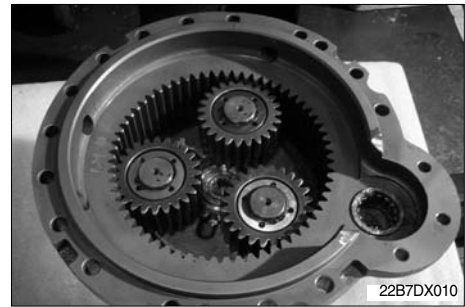
- ⑧ Assemble the washer.



- ⑨ Assemble the retaining ring of planetary gear.



- ⑩ Planetary gear is now assembled.



**(2) Cover sub assembly**  
**Brake pack sub assembly**

- ① Prepare the components.



- ② Assemble the bearing by the special tool.



- ③ Assemble the retaining ring of the bearing.



- ④ Assemble the support disc.



- ⑤ Assemble the key.



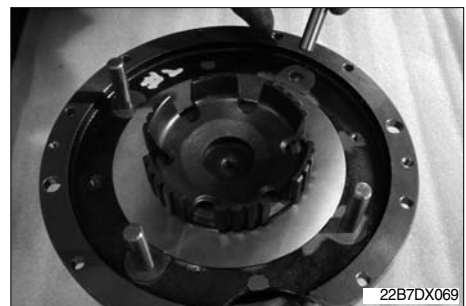
- ⑥ Assemble the inner cover and driven gear by the special tool.



- ⑦ Assemble the retaining ring.



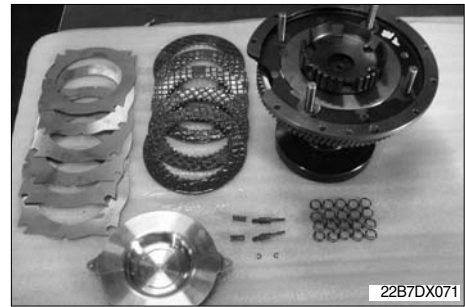
- ⑧ Assemble the parallel pin.



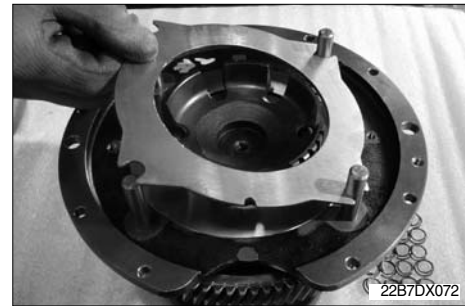
- ⑨ Before assembling, soak the friction plate into oil during 2 hours.



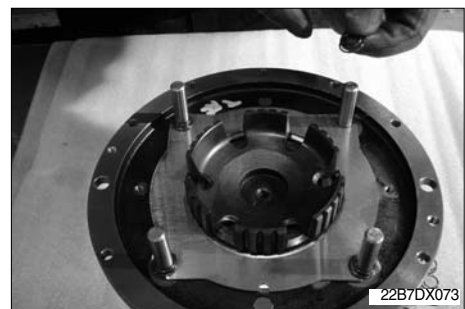
- ⑩ Prepare the components.



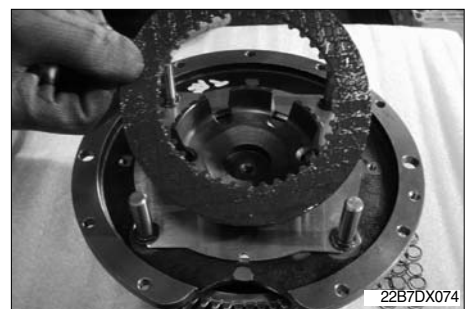
- ⑪ Assemble the steel disc.



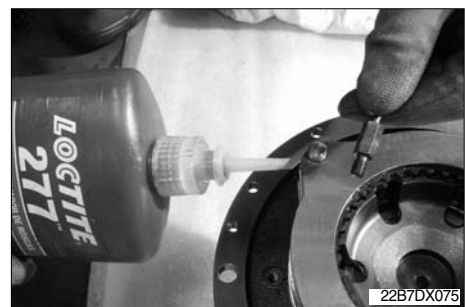
- ⑫ Assemble the cone spring.



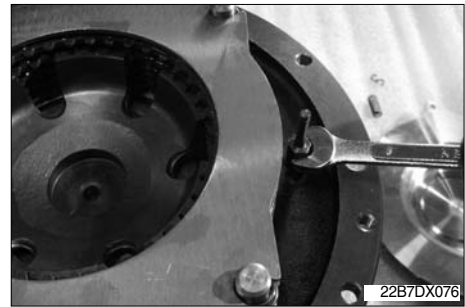
- ⑬ Assemble the friction plate.



