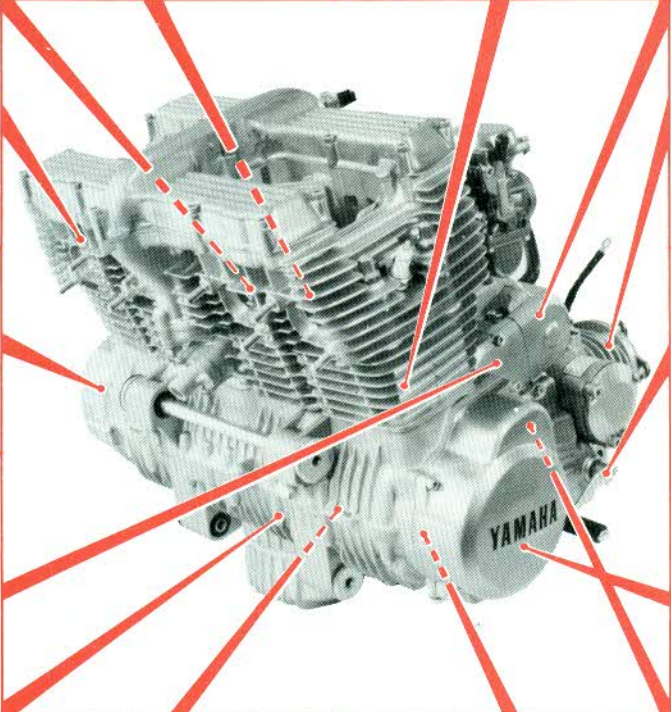


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## CHAPTER 3. ENGINE OVERHAUL

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### SPECIAL TOOLS

1. Clutch holder P/N 90890-04007
2. Piston ring compressor P/N 90890-04008
3. Drive axle holder P/N 90890-04009
4. Damper compressor P/N 90890-04011
5. Piston base P/N 90890-01067
6. Valve guide remover P/N 90890-01225
7. Valve guide installer P/N 90890-01226
8. Valve spring compressor P/N 90890-01253
9. Rotor puller P/N 90890-01235
10. Rotor holding tool P/N 90890-01235
11. Dial gauge stand P/N 90890-01258
12. Valve seat cutter P/N 90890-91043
13. Valve guide reamer P/N 90890-01227
14. Drive axle wrench P/N 90890-05245



## ENGINE OVERHAUL

### NOTE:

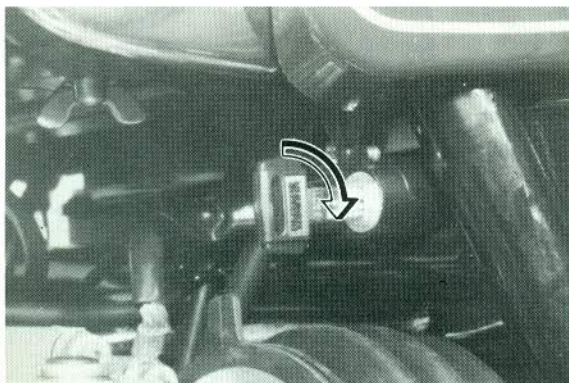
It is not necessary to remove the engine in order to remove the cylinder head, cylinder, or pistons.

### A. Preparation for Removal

1. All dirt, mud, dust and foreign material should be thoroughly removed from the exterior of the engine before removal and disassembly. This will help prevent any harmful foreign material from engine oil.
2. Before engine removal and disassembly, be sure that you have the proper tools and cleaning equipment so that you can perform a clean and efficient job.
3. During disassembly of the engine, clean and place all of the parts in trays in order of disassembly. This will speed up assembly time and help insure correct reinstallation of all the engine parts.
4. Place the machine on its center stand. Start the engine and allow it to warm up. Stop the engine and drain the engine oil.
5. Remove the oil filter element to drain the oil filter.
6. If the middle gear case is to be removed, drain the middle gear oil.
7. Remove the wing bolt with the cover and then take out the kick crank.
8. Remove the left and right side covers.

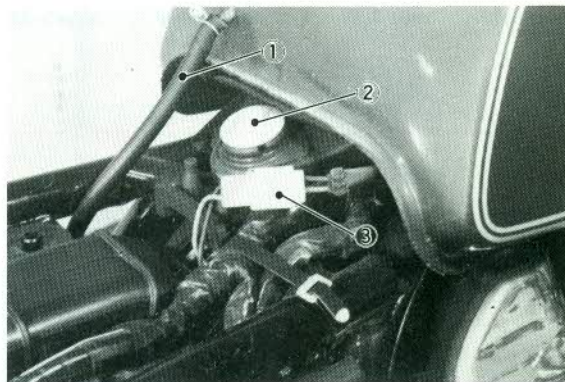
### NOTE:

The left side cover is normally locked. To open the side cover, use the ignition key.



### B. Seat and Fuel Tank Removal

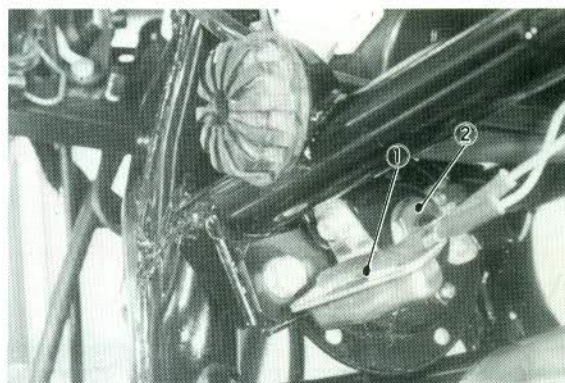
1. Loosen the 2 nuts that hold the seat to the frame. Slide the bolts in the seat to the front and remove the seat.
2. Remove the bolt that holds the fuel tank to the frame and remove the pipes. Disconnect the fuel gauge unit lead wires and remove the fuel tank.



1. Drain hose      2. Fuel tank holding bolt  
3. Fuel gauge unit lead wires

### C. Ignition Ballast Resistor, Horn, Muffler, Footrest, Brake Pedal

1. Remove the resistor and the horn.



1. Resistor      2. Horn

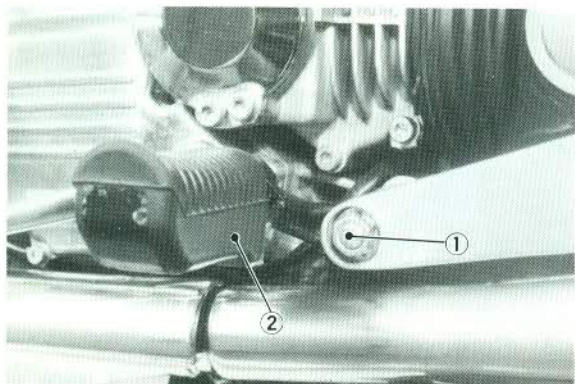
2. The right and left muffler and the footrests.
  - a. Remove the brake switch spring at the brake lever.



1. Brake switch spring



- b. Remove the rear engine mounting through bolt and the footrests, muffler brackets to the frame.

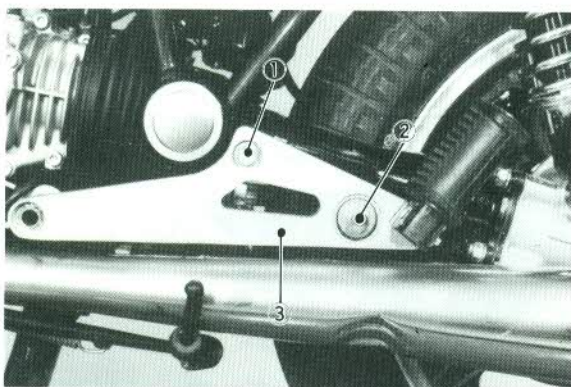


1. Engine mounting bolt  
2. Footrest

- c. Remove the bolts holding the muffler brackets to the frame and remove the muffler brackets.

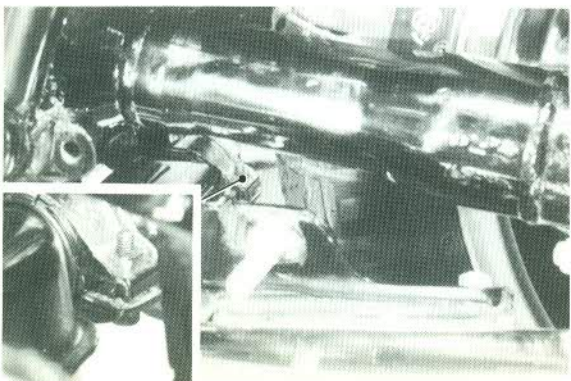
**NOTE:**

The brake pedal assembly and the right side muffler bracket can be removed as a single unit.

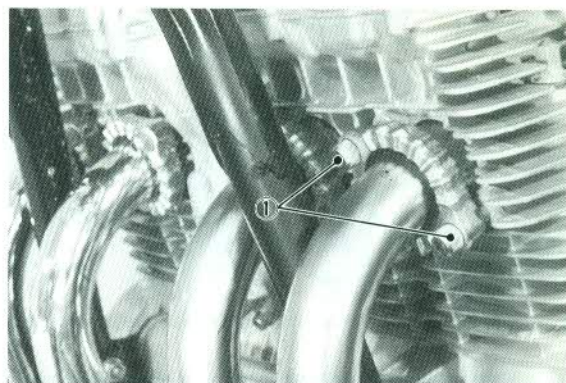


1. Bracket holding bolt  
2. Muffler mounting bolt  
3. Muffler bracket

- d. Loosen the clamp securing the crossover pipe.



- e. Remove exhaust pipe holding nuts from cylinder head.

