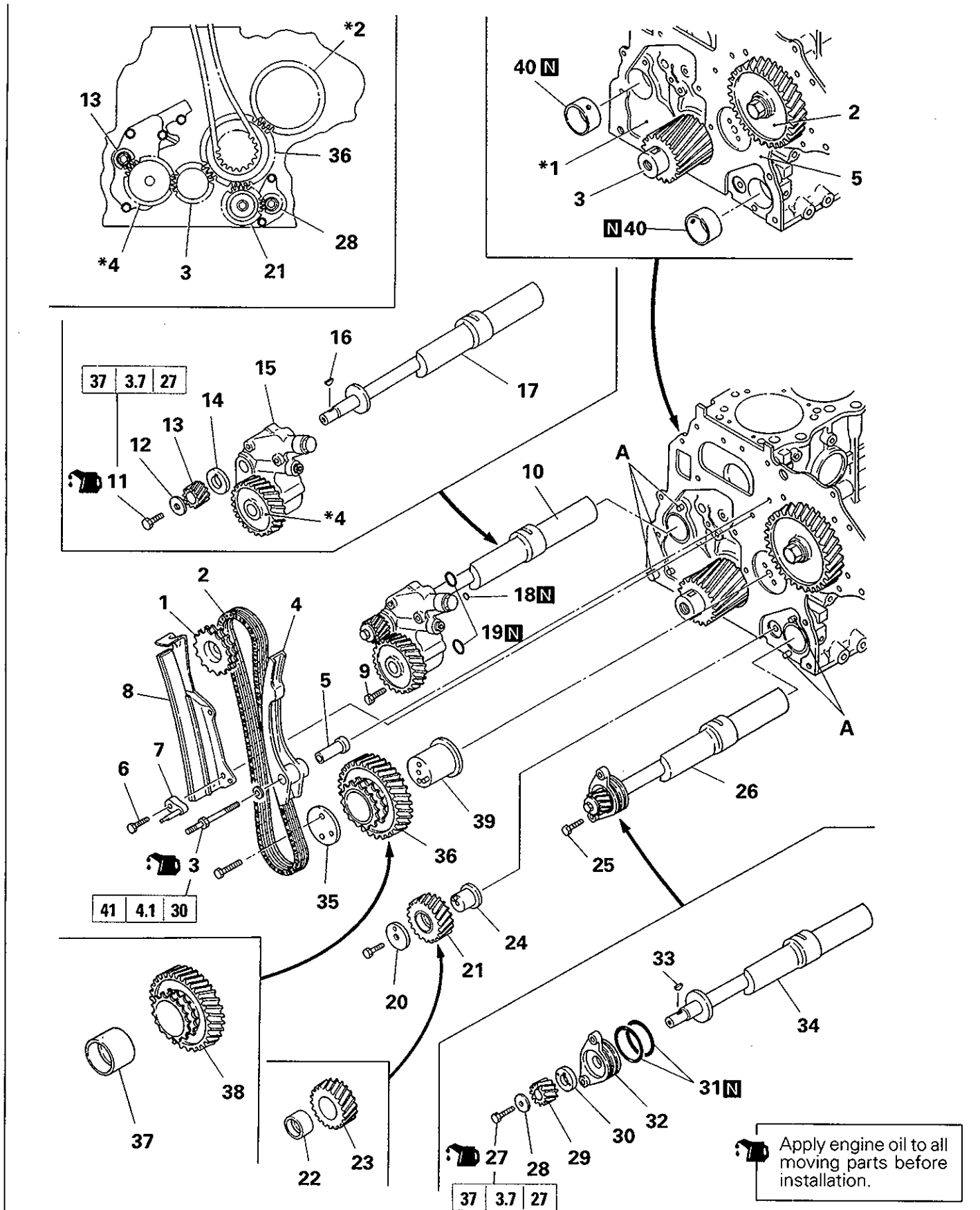


19. TIMING GEAR AND BALANCE SHAFT

REMOVAL AND INSTALLATION

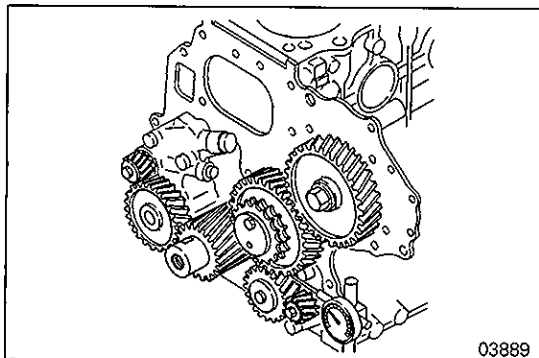


Removal steps

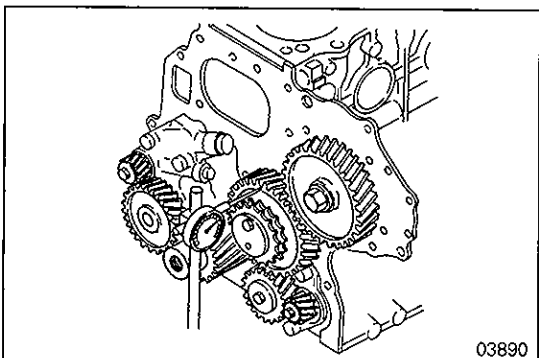
- | | | |
|--|-------------------------------|---|
| 1. Cam sprocket | 17. Balance shaft RH | 34. Balance shaft LH |
| 2. Timing chain | 18. O-ring | 35. Idler washer |
| 3. Bolt | 19. O-ring | 36. Idler gear and sprocket assembly |
| 4. Tension lever | 20. Idler washer A | 37. Idler sprocket bush |
| 5. Tension lever shaft | 21. Idler gear assembly LH | 38. Idler gear and sprocket |
| 6. Eyebolt | 22. Idler gear bush LH | 39. Idler shaft |
| 7. Oil jet assembly (See page 11A-16-1.) | 23. Idler gear LH | 40. Balance shaft bush |
| 8. Guide plate | 24. Idler shaft A | |
| 9. Bolt | 25. Bolt | |
| 10. Balance shaft assembly RH | 26. Balance shaft assembly LH | *1: Crankcase assembly (See page 11A-28-1.) |
| 11. Bolt | 27. Bolt | *2: Injection pump gear |
| 12. Washer | 28. Washer | *3: Crankshaft gear (See page 11A-28-1.) |
| 13. Balance shaft gear RH | 29. Balance shaft gear LH | *4: Oil pump gear |
| 14. Thrust spacer | 30. Thrust spacer | *5: Front plate (See page 11A-28-1.) |