- ⑭ Apply the loctite #277 and tighten the stud bolt.



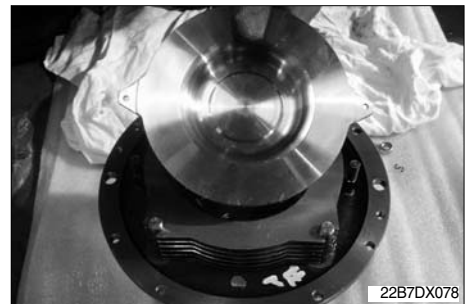
· Tightening torque : 1.3~1.6kgf · m(9.4~11.6lbf · ft)



⑮ Assemble the spring.



Assemble the elastic disc.



Assemble the retaining ring.



Brake pack is now assembled.



### Input shaft sub assembly

- ① Prepare the component.



- ② Temporarily assemble the bearing on the shaft.



- ③ Fit the bearing by the special tool.



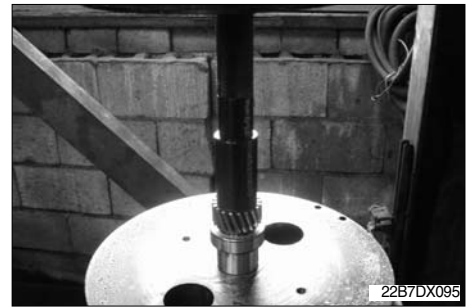
- ④ Assemble the key.



- ⑤ Assemble the drive gear.



- ⑥ Fit the drive gear by the special tool.



- ⑦ Assemble the inner race of the bearing by the special tool.



- ⑧ Assemble the retaining ring.



### Cover sub assembly

- ① Assemble the piston sub assembly.



- ② Assemble the lock pin.



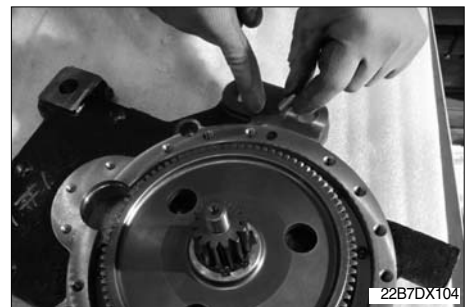
- ③ Assemble the brake pack sub assembly.



- ④ Apply the loctite #277 on bolt.  
· Tightening torque : 1.3~1.6kgf · m(9.4~11.6lbf · ft)

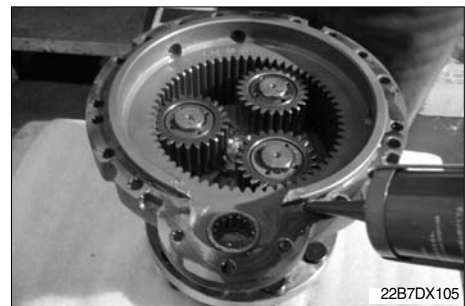


- ⑤ Assemble the lock pin.



### (3) Drive unit assembly

- ① Apply the loctite #5127 on the mounting surface.



- ② Assemble the cover sub assembly.



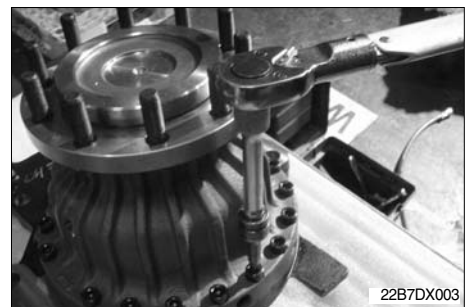
- ③ Assemble the input shaft sub assembly.



- ④ Assemble the retaining ring.



- ⑤ Apply the loctite #227 on bolt.  
· Tightening torque : 5.5~6.5kgf · m(39.8~47lbf · ft)



- ⑥ Apply the loctite #227 on bolt.  
· Tightening torque : 3.5~4.0kgf · m(25.3~28.9lbf · ft)

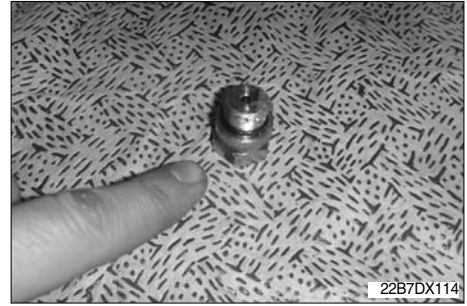


#### (4) Other parts

- ① Prepare the brake plug and O-ring.