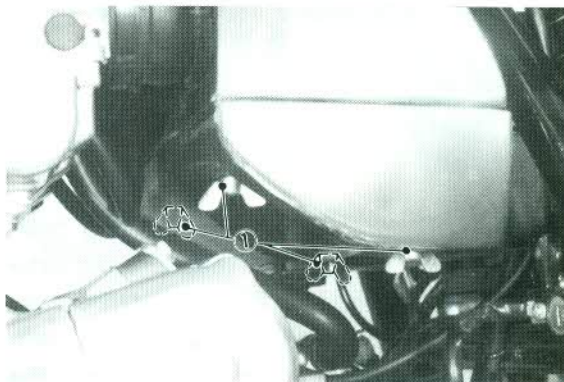


1. Exhaust pipe holding nuts

- f. Remove the left and right exhaust pipes and mufflers as an assembly.

**D. Air Cleaner Case**

1. Remove the air filter cover and the filter by loosening the wing bolts.

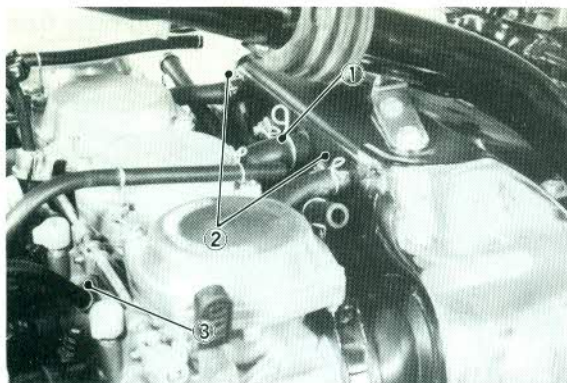


1. Wing bolts

2. Loosen the clamp holding the carburetors to the air cleaner case and the carburetor joints.  
3. Remove the crankcase breather hose and the carburetor ventilation hoses at the air cleaner case. Remove the vacuum advancer hose from No. 2 carburetor joint.

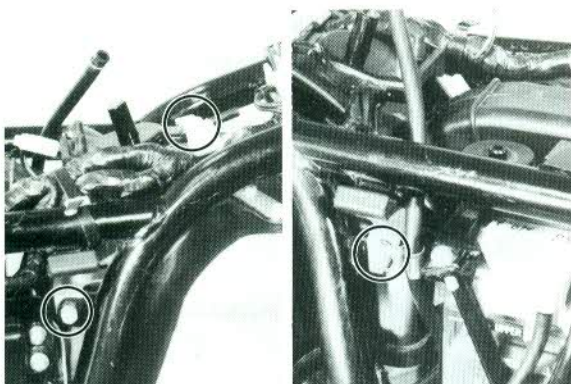




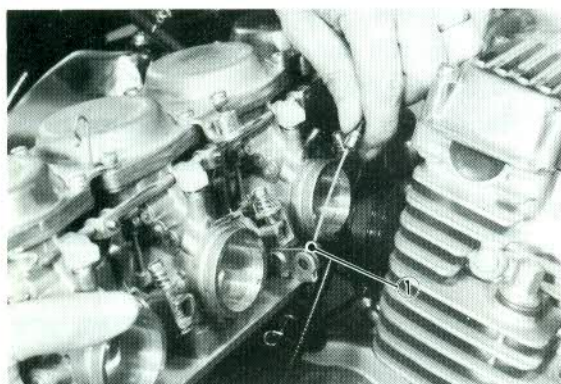


1. Breather hose 2. Ventilation hoses 3. Vacuum advance hose

4. Remove the bolts holding the air cleaner case to the frame.



5. Pull the air cleaner case to the rear. Remove the clutch cable from the holder attached to the right carburetor. Lift the carburetors back and to the left. Remove the throttle cable from the carburetors.



1. Throttle cable

### E. Wiring and Cables

1. Disconnect the battery ground wire at the battery terminal.
2. Remove the clutch cover and disconnect the clutch cable at the push lever.



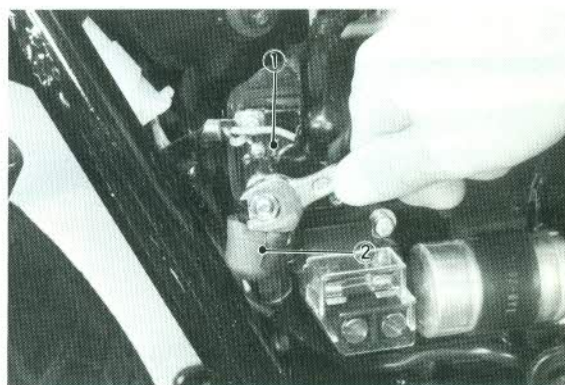
1. Clutch cable

3. Remove the spark plug wires.
4. Disconnect the engine ground wire at the frame side.



1. Ground wire

5. Disconnect the starter motor cable at the starter solenoid switch.



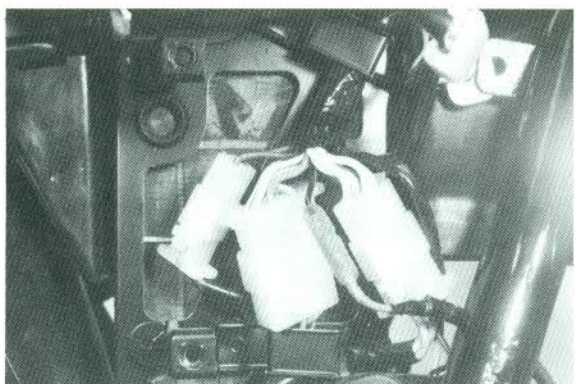
1. Starter solenoid switch  
2. Starter motor cable

6. Remove the 3 screws holding the fuse box backing plate to the battery box.





7. Disconnect the wiring harness couplers. Position the wires so that they can be safely removed.



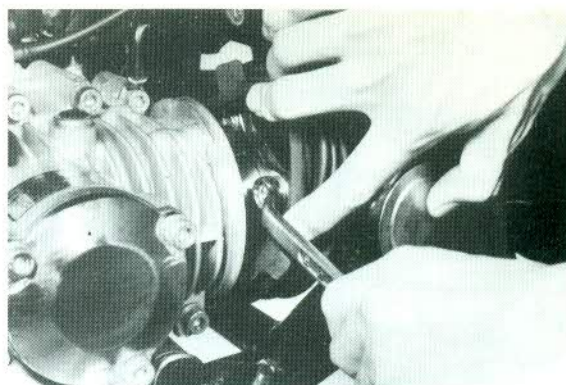
#### F. Drive Shaft Joint

1. Pull rubber boot from drive shaft coupling to expose 4 bolts.



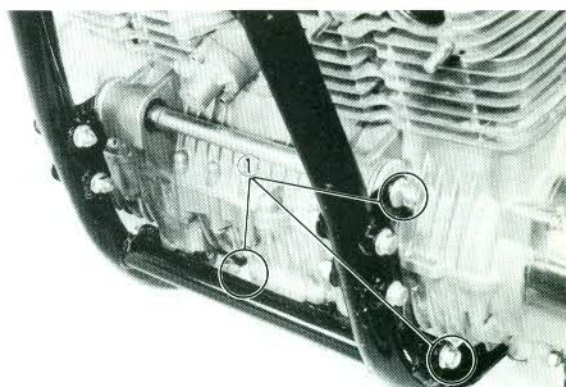
1. Rubber boot

2. Remove the 4 bolts on the drive shaft coupling.



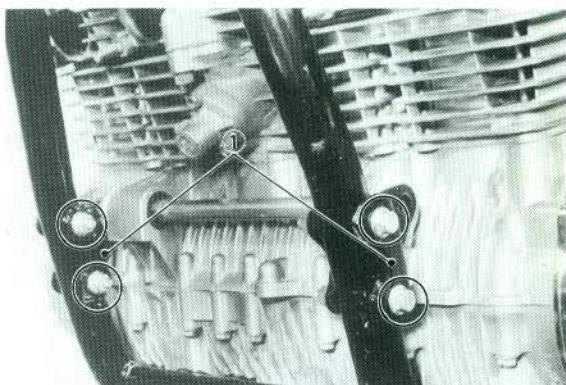
#### G. Removal

1. Remove the 3 engine mounting bolts from the frame.



1. Engine mounting bolts

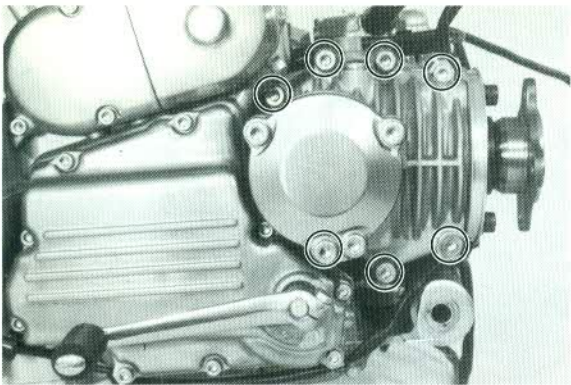
2. Remove the bolts securing the engine bracket to the frame.



1. Engine bracket

3. Slide the engine forward. Remove the engine to the right. Position a box or other support to the right of the machine for assistance when removing the engine.
4. Remove the 7 middle gear case securing bolts and remove the middle gear case.





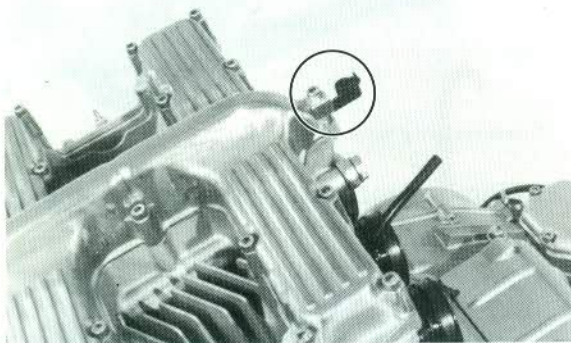
## ENGINE DISASSEMBLY

### A. Cylinder Head and Cylinder Removal

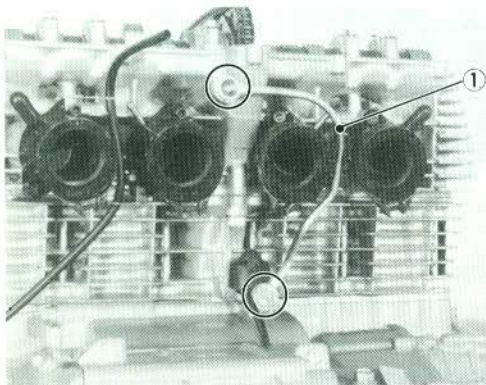
#### NOTE:

Cylinder head and cylinder can be removed without removing engine.