| 15. Oil pump assembly | 31. O-ring | A: Dowel pin |
| 16. Key | 32. Thrust plate | |
| | 33. Key | |

Installation steps

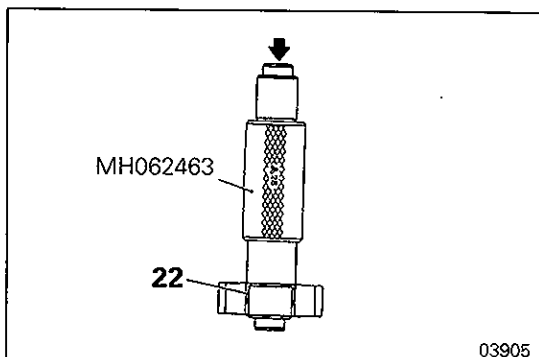
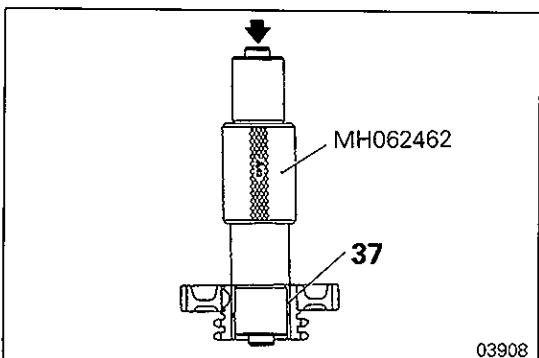
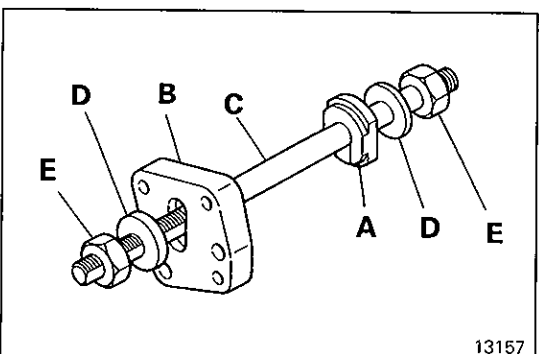
- | | | |
|---|--|----------------------------|
| ♦ A 40. Balance shaft bush | 24. Idler shaft A | 8. Guide plate |
| ♦ C 39. Idler shaft | 23. Idler gear LH | 7. Oil jet assembly |
| 38. Idler gear and sprocket | ♦ D 22. Idler gear bush LH | 6. Eyebolt |
| ♦ B 37. Idler sprocket bush | 21. Idler gear assembly LH | 5. Tension lever shaft |
| ♦ C 36. Idler gear and sprocket assembly | 20. Idler washer A | 4. Tension lever |
| 34. Balance shaft LH | 19. O-ring | 3. Bolt |
| 33. Key | 18. O-ring | ♦ G 2. Timing chain |
| 32. Thrust plate | 17. Balance shaft RH | 1. Cam sprocket |
| 31. O-ring | 16. Key | 35. Idler washer |
| 30. Thrust spacer | 15. Oil pump assembly | |
| 29. Balance shaft gear LH | 14. Thrust spacer | |
| 28. Washer | 13. Balance shaft gear RH | |
| 27. Bolt | 12. Washer | |
| ♦ E 26. Balance shaft assembly LH | 11. Bolt | |
| 25. Bolt | ♦ F 10. Balance shaft assembly RH | |
| | 9. Bolt | |

