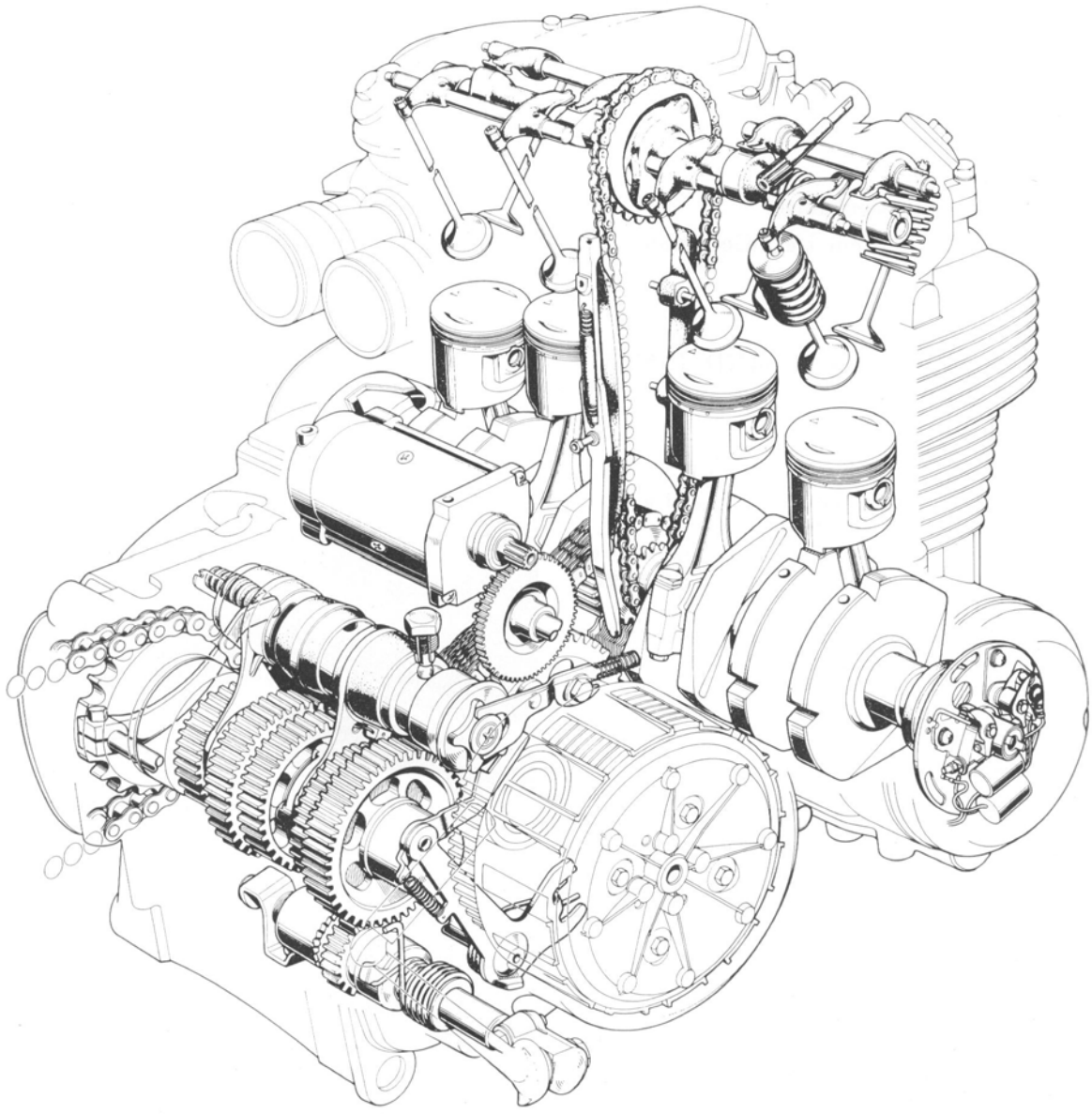
4. ENGINE



1. SERVICING WITH ENGINE MOUNTED IN FRAME

2. ENGINE REMOVAL AND INSTALLATION

A. Removal

1. Turn the fuel cock to the "STOP" position, disconnect the fuel pipe at the tank, and dismount the fuel tank.
2. Unscrew the oil drain bolt and the oil filter center bolt, and drain the engine oil.
3. Remove the exhaust pipe and the muffler.
4. Disconnect the high tension cords at the spark plugs.
5. Disconnect the ground cable at the battery terminal.
6. Unscrew the 5 mm screw and disconnect the tachometer cable at the cylinder head cover.
7. Open the seat, take out the air cleaner element, unscrew three 6 mm bolts and remove the air cleaner case.