1. Remove the cylinder head cover. Note the location of the throttle cable clip.

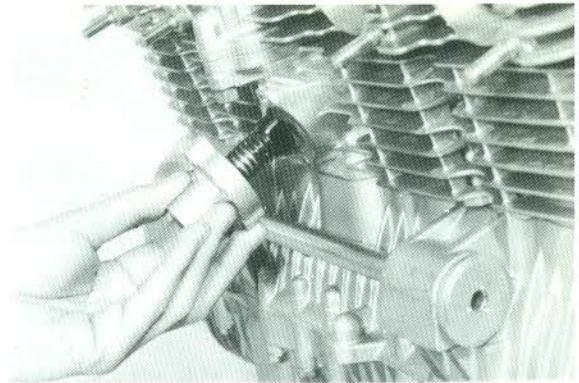


2. Remove the oil delivery pipe and copper washers.

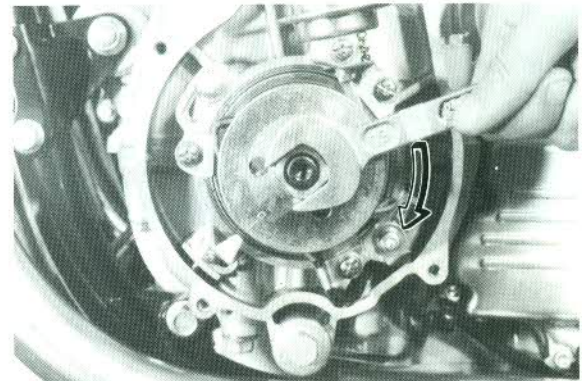


1. Oil delivery pipe

3. Remove the cam chain tensioners from the front of the engine.



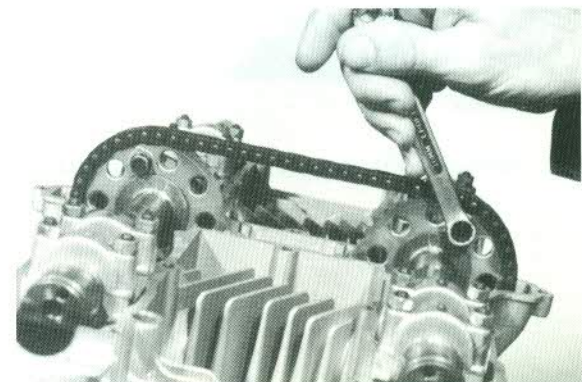
4. Remove the timing cover. Use a 19 mm wrench on the timing plate flats to rotate the crankshaft clockwise until the engine is at TDC. An important note: This engine rotates in a clockwise direction, contrary to Yamaha engines of the past.



#### CAUTION:

Never use an allen wrench to rotate the crankshaft. Always use the 19 mm flats provided on the timing plate to rotate this engine.

5. Remove the four cam sprocket bolts.

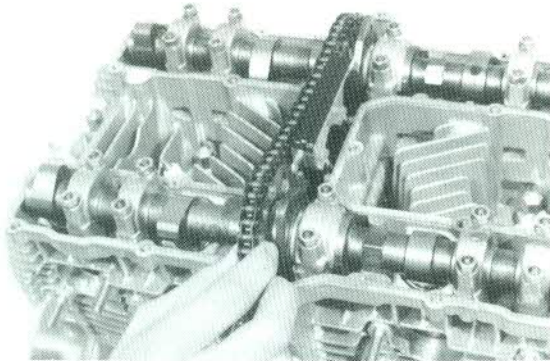


6. Slip each sprocket off its mounting boss on the cam.

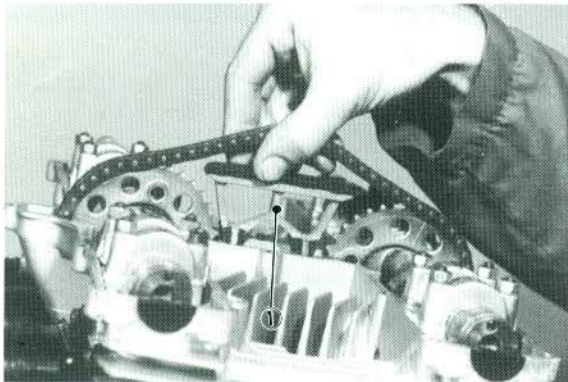


**CAUTION:**

From this point on, do not rotate the cam shaft or valve damage may occur. On the XS1100E, it is not necessary to break the cam chain. However, it can be broken if so desired. It is easier to disassemble the engine without separating the chain.

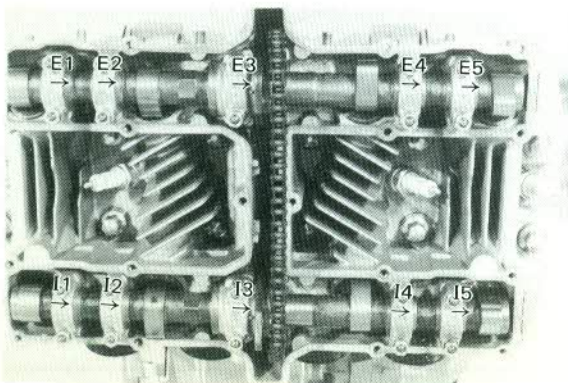


7. Remove the cam chain guide.



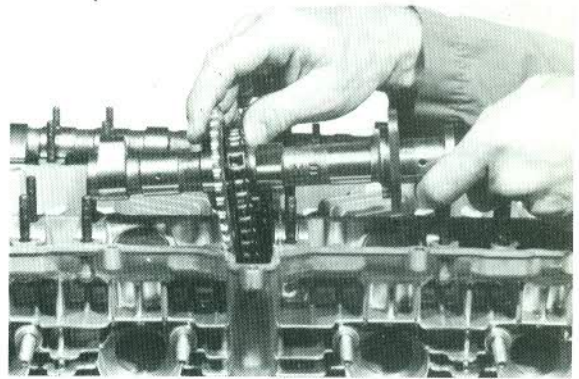
1. Cam chain guide

8. Note the location of the cam caps. The caps for the intake cams are identified I-1 through I-5. The exhaust cam caps are identified E-1 through E-5. The center cap for each cam is dowel pinned. Directional arrows are cast on each cap and point toward the alternator and the clutch side of the engine. Use the center caps as a reference.

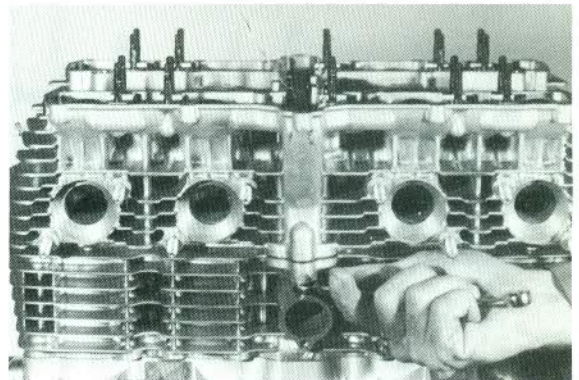


9. Fasten safety wire to the cam chain to prevent its falling into the crankcase cavity.

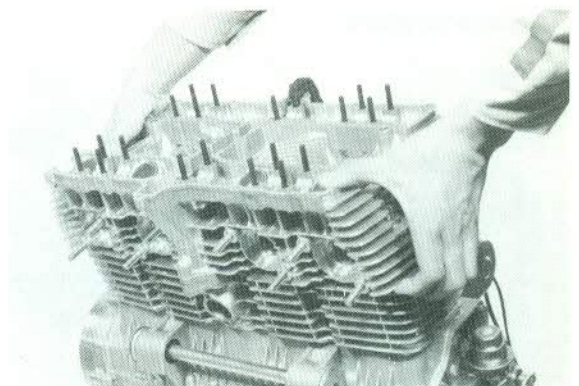
Slide the cams and sprockets from under the chain and remove the cams and sprockets.



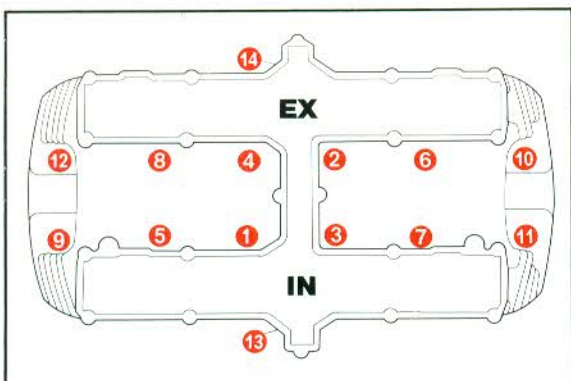
10. Remove the cylinder head nuts located in the front and the rear of the cylinder.



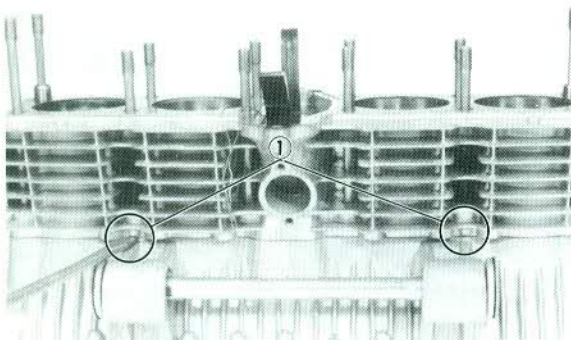
11. Remove the cylinder head nuts in the reverse order of the torque sequence. Start by loosening each nut 1/2 turn until all of the nuts are loose. Then remove the cylinder head.