**PRE-REMOVAL INSPECTION****BACKLASH**

- (1) Measure backlash between gears, pair by pair, at three or more points. If the reading exceeds the specified service limit, replace defective part.

**END PLAY**

- (1) Measure end play of each gear and shaft. If the reading exceeds the specified service limit, replace defective part.

**REMOVAL SERVICE POINTS****◊A◊ IDLER GEAR BUSH LH REMOVAL****◊B◊ IDLER SPROCKET BUSH REMOVAL****◊C◊ BALANCE SHAFT BUSH REMOVAL**

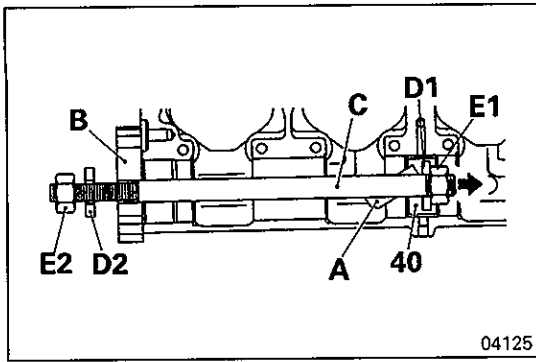
- (1) Using the special tool, remove the balance shaft bushes **40** in the following manner:

Component Parts of Special Tool MH062490 – Balance Shaft Bush Remover

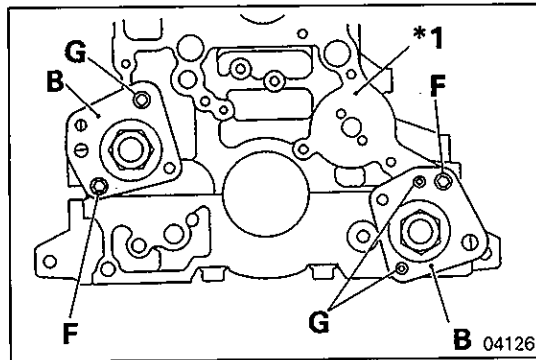
- | | |
|-------------------|--------------------------|
| A: Remover | D: Washer (2 pcs) |
| B: Plate | E: Nut (2 pcs) |
| C: Puller | |

NOTE:

Apply engine oil to the sliding surface of plate **B** and puller **C**.



- (2) Set the tools as shown by passing the remover **A**, through the balance shaft bush **40** while tilting it as shown.
- (3) Pull the puller **C** to bring the washer **D1** into contact with the remover **A**. Then, turn in the nut **E2** until the plate **B** is lightly pressed by it.

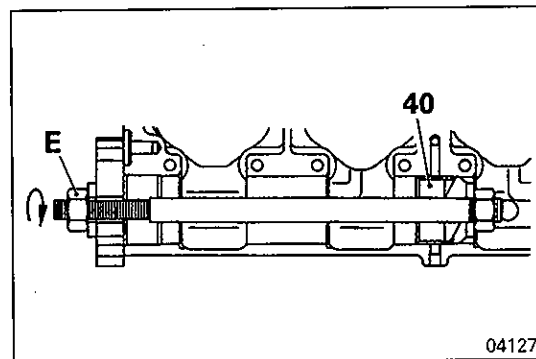


- (4) Secure the plate **B** to the crankcase ***1** using bolt **F** [M8x1.25 mm (0.042 in.)]

G: Dowel pin

Caution

- The securing position of the plate **B** is different between when removing the left-hand and right-hand balance shaft bushes. Be sure to secure it in right places.



- (5) Tighten the Nut **E** further to remove the balance shaft bush **40**.