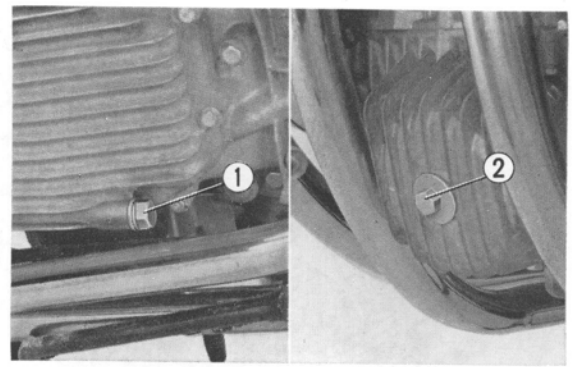


Fig. 43 ① Drain bolt ② Oil filter center bolt

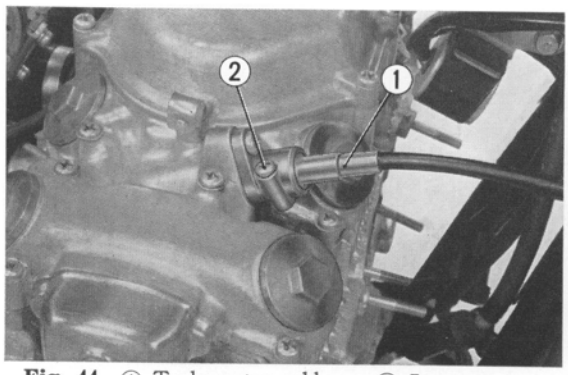


Fig. 44 ① Tachometer cable ② 5 mm screw

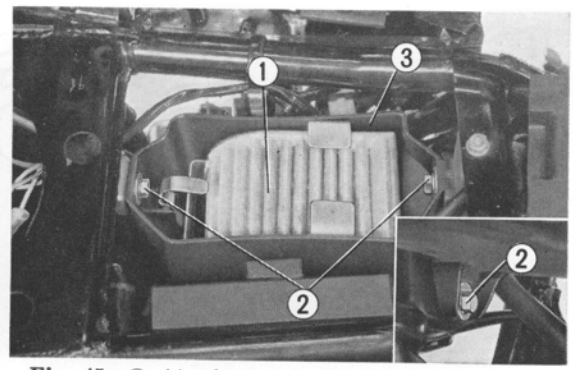


Fig. 45 ① Air cleaner element ② 6 mm bolts ③ Air cleaner case

8. Disconnect the throttle cable at the carburetor.

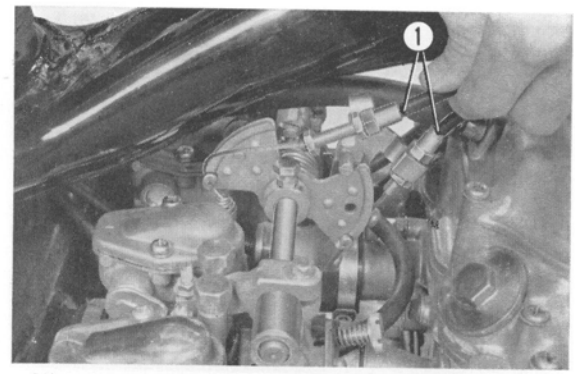


Fig. 46 ① Throttle cable

9. Loosen the two 5 mm screws at the carburetor insulator and the 4mm screws at the air cleaner chamber. Remove the carburetor.