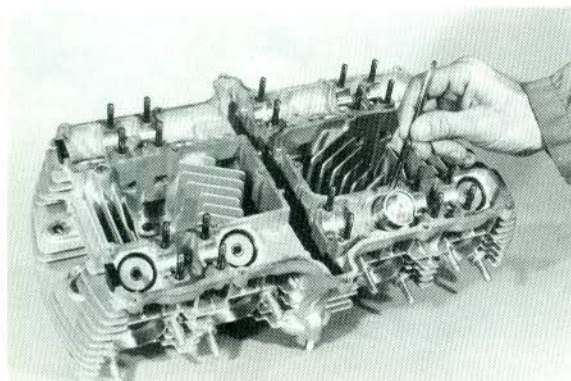
12. Remove the cylinder assembly. It may be necessary to tap the cylinder lightly to loosen it from the base gasket. If it is necessary to pry the cylinder loose from the base gasket, carefully use a broad, flat-bladed screw driver at the reinforced points shown.



1. Reinforcement points

### B. Cylinder Head Disassembly

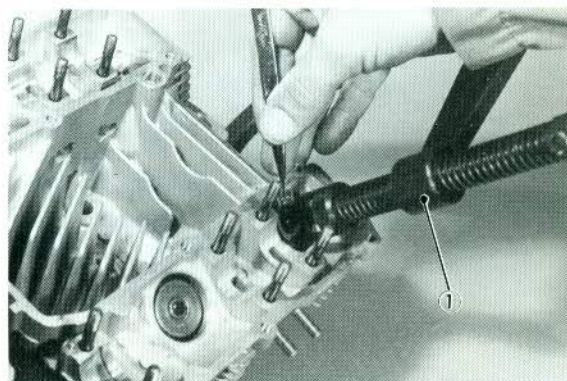
1. Remove the valve lifters and pads. Be careful not to scratch the lifter bodies or lifter bores in the cylinder head. Be very careful to identify each lifters position so that it may be returned to its original place.



2. Mount the valve spring compressor on the head and depress each valve spring. Remove the keepers using a magnet and take out the retainer and valve springs with forceps.

#### NOTE:

Note that the valve springs are progressively wound with the more tightly wound end facing the cylinder head.

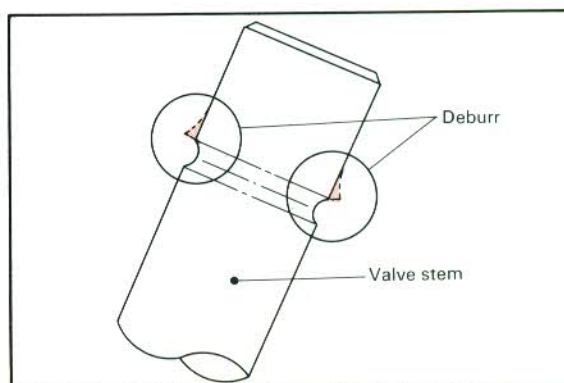
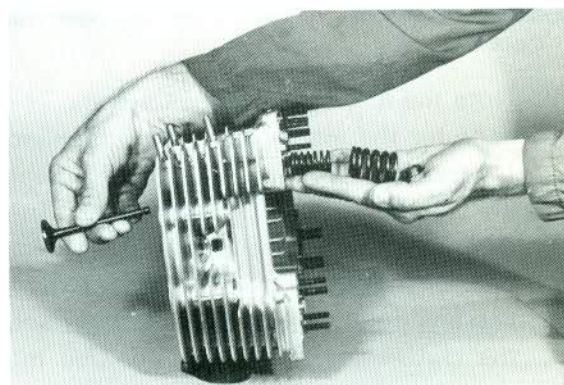


1. Valve spring compressor

3. Remove valves.

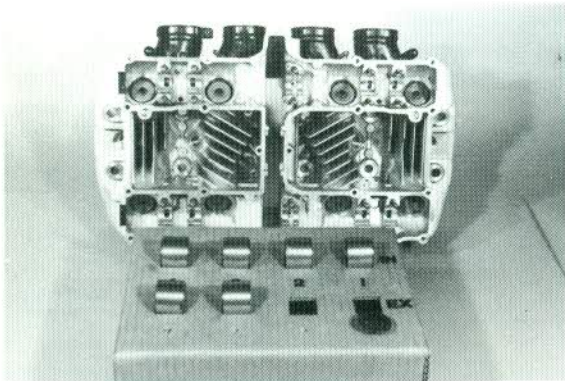
#### NOTE:

Deburr any deformed valve stem end. Use an oil stone to smooth the stem end. This will help prevent damage to the valve guide during valve removal.



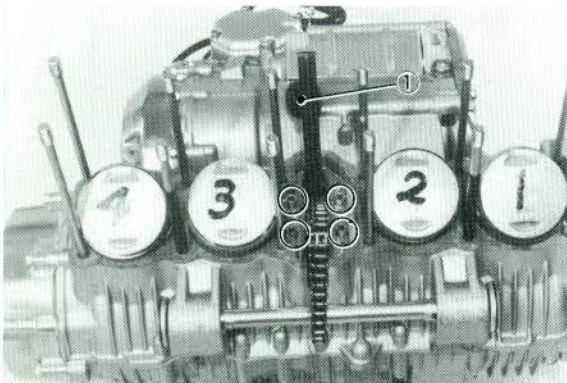


4. Use a small box to hold the parts and identify the original position of each lifter and valve. Be very careful not to mix the location of these components.



#### C. Piston and Cam Chain Dampers Removal

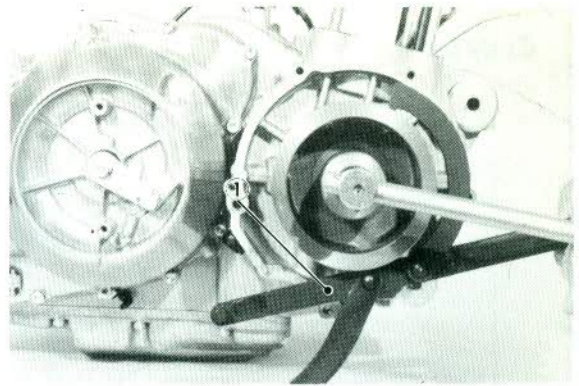
1. Mark each piston to aid in reassembly.
2. Place a clean towel or rag into the crankcase to keep circlips and material from falling into the engine.
3. Remove piston pin clips, piston pins, and pistons.
4. Remove the cam chain dampers.



1. Cam chain damper

#### D. Generator

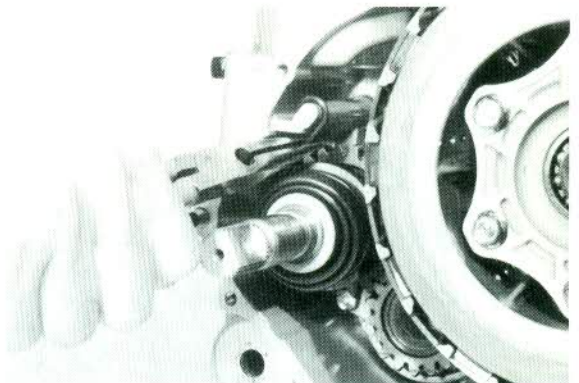
1. Remove the bolts that hold the generator.  
After the wiring harness has been removed from the clips take off the stator assembly.
2. Remove the alternator rotor using the universal magneto and rotor holding tool (special tool) and the rotor puller bolt (special tool).



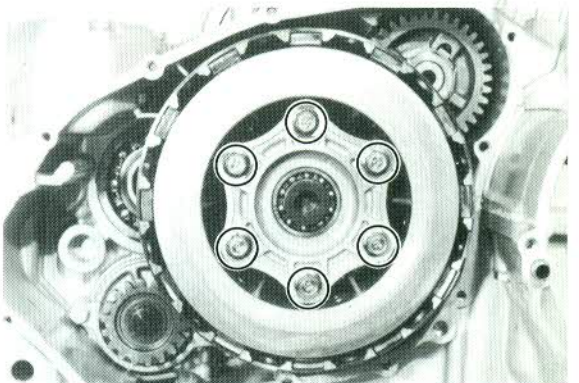
1. Universal magneto and rotor holding tool

#### E. Kick Shaft, Clutch and Primary Driven Gear

1. Remove the kick start shaft cap and then the right crankcase cover. Pull the kick crank spring off of the crankcase boss and remove the kick crank assembly.