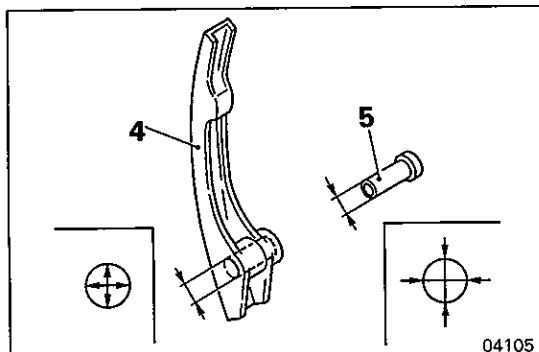
INSPECTION

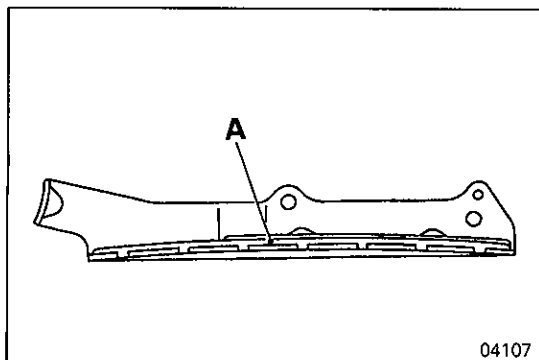
TENSION LEVER

- (1) Check the tension lever **4** for evidence of cracking, flaking or other defect in the surface **A** that makes sliding contact with the timing chain and in the surface **B** that contacts the tensioner. Replace the tension lever **4** if necessary.

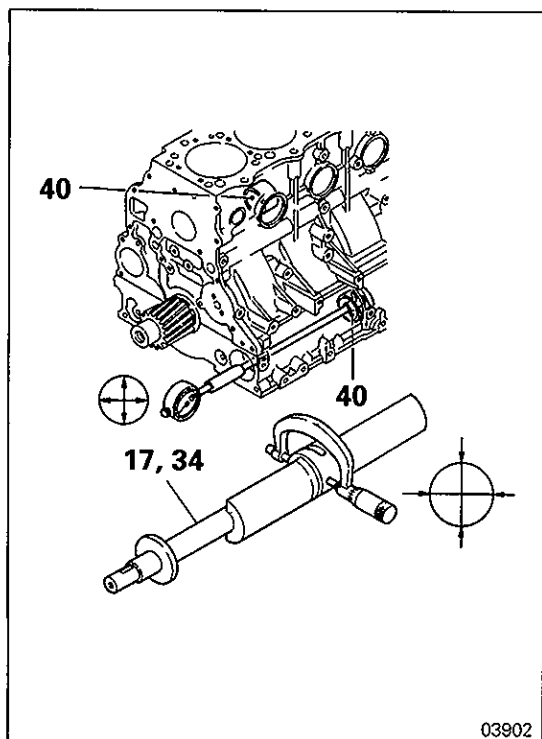
TENSION LEVER-TO-TENSION LEVER SHAFT CLEARANCE

- (1) Measure the tension lever-to-tension lever shaft clearance. If the reading exceeds the specified service limit, replace defective part.

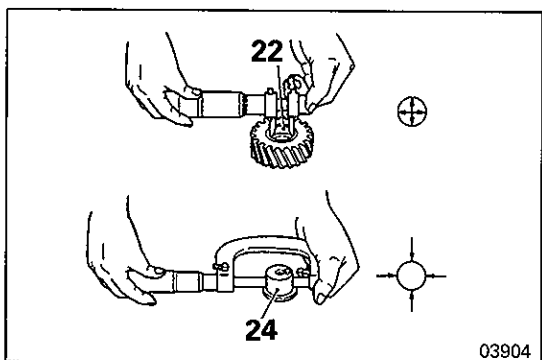


**CHECKING GUIDE PLATE**

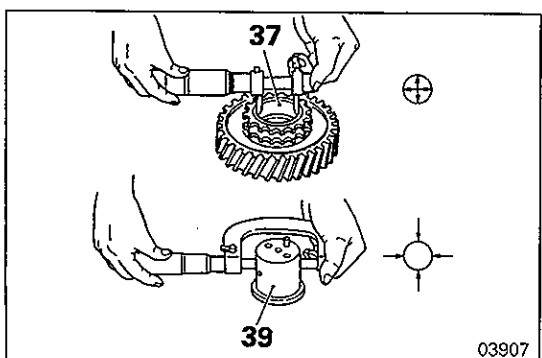
- (1) Check the guide plate **8** for evidence of cracking, flaking or other defect in the surface **A** that makes sliding contact with the timing chain. Replace the guide plate if necessary.