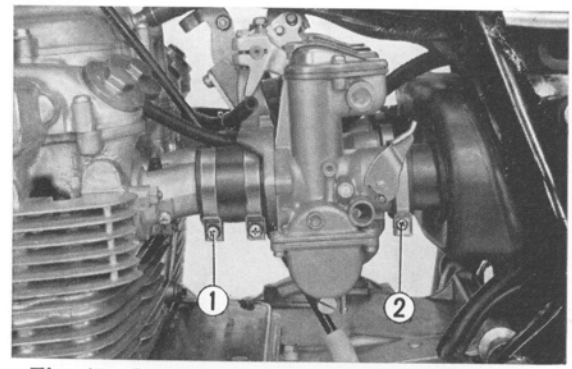


Fig. 47 ① 5 mm screw ② 4 mm screw

10. Disconnect the starting motor cable from the magnetic switch, and then the generator wiring at the coupler.

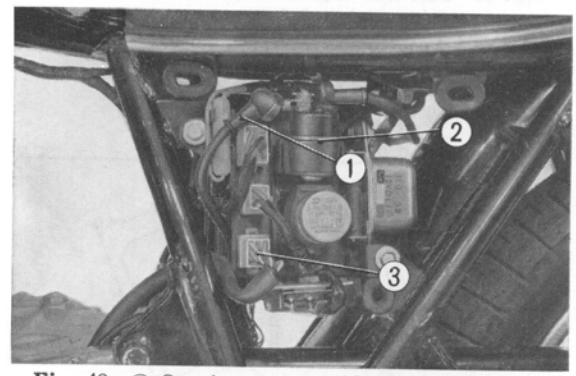


Fig. 48 ① Starting motor cable ② Magnetic switch ③ Wiring coupler

11. Remove the gear change pedal, unscrew the starting motor cover bolts, remove the starting motor cover, and then remove the left crankcase cover. Disconnect the clutch cable at the clutch lifter.

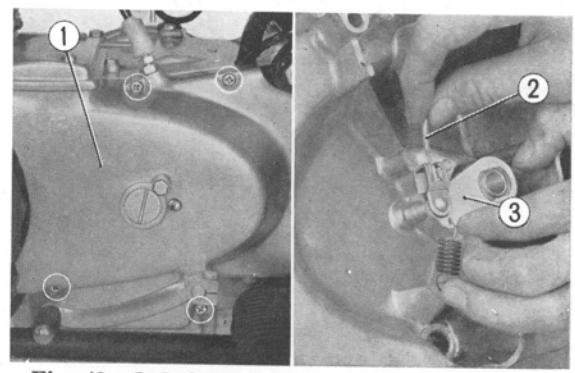


Fig. 49 ① Left crankcase cover ② Clutch cable ③ Clutch lifter

Fig. 50 ① Contact breaker point leads

12. Remove the final driven sprocket and the drive chain.

13. Disconnect the contact breaker point leads (yellow and blue) at the connectors.

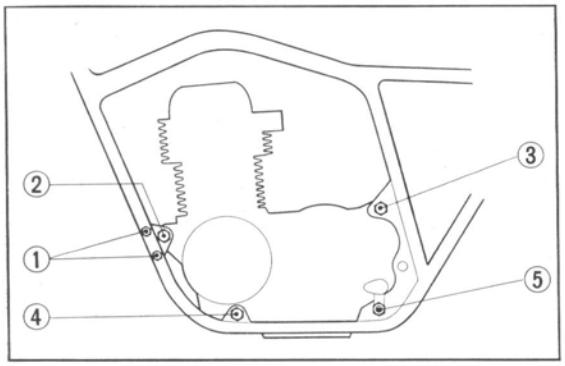


Fig. 51 Left side engine hanger bolts
① 8×50 hex bolt
② 10×50 hex bolt
③ Rear upper hanger bolt
④ 10×80 hex bolt
⑤ Rear lower hanger bolt

14. Unscrew the nuts from the engine hanger bolts, and dismount the engine from the right side by raising it's rear slightly.