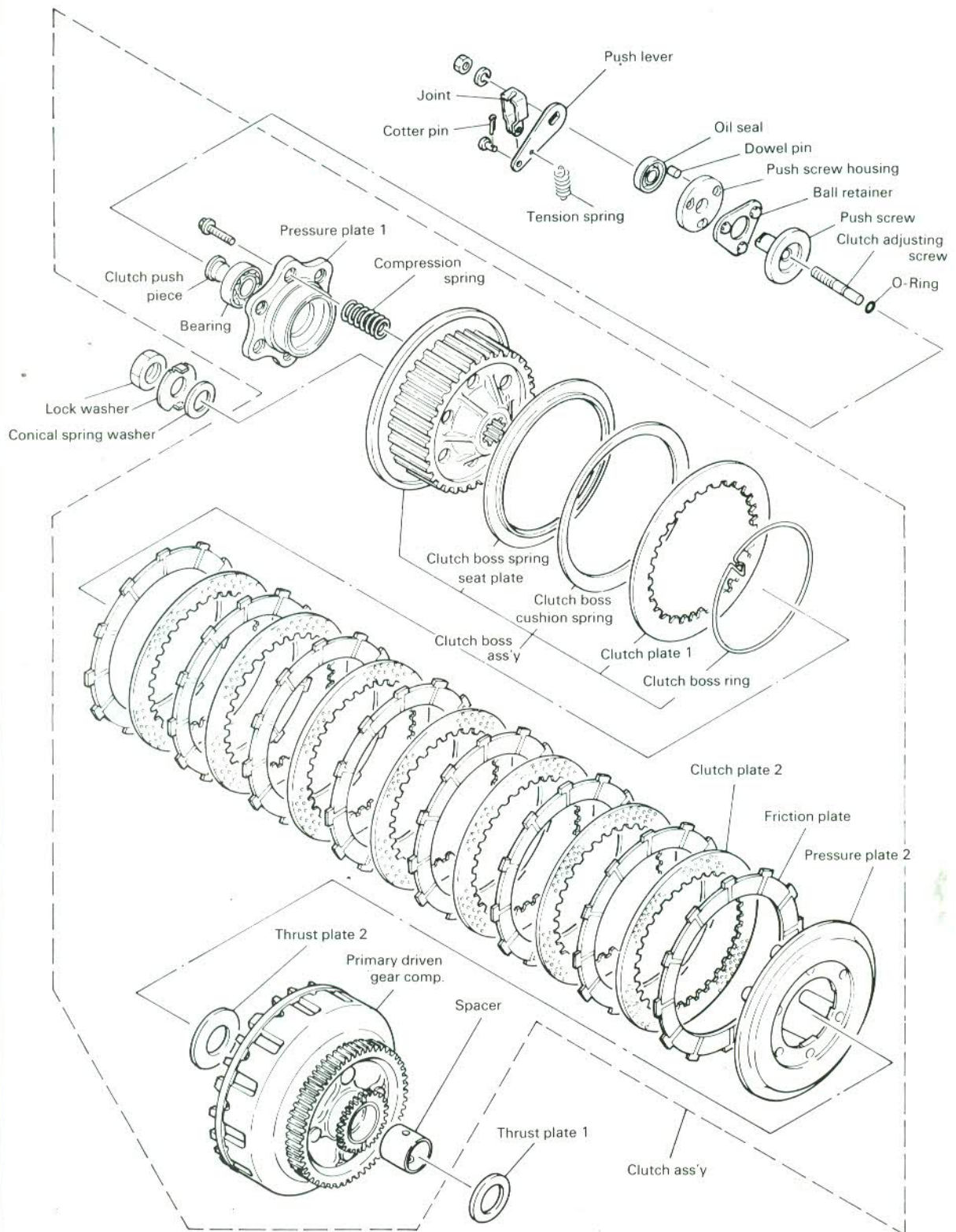
2. Release the tension evenly on the six 6 mm bolts and remove clutch pressure plate No. 1 and the six clutch springs.



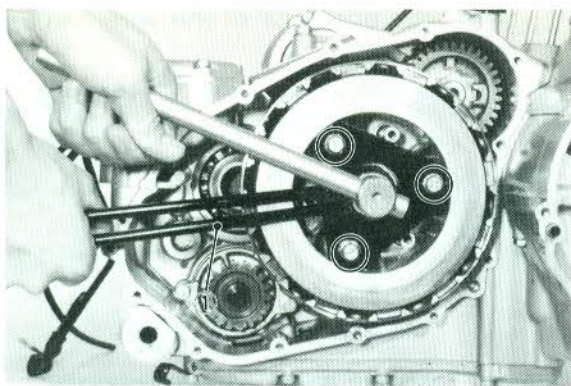
3. After straightening the lock washer tab on the clutch unit, secure the clutch holding tool (special tool) to the clutch boss using three 6 mm clutch bolts.



# CLUTCH





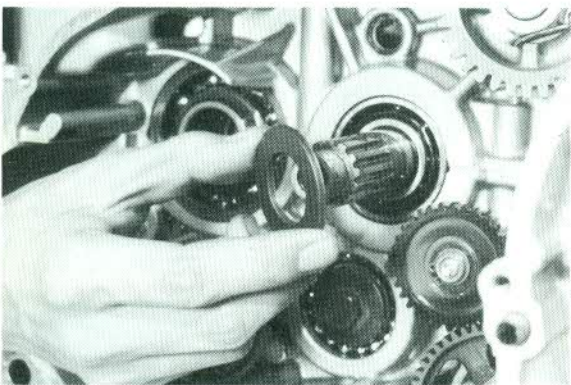


1. Clutch holding tool

**CAUTION:**  
Use a new lock washer during reassembly.

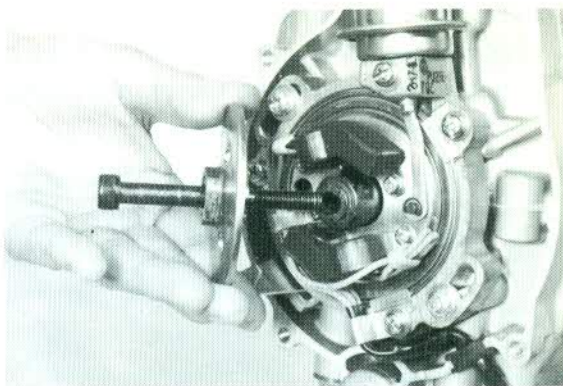
**CAUTION:**  
Failure to secure the clutch tool with the bolts could result in a broken clutch boss.

4. Remove the clutch nut.
5. Remove the clutch holding tool along with the clutch boss clutch plates and pressure plate and remove the three clutch bolts from the clutch holding tool.
6. Take off the thrust washer, clutch housing and primary driven gear. Remove the thrust washer from the main axle.



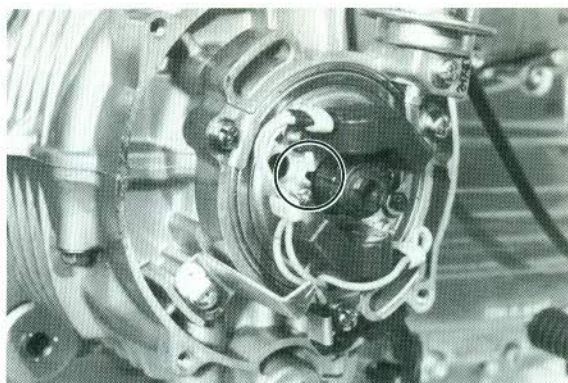
#### F. Pick-up Coil Assembly Removal

1. Remove the allen bolt that holds the timing plate.

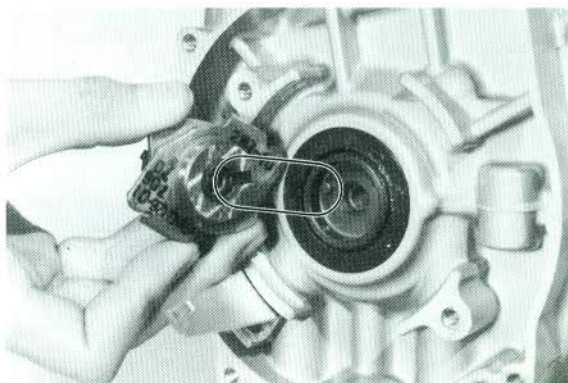


2. Remove the pick-up coil assembly by removing the two Phillips head screws which hold the assembly to the crankcase.

**NOTE:**  
Note that there is a slot in the pick-up coil backing plate. This slot must align with the projection on the governor assembly so that the backing plate can be removed.

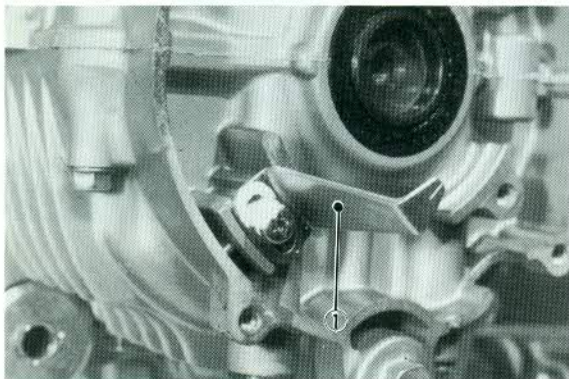


3. Remove the governor. Notice that the governor assembly is indexed by a pin on the end of the crankshaft.





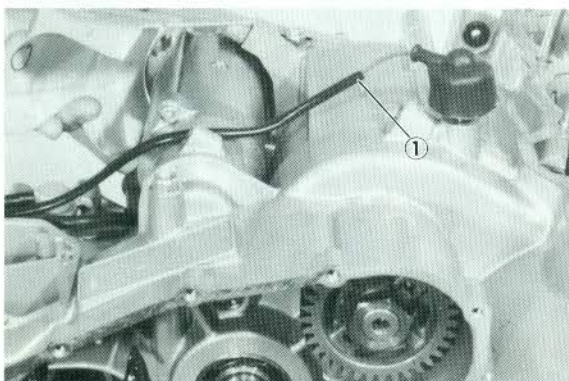
4. Remove the timing pointer from the crankcase. This will prevent it from being damaged when turning the crankcases over on the bench.



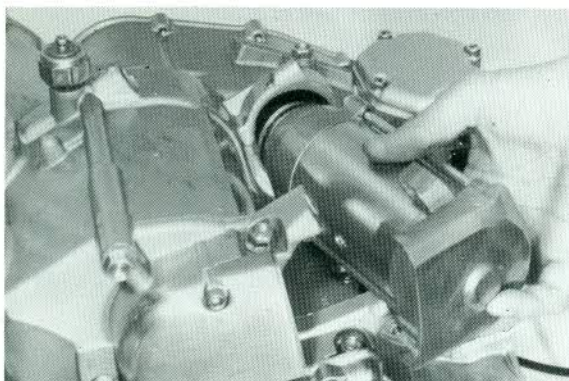
1. Timing pointer

### G. Starter Motor Removal

1. Remove the 3 bolts holding the starter motor and cover.
2. Remove the oil pressure switch lead wire from the pressure switch.
3. Remove the cover and the starter motor.