**BALANCE SHAFTS RH AND LH, AND BALANCE SHAFT BUSHES**

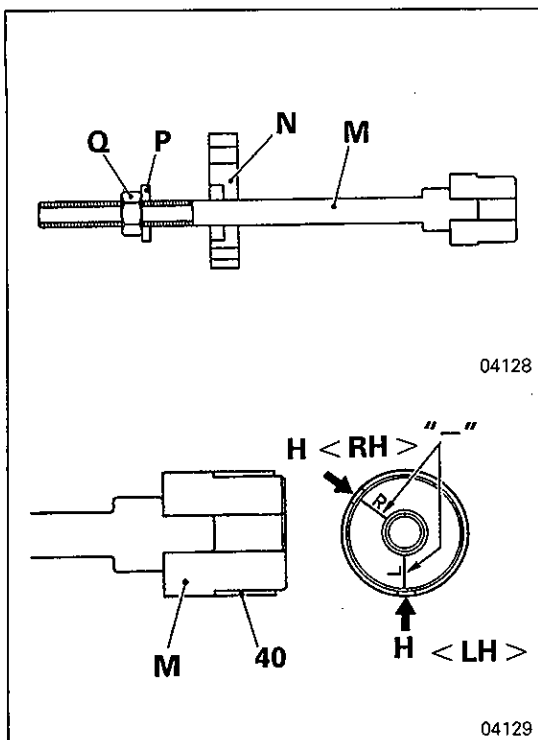
- (1) Measure the balance shaft-to-balance shaft bush clearance. If the reading exceeds the specified service limit, replace defective part.

**IDLER GEAR BUSH LH AND IDLER SHAFT A**

- (1) Measure the idler shaft-to-idler gear bush clearance. If the reading exceeds the specified service limit, replace defective part.

**IDLER SPROCKET BUSH AND IDLER SHAFT**

- (1) Measure the idler shaft-to-idler sprocket bush clearance. If the reading exceeds the specified service limit, replace defective part.



INSTALLATION SERVICE POINTS

◆A◆ BALANCE SHAFT BUSH INSTALLATION

- (1) Using the special tool, install the balance shaft bushes **40** in the following manner:

Component Parts of Special Tool MH062717 – Balance Shaft Bush Installer

M: Installer

N: Plate

P: Washer

Q: Nut

Caution

- Apply engine oil to the sliding surfaces of the installer **M** and plate **N**.

- (2) Install the balance shaft bush **40** onto the installer **M** with its oil hole **H** in line with the alignment mark “–” on the installer. Align the oil hole of the left-hand bush with the “L” side “–” mark and that of the right-hand bush with the “R” side mark.

Caution

- To keep the oil hole **H** of the balance shaft bush **40** in position on the installer **M**, install the bush with the chassis grease applied on the inner surface of it.

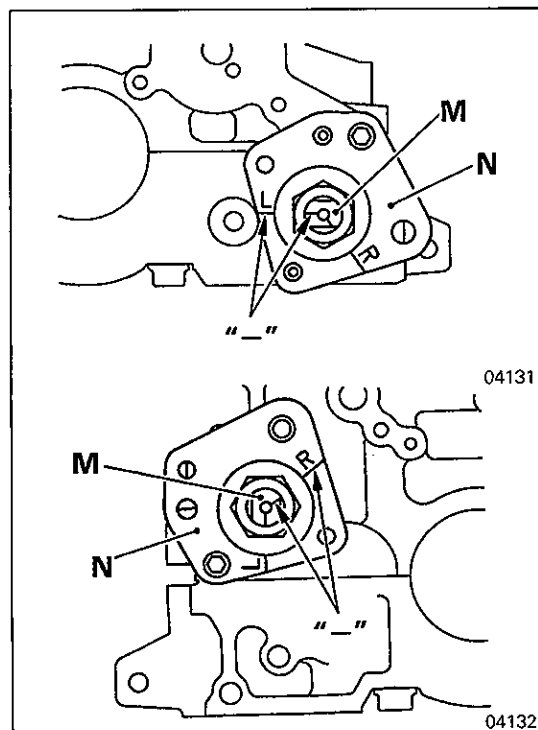
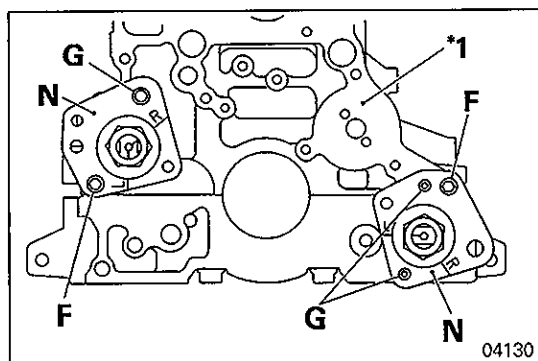
- (3) Secure the plate **N** to the crankcase ***1** using bolt **F** [M8 x 1.25 mm (0.0492 in.)] as shown.