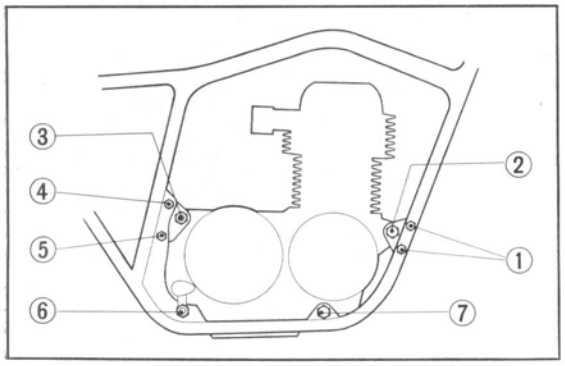


Fig. 52 Right side engine hanger bolts
① 8×50 hex bolt
② 10×50 hex bolt
③ Rear upper hanger bolt
④ 8×100 hex bolt
⑤ 8×40 hex bolt
⑥ Rear lower hanger bolt
⑦ 10×80 hex bolt

B. Engine Installation

1. Remount the engine in the reverse order of dismounting, however, attention should be given to the following points:
   - Install the engine from the right side and tighten the hanger bolts. The battery ground cable terminal is installed together with the rear hanger bolt.
   - Make sure that the generator cord and starting motor cord are not pinched when the left crankcase cover is installed.
   - Make sure that the two mufflers on each side are properly connected with the muffler connecting band.
   - Perform the following adjustments after the engine is installed.
     Clutch adjustment
     Drive chain slack adjustment
     Carburetor adjustment