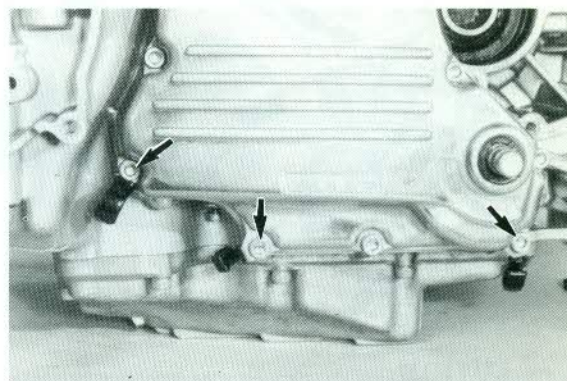
1. Oil pressure switch lead wire



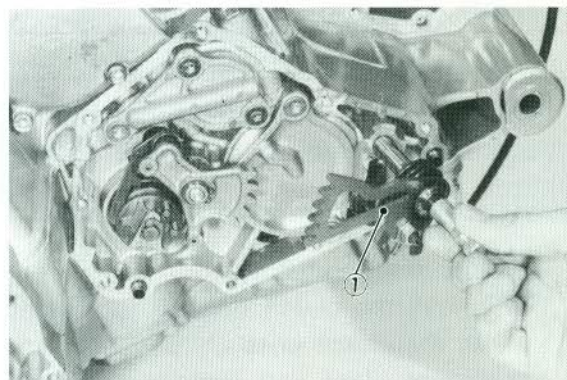
### H. Shifter

1. Remove the change pedal and the left hand crankcase cover.

Note the positions of the wire harness clips.

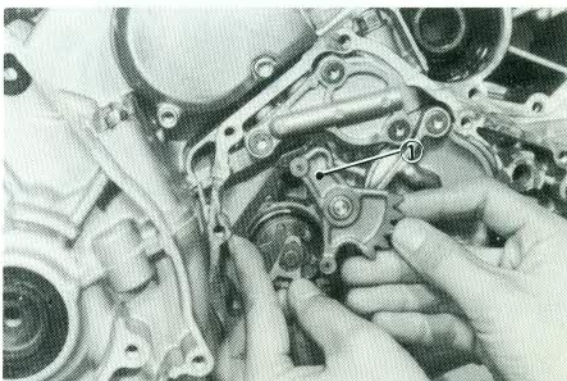


2. Remove the shift shaft assembly.



1. Shift shaft assembly

3. Remove the circlip and shift lever No. 2.



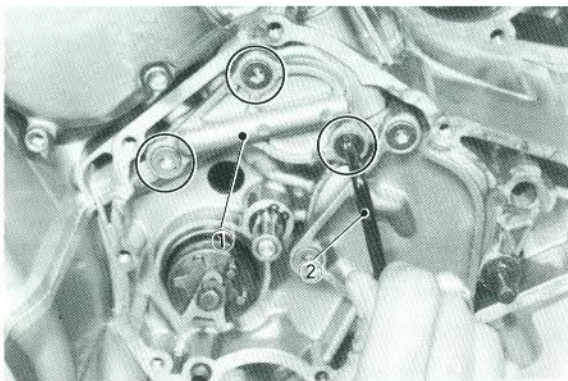
1. Shift lever No. 2



**NOTE:**

Use a new circlip during reassembly.

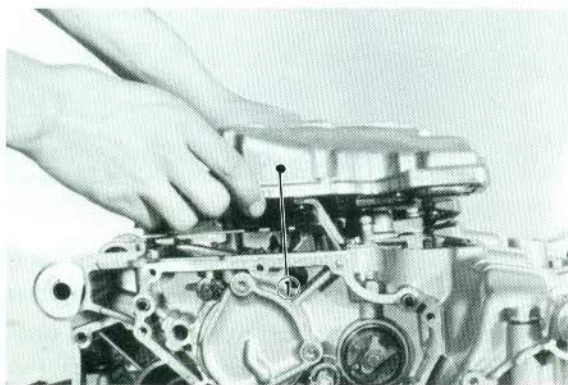
4. Using the drive axle wrench (special tool) remove the three countersunk screws securing the special oil nozzle. remove the nozzle.



1. Special oil nozzle
2. Drive axle wrench

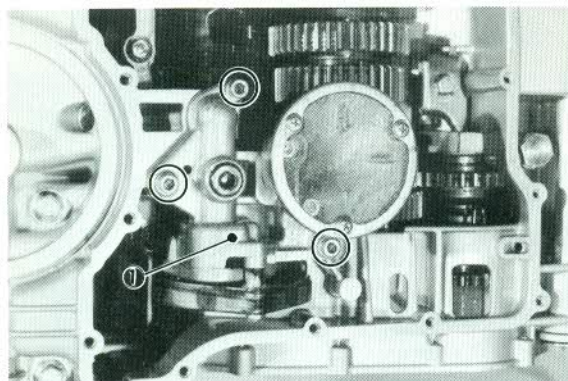
**I. Oil Pump Removal and Disassembly**

1. Remove the strainer cover.



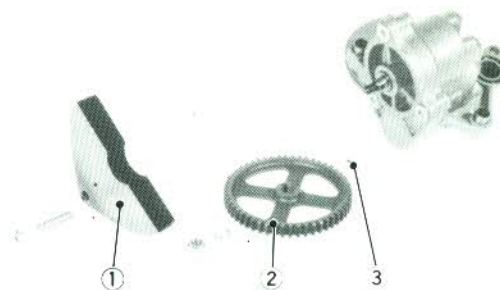
1. Strainer cover

2. Remove the oil pump assembly.



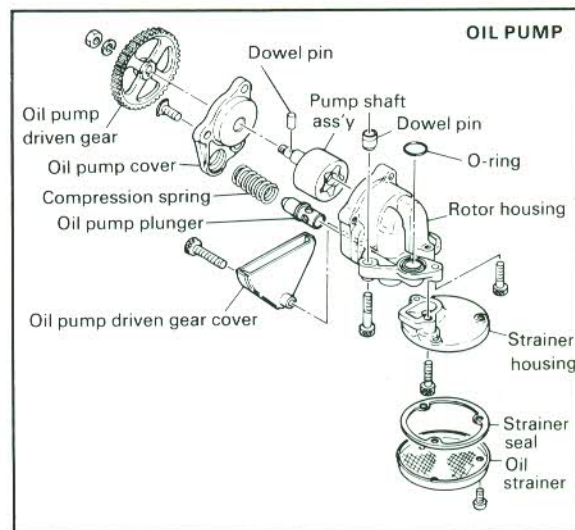
1. Oil pump

3. Remove the driven gear cover, driven gear, and retaining pin.



1. Gear cover
2. Driven gear
3. Retaining pin

4. Remove the oil pump cover, the rotor assembly and the pressure relief valve.

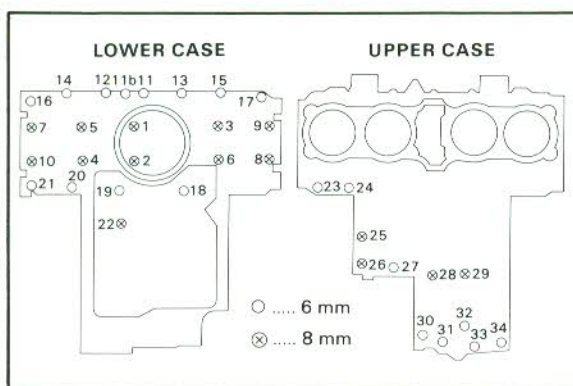
**J. Crankcase Disassembly**

1. Refer to the illustration for the crankcase bolt removal sequence. Start with the highest numbered bolt. Loosen all bolts 1/2 turn, then remove the bolts. The crankshaft area bolts should be loosened last. Notice that the bolts in the oil filter cavity have no washers, while the other crankshaft area bolts use washers.

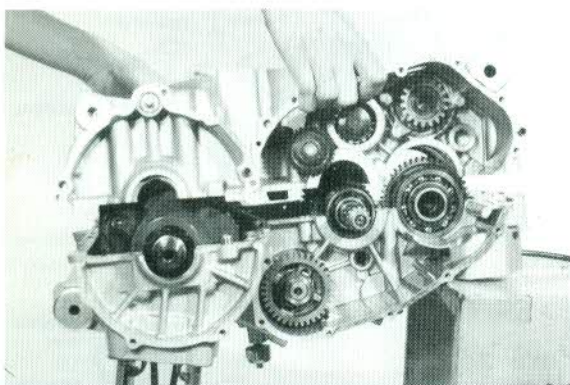
**CAUTION:**

Before trying to separate the crankcases, remove the crankcase breather cover and remove the hidden bolt located under the cover.

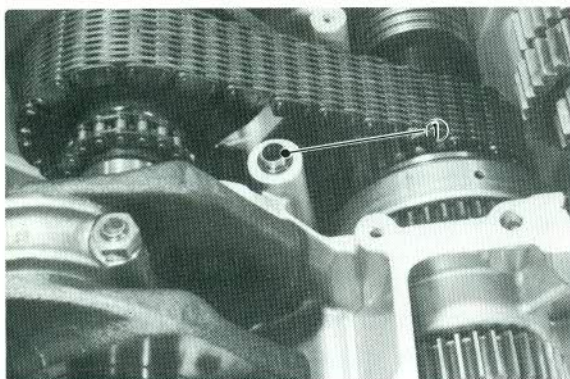




2. Turn the engine upside down and lift off the lower case half. The crankshaft will remain in the upper case half. Prop the engine up to prevent damage to the cylinder studs.

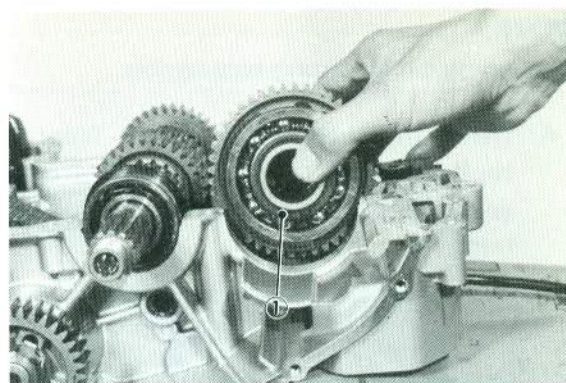


3. The arrow indicates an important "O-ring" and oil passage in the top case half. Take care not to allow any dirt or foreign matter to enter this passage.