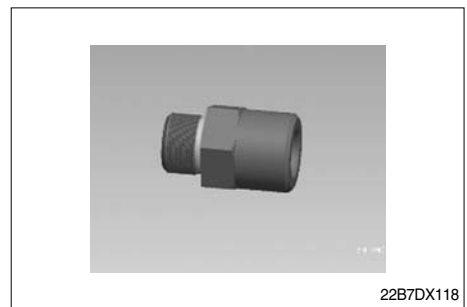
- ② Apply the grease on the O-ring and assemble it.



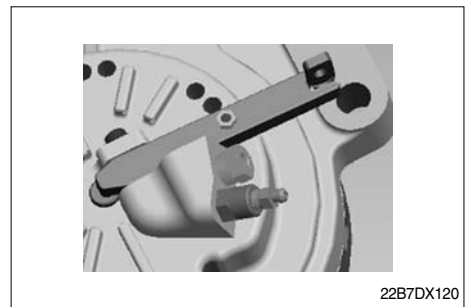
- ③ Assemble the brake plug.  
· Tightening torque : 3.5~4.5kgf · m(25.3~32.5lbf · ft)



- ④ Prepare the bleeder fitting and the O-ring.  
Apply the grease on the O-ring and assemble it.



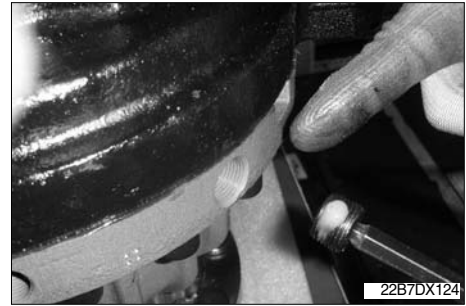
- ⑤ Assemble the bleeding valve.  
· Tightening torque : 3.5~4.5kgf · m(25.3~32.5lbf · ft)



- ⑥ Apply the loctite #577 on plug and assemble it.



- ⑦ Apply the loctite #577 on the magnetic plug and assemble it.
- Tightening torque : 3.0~4.1kgf · m(21.7~29.7lbf · ft)

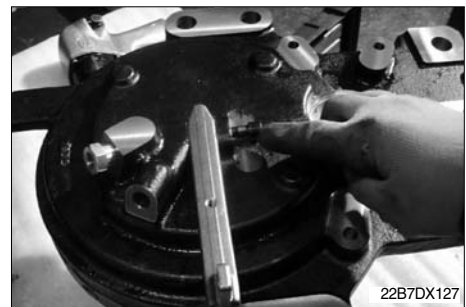


- ⑧ Apply the loctite #577 on the air breather and assemble it.



**(5) Adjusting lever stroke**

- ① Assemble the lever and pin.



- ② Assemble the adapter for a pressure measurement.



- ③ Measure the stroke with a dial gauge.



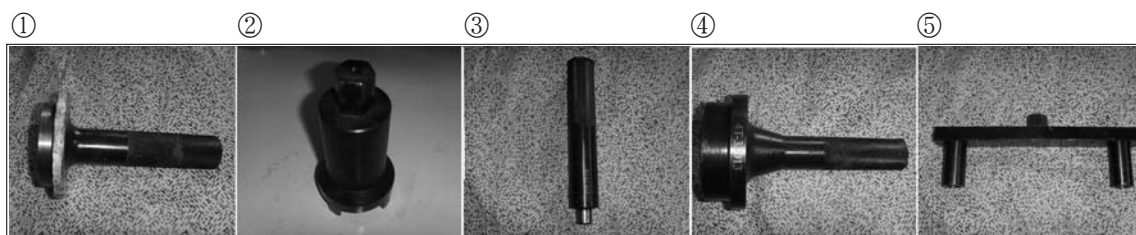
- ④ Set the stroke with set screw.  
· Stroke :  $1.2 \pm 0.1$ mm



- ⑤ Tighten the nut.  
· Tightening torque : 1.3~1.6kgf · m(9.4~11.6lb · ft)



### 3) SPECIAL TOOL



22B7DX133



22B7DX134



22B7DX135

- |                  |                               |                |
|------------------|-------------------------------|----------------|
| 1 Oil seal       | 5 The pre-load value checking | 8 Driven gear  |
| 2 Lock nut       | 6 Needle bearing              | 9 Ball bearing |
| 3 Needle bearing | 7 Bearing                     | 10 Gamma seal  |
| 4 Bearing        |                               | 11 Drive gear  |