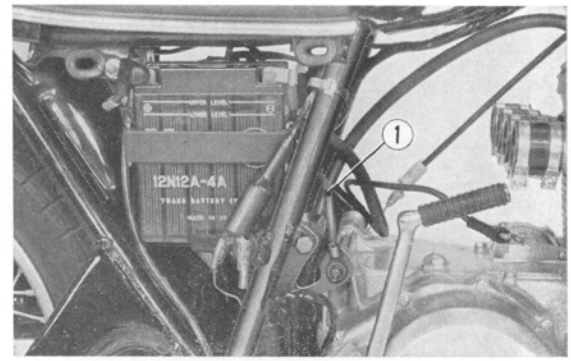


Fig. 53 ① Battery ground cable

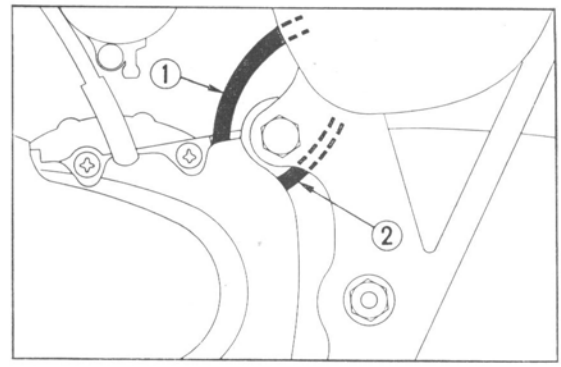


Fig. 54 ① Generator cord
② Starting motor cord

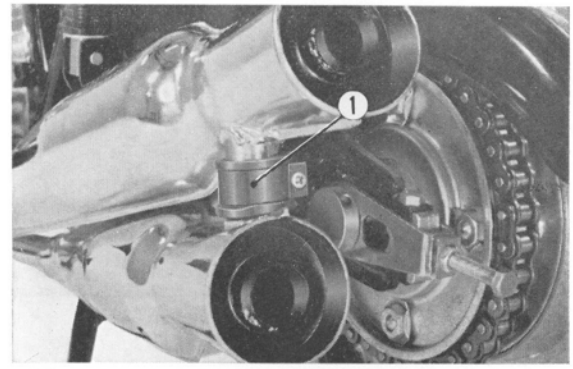


Fig. 55 ① Muffler connecting band

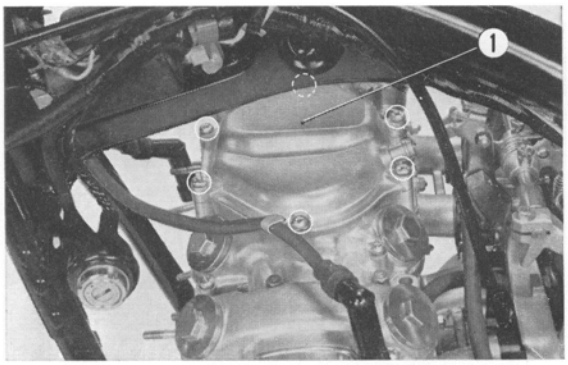


Fig. 56 ① Breather cover

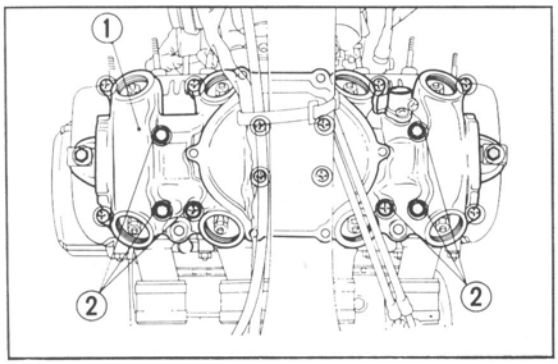


Fig. 57 ① Cylinder head cover
② 6 mm copper washers

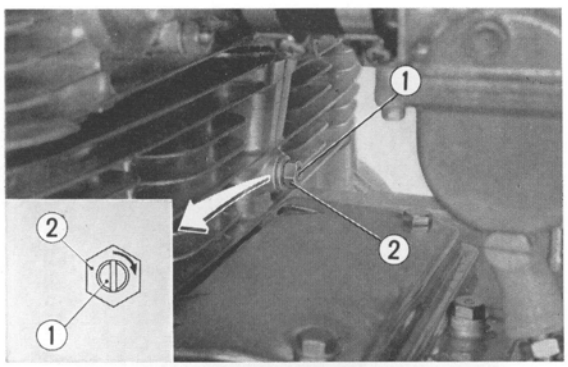


Fig. 58 ① Cam chain tension adjuster
② Lock nut

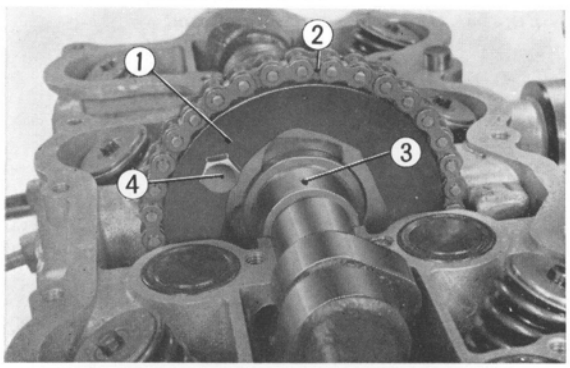


Fig. 59 ① Cam sprocket ③ Camshaft
② Cam chain ④ 7 mm bolt

3. CYLINDER HEAD, CYLINDER AND PISTON

A. Disassembly

1. Turn the fuel cock to the "STOP" position, disconnect the fuel lines at the tank, and dismount the fuel tank.
2. Remove the exhaust pipe and muffler.
3. Disconnect the tachometer cable.
4. Disconnect the high tension cords at the spark plugs, unscrew six 6 mm screws and remove the breather cover.
5. Remove the tappet hole caps, left and right side covers, unscrew twelve 6 mm screws and six bolts, and remove the cylinder head cover.

Note:

- **Loosen the screws and bolts uniformly to relieve the stress gradually.**

6. Loosen the lock nut of the cam chain tension adjuster (leave the wrench on the nut), turn the screw fully (approximately 90°) clockwise, and then tighten the lock nut.
   In this condition the cam chain tensioner is not applying tension to the cam chain.

7. Unscrew two cam sprocket mounting bolts and remove the camshaft from the sprocket.
8. Remove the cam chain from the sprocket.