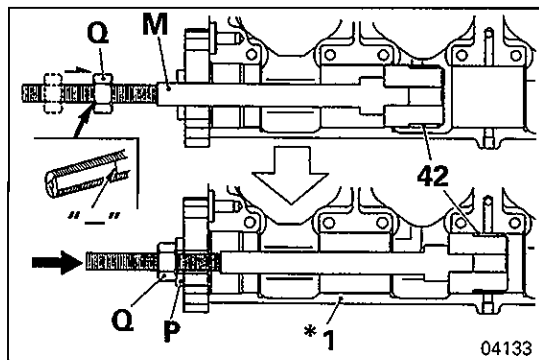
G: Dowel pin

Caution

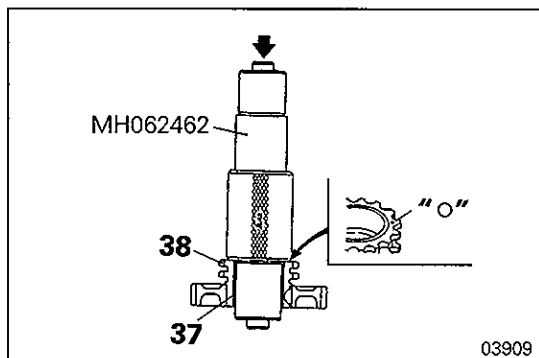
- Note that the securing position of the plate **N** is different between the left-hand balance shaft bush and the right-hand bush.
- Prior to securing the plate **N**, check that the installer **M** is correctly positioned with respect to the balance shaft bush **40**.

- (4) Line up the alignment marks “–” on the installer **M** and the plate **N**.



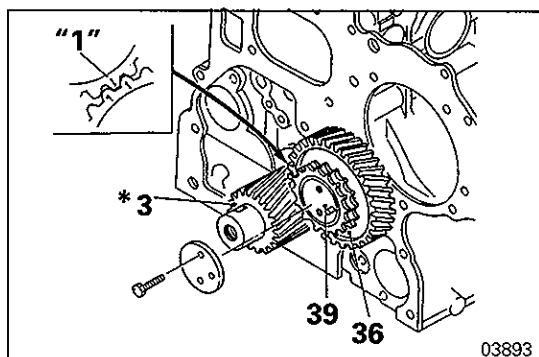


- (5) Set the drive-in depth for the balance shaft bush **40** by turning the nut **Q** until it reaches the alignment mark "-" on the installer **M**.
- (6) Press-fit the balance shaft bush **40** in the crankcase ***1** by driving in the installer **M** until the nut **Q** completely contacts the washer **P**.
- (7) Check that the oil hole **H** in the balance shaft bush **40** is in exact alignment with the oil passage in the crankcase.



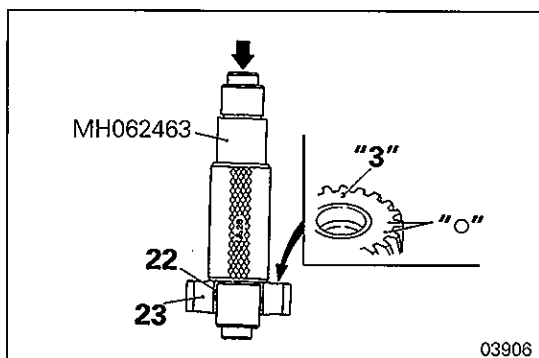
◆B◆ IDLER SPROCKET BUSH INSTALLATION

- (1) Press-fit the idler sprocket bush **37** into the idler gear and sprocket **38** from the side showing the match mark "o".



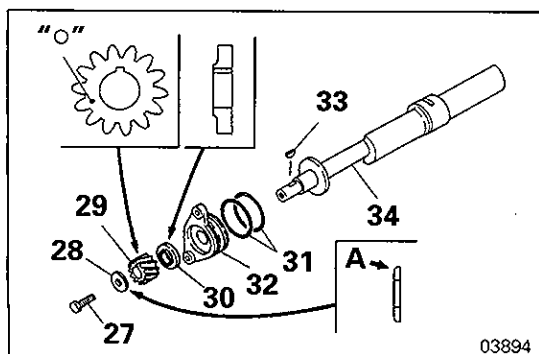
◆C◆ INSTALLING IDLER GEAR AND SPROCKET ASSEMBLY TO IDLER SHAFT

- (1) Install the idler gear and sprocket assembly **36** onto the idler shaft **39** while aligning the mark "1" with that on the crankshaft gear ***3**.