1. "O"-ring

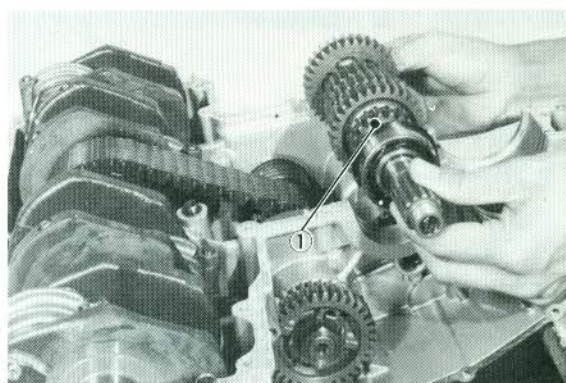
4. Remove the middle driven gear assembly from the upper case half.



1. Middle driven gear assembly

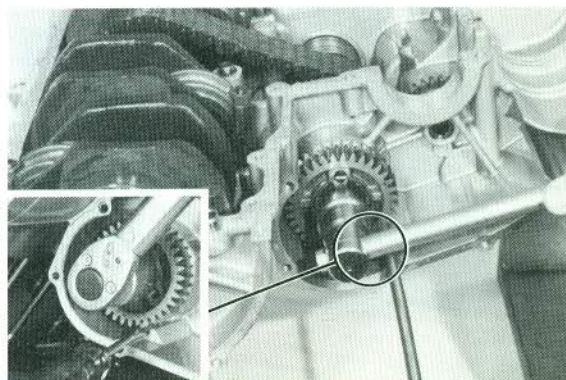
**NOTE:**  
Always use a new oil seal when reassembly.

5. Remove the main axle assembly from the upper case half.



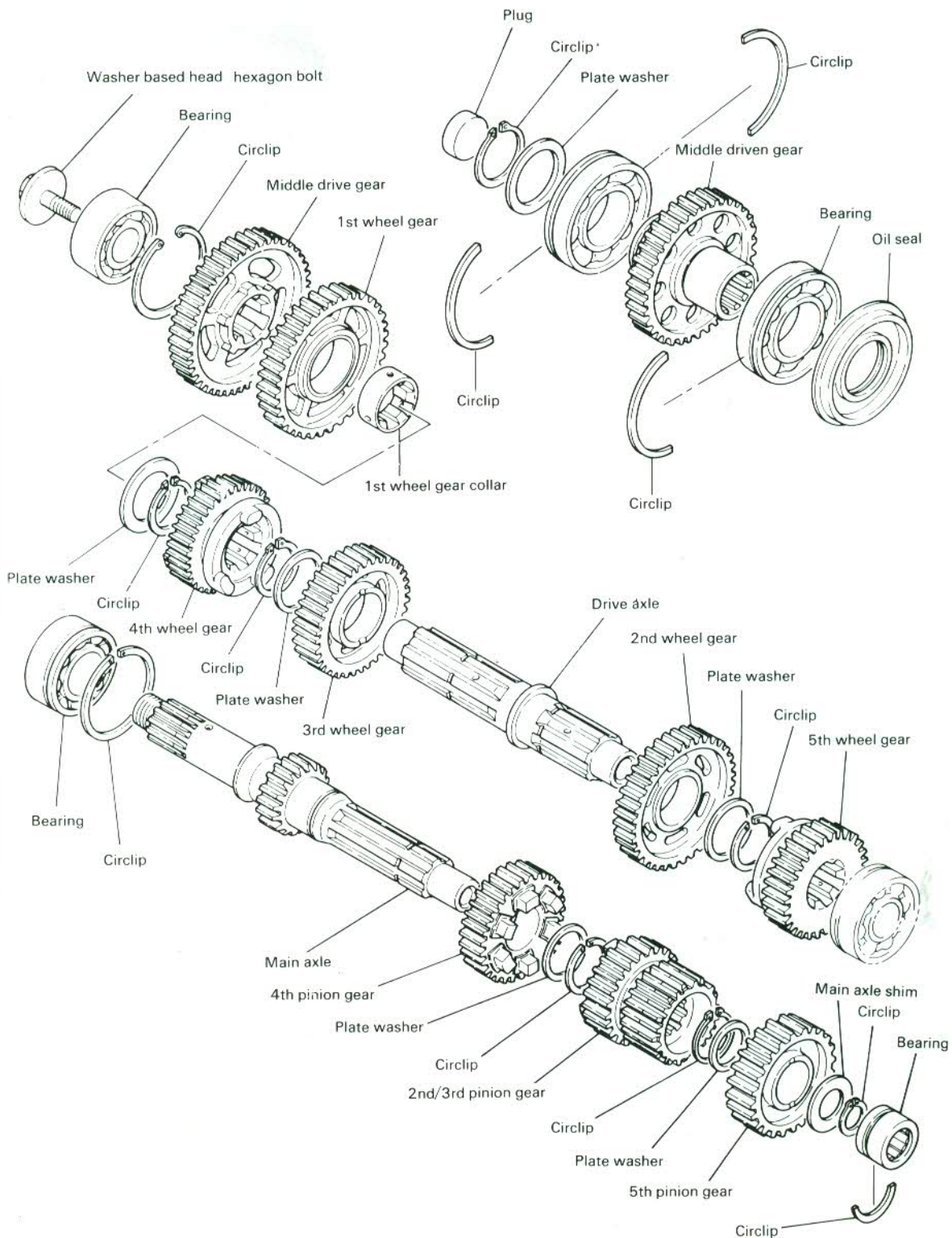
1. Main axle assembly

6. Straighten the lockwasher tab and loosen the holding nut. Place a large flat bladed screwdriver into the slot provided in the crankcase to prevent the primary drive gear from turning when loosening the nut. Next, take off conical spring washer located under the lock tab and remove the gear.





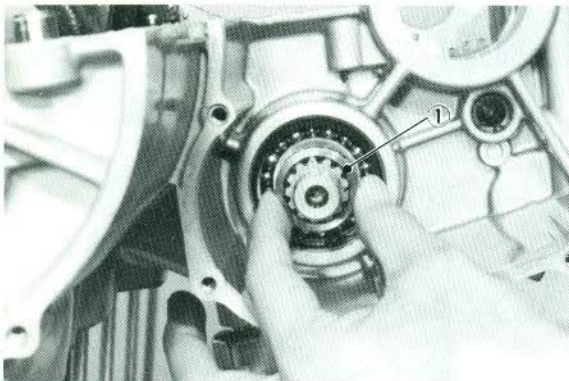
# TRANSMISSION





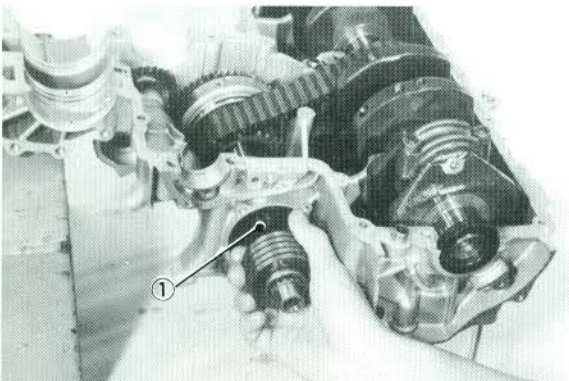
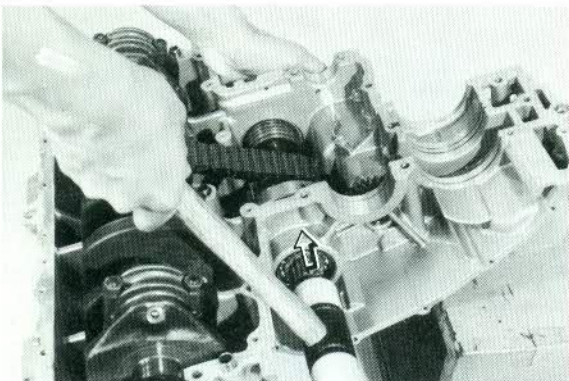
**CAUTION:**  
Replace lockwasher during reassembly.

7. Remove the spacer from the primary shaft.



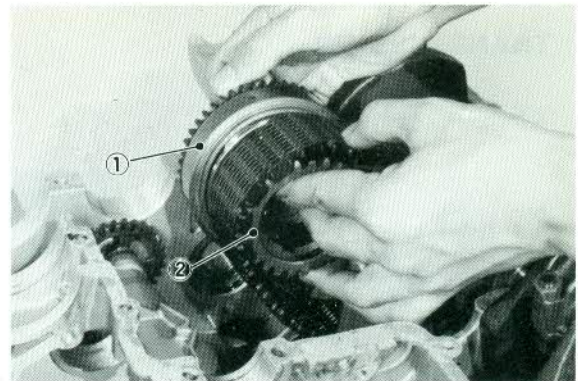
1. Spacer

8. Remove the 3 allen screws and lightly tap the right end of primary shaft with a soft faced hammer and then pull out the primary shaft bearing housing. Remove the primary shaft.