9. Separate the carburetor assembly from the cylinder head.
10. Unscrew the cam chain tensioner mounting bolt.

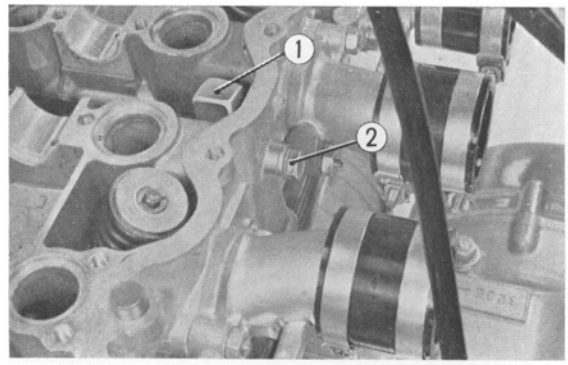


Fig. 60 ① Cam chain tensioner
② Cam chain tensioner mounting bolt

11. Unscrew twelve cylinder head mounting nuts and two 6 mm flange bolts, and remove the head. Loosen the nuts uniformly in the reverse order of tightening shown in Fig. 83.

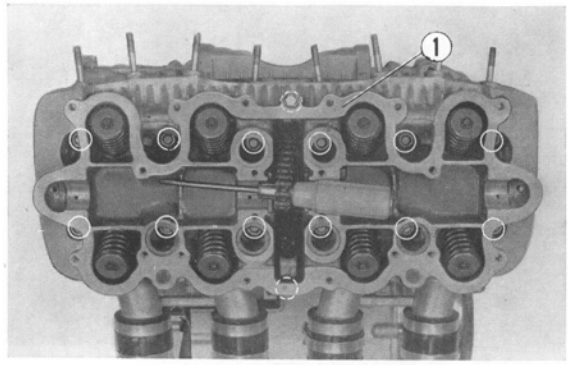


Fig. 61 ① Cylinder head

12. Remove the cam chain guide from the cylinder by raising the cam chain guide slightly, and rotate the guide 90° and removing it toward the top.
During this operation, do not drop the cam chain.

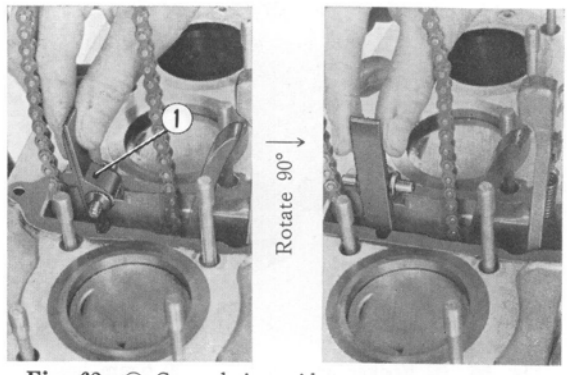


Fig. 62 ① Cam chain guide

13. Unscrew the cam chain adjuster lock nut (Fig. 58) and remove the chain tensioner from the cylinder.
To facilitate removal, raise the cylinder about 20 mm/1 in., and remove the cam chain tensioner.

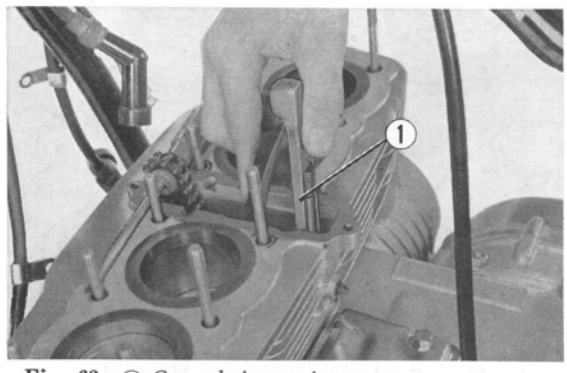


Fig. 63 ① Cam chain tensioner

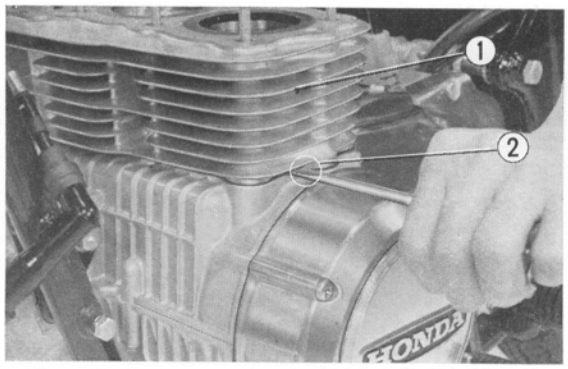


Fig. 64 ① Cylinder ② Cylinder groove

14. Remove the cylinder.
    If the cylinder is tightly stuck pry the cylinder loose with a screwdriver placed in the groove at the base of the cylinder.