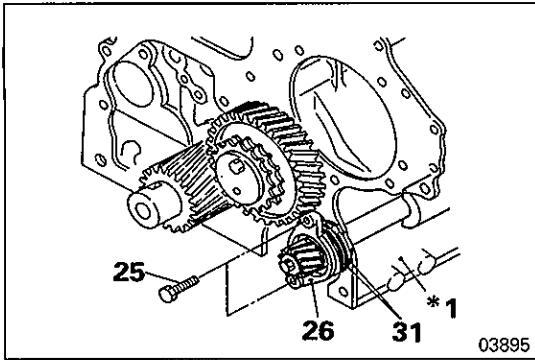
◆D◆ IDLER GEAR BUSH LH INSTALLATION

- (1) Press-fit the idler gear bush LH **22** into the idler gear LH **23** from the side showing the match marks "3" and "o".



◆E◆ BALANCE SHAFT LH ASSEMBLY INSTALLATION

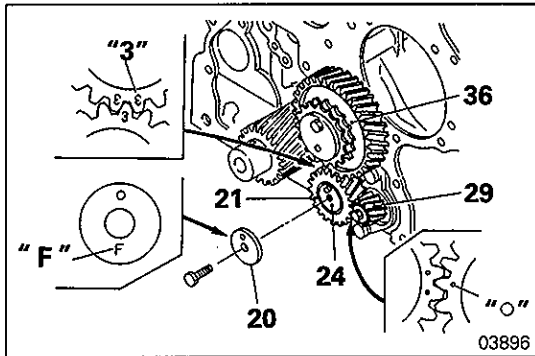
- (1) Install the balance shaft LH assembly **26** as follows:
 - (a) Assemble the parts shown in the illustration to the balance shaft LH **34** and secure them by tightening the bolt **27** to the specified torque.
Be sure that the washer **28** and thrust spacer **30** face in correct direction as shown. Install the balance shaft gear LH **29** with the side showing the match mark "o" outward.
A: Shear droop side



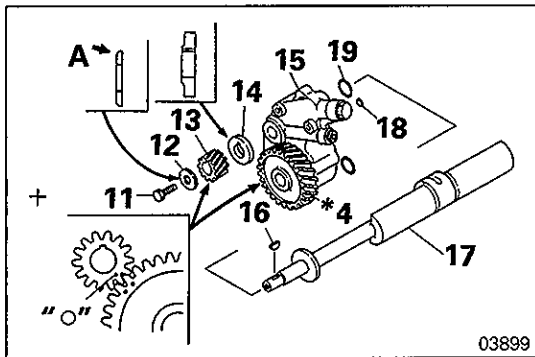
- (b) Insert the completed balance shaft LH assembly **16** into the crankcase assembly ***1**, set it in position with the dowel pin on the crankcase assembly and secure it with bolts **25**.

Caution

- Do not rotate the balance shaft LH assembly **26** during insertion into the crankcase assembly ***1**. This may cause the O-ring **31** to be slipped out of place.
- Insert the balance shaft LH assembly **26** using care not to damage the inner surface of the balance shaft bush **40** in the crankcase.



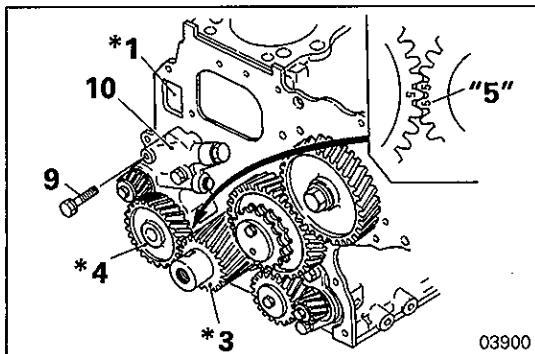
- (c) Install the idler gear LH assembly **21** onto the idler shaft **24**. At this time, be sure to align the match marks **"3"** and **"o"** on the idler gear with the corresponding match marks on the idler gear and sprocket assembly **36** and the balance shaft gear LH **29**.
- (d) Then, install the idler washer **20** to the idler gear LH assembly with its front mark **"F"** facing outward.



⚡ F ⚡ BALANCE SHAFT RH ASSEMBLY INSTALLATION

- (1) Install the balance shaft RH assembly **10** as follows:
- (a) Assemble the parts shown in the illustration to the balance shaft RH **17** and secure by tightening the bolt **11** to the specified torque.
- Be sure to install the washer **12** and thrust spacer **14** in the direction shown in the illustration, and install the balance shaft gear RH **13** with its mating mark **"o"** aligned with the mating mark **"6"** on the oil pump gear ***4**.