1. Primary shaft

9. With the primary shaft removed, the starter clutch assembly and primary chain gear can be removed.

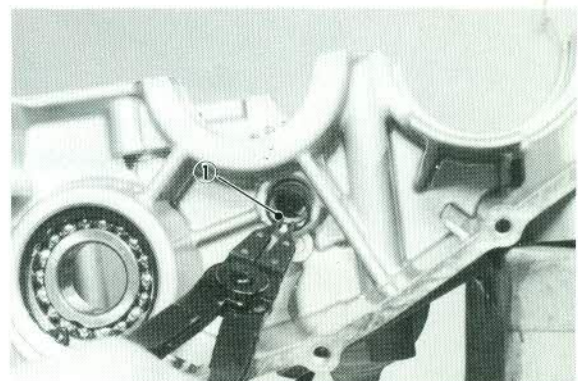


1. Starter clutch assembly  
2. Primary chain gear

10. Lift the crankshaft with connecting rods from the case.



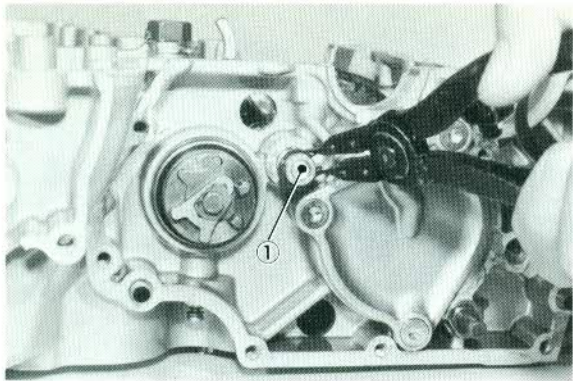
11. Mark the original location of each connecting rod and cap and then remove the rods.
12. Slip the primary chain and cam chain over the crank webs and remove the chains.
13. Remove the starter idle gear from the upper case half.



1. Starter idle gear shaft

14. Remove the circlip securing the shift fork guide bar and pull out the bar and shift forks. The shift forks are identified by numbers cast on their sides.

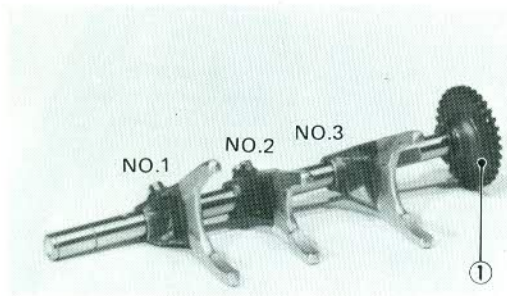




1. Shift fork guide bar

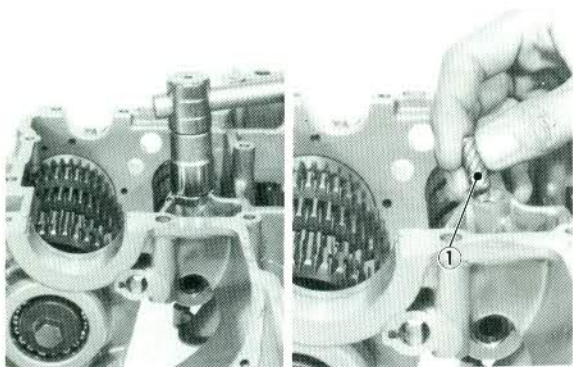
**NOTE:**

The gear on the end of this shaft is the oil pump idle gear.



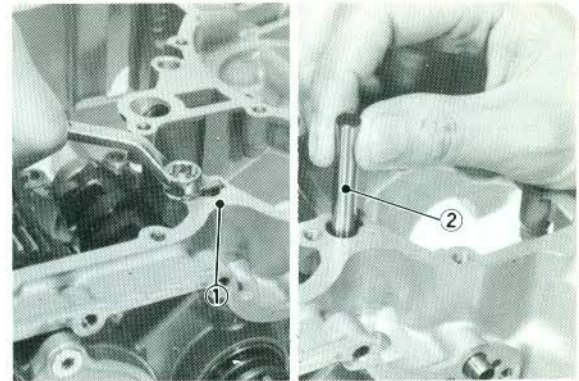
1. Oil pump idle gear

15. Remove the shift cam detent.



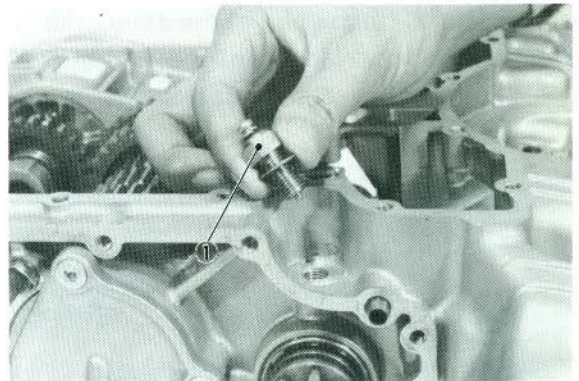
1. Shift cam detent

16. Remove the bolt, retainer and guide pin.



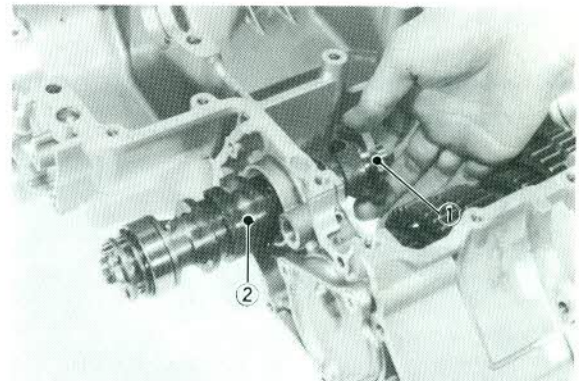
1. Retainer 2. Guide pin

17. Remove the neutral indicator switch.



1. Neutral indicator switch

18. Remove the circlip holding the stopper plate to the shift cam and remove the shift cam.



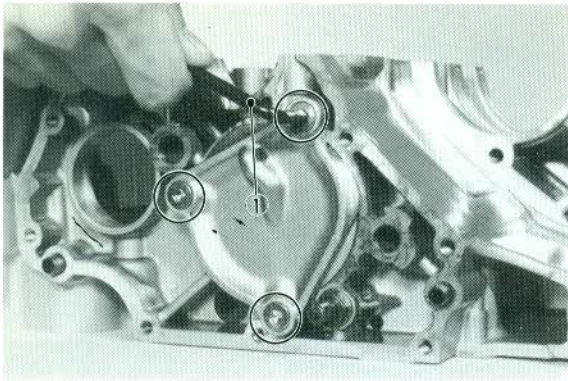
1. Stopper plate 2. Shift cam

19. Remove the three screws holding the drive axle bearing housing and remove the housing.

Using the drive axle wrench (special tool) remove the three countersunk, Loctited screws securing the drive axle bearing housing.

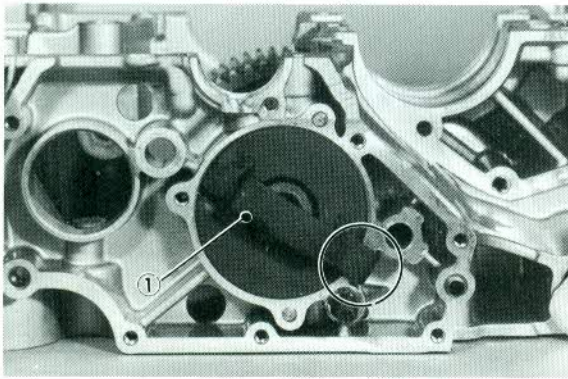
Remove the housing.





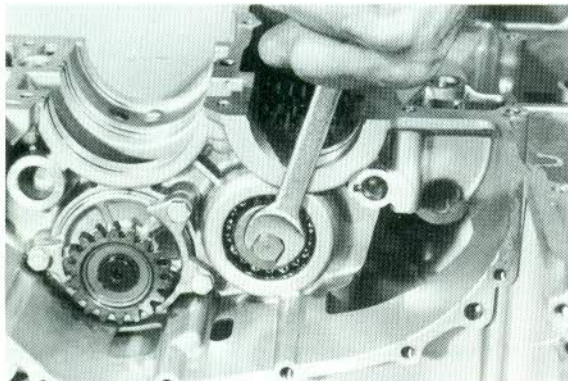
1. Drive axle wrench

20. Mount the drive axle holding tool (special tool) on the end of the drive axle.
21. Place the projection of the tool against the shift lever eccentric screw in the crankcase.

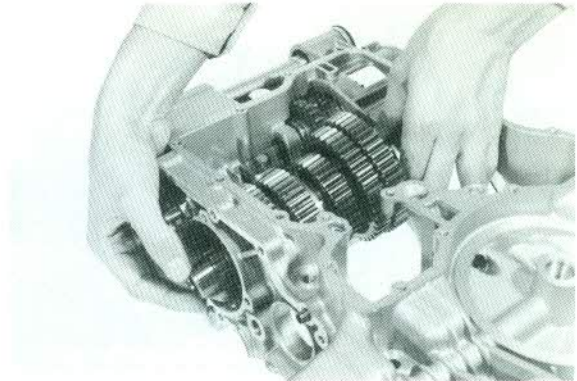


1. Drive axle holding tool

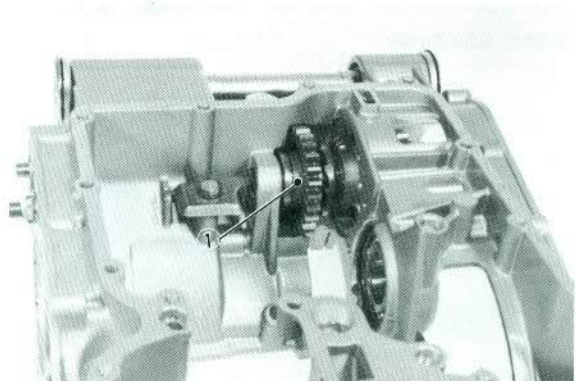
22. Loosen the washer based bolt on the opposite end of the drive axle.



23. To remove the drive axle, tilt it up and pull it out of the lower crankcase.



24. Remove the kick idle gear from the lower case half.



1. Kick idle gear

## K. Primary Shaft Disassembly

1. Disassembly of the primary shaft requires the special primary shaft damper tool (special tool) and a hydraulic press. Place the shaft in a press with the special tool in place as shown.