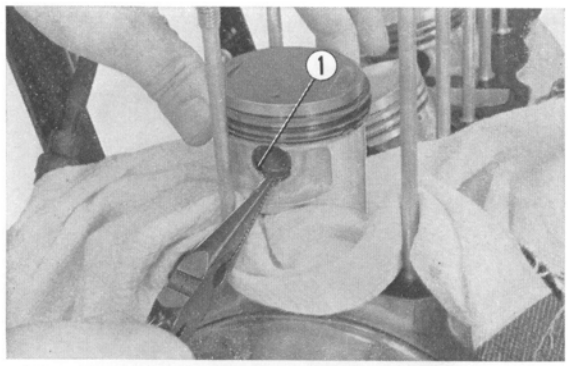


Fig. 65 ① Piston pin clip

15. Remove the piston pin clip, piston pin, and the piston.
    Note:
    When removing the pin clip, exercise care not to drop the clip into the crankcase.

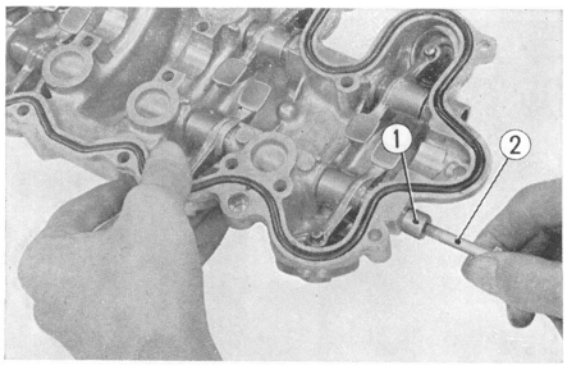


Fig. 66 ① Rocker arm shaft ② 6 mm bolt

16. Remove the piston rings.
17. Screw a 6 mm bolt into the rocker arm shaft and remove the rocker arm shaft from the cylinder head cover.

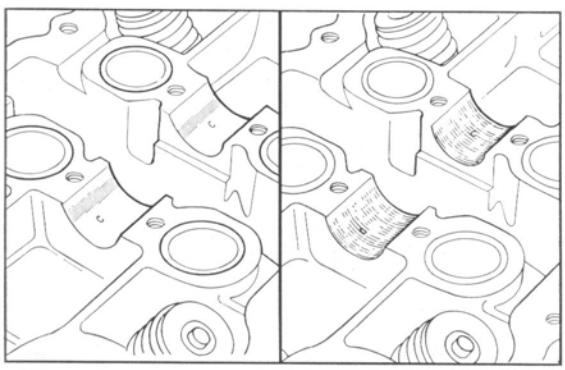


Fig. 67 Good No good

B. Inspection

1. Inspect the camshaft bearing surfaces.
   Camshaft bearing surfaces should be smooth and shiny. If it is scratched or excessively worn, it should be replaced.

2. Measure the height of the cam with a micrometer.
   Replace the camshaft if beyond the serviceable limit.

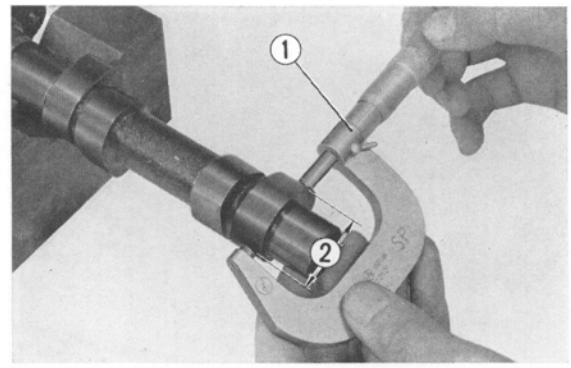


Fig. 68 ① Micrometer ② Cam height

3. Measure camshaft runout.
   Support level both ends of the camshaft on V-blocks and with a dial gauge measure radial runout by rotating the shaft. Replace the camshaft if beyond the serviceable limit.
4. Also check the camshaft for scratch, wear and replace if necessary.