A: Shear droop side

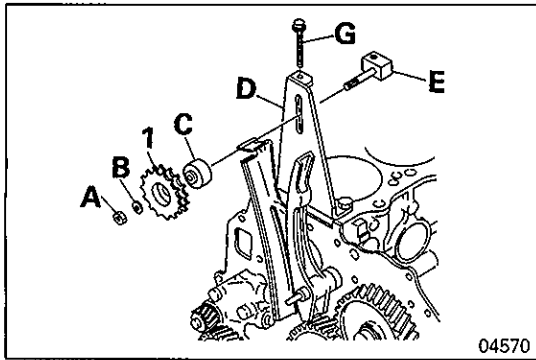


- (b) Insert the completed balance shaft RH assembly **10** into the crankcase assembly while aligning the mating marks **"5"** on the oil pump gear ***4** and the crankshaft gear ***3**, and set the shaft assembly in position with the dowel pin on the crankcase assembly ***1** and secure it with bolts **9**.

Caution

- Insert the balance shaft RH assembly **10** using care not to damage the inner surface of the balance shaft bush **40** in the crankcase.

- (c) After the timing gears are installed in position, check that all the rotary parts smoothly rotate.

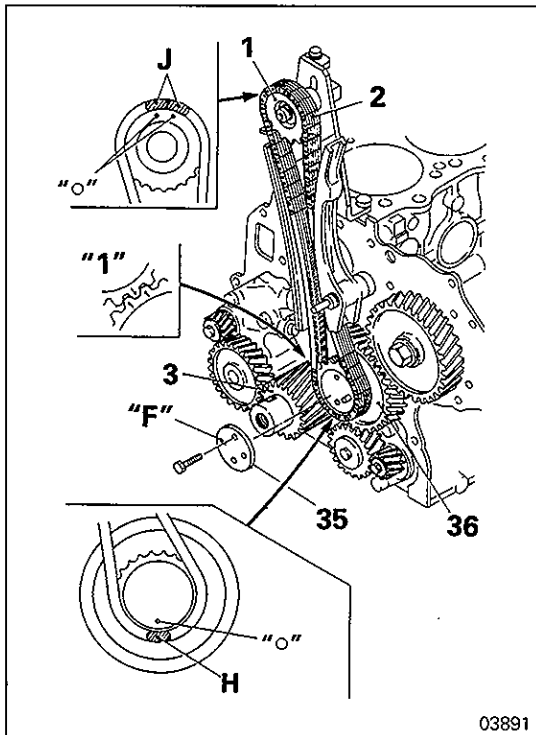


◆G◆ TIMING CHAIN INSTALLATION

- (1) Hold the cam sprocket **1** using the special tool.

Component Parts of Special Tool MH062381 – Cam Sprocket Holder Kit

- A:** Nut
B: Washer
C: Spacer
D: Adjusting plate
E: Nut
G: Bolt

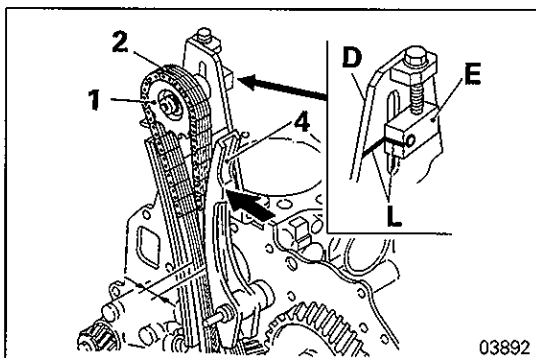


- (2) Check that the match mark **"1"** on the idler gear and sprocket assembly **36** is in alignment with that on the crankshaft gear ***3**.
 (3) Align the match mark **"o"** on the idler gear and sprocket assembly **36** with the mark link plate **H** of the timing chain **2**.

NOTE

The timing chain **2** has the match mark provided at two places: one bright white link plate **H** at one place and a pair of bright white link plates **J** at the other.

- (4) Place the timing chain **2** around the cam sprocket **1** while aligning the timing mark **"o"** on the cam sprocket **1** with the mark link plate **J** on the timing chain **2**.
 (5) Attach the idler washer **35** with the front mark **"F"** facing outward.



- (6) With the stamped lines **L** on the adjusting plate **D** and nut **E** in alignment, set the cam sprocket **1** in the normal operating position. Push the tension lever **4** by hand to take up the slack of the timing chain **2**.
 (7) Measure the clearance **K** of the timing chain **2** stretched. If the reading deviates the specified standard limit, replace the timing chain.