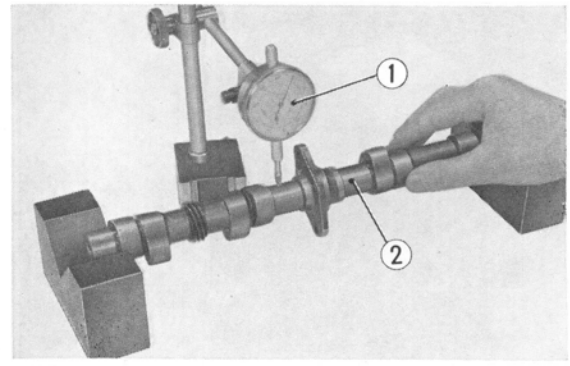


Fig. 69 ① Dial gauge ② Camshaft

5. Measure cylinder diameter at the top, center and bottom in both the X and Y axes. Rebore the cylinder if beyond the serviceable limit at any point.
   When reboring the cylinder, rebore it to fit one of the four standard oversize pistons available.
   Standard oversizes are **0.25, 0.50, 0.75 and 1.00 mm** (**0.009, 0.019, 0.029 and 0.039 in.**).

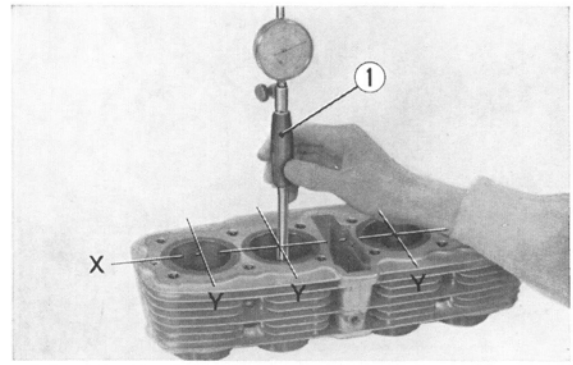


Fig. 70 ① Cylinder gauge

6. Measure piston diameter.
   Measure the diameter at the piston skirt, 90° to the piston pin with a micrometer. Replace the piston if the diameter beyond the serviceable limit.

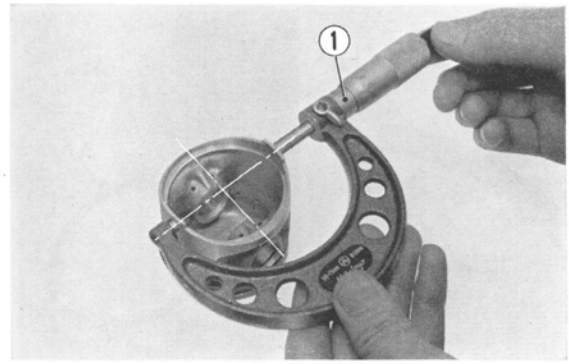


Fig. 71 ① Micrometer

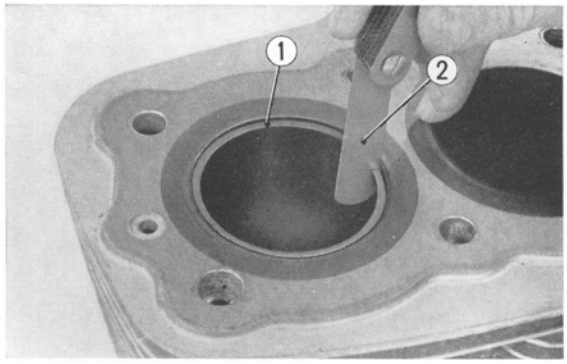


Fig. 72 ① Piston ring ② Feeler gauge

7. Measure piston ring end gap.
   Insert the piston ring into the skirt of the cylinder so that it is squarely positioned, and measure the gap with a feeler gauge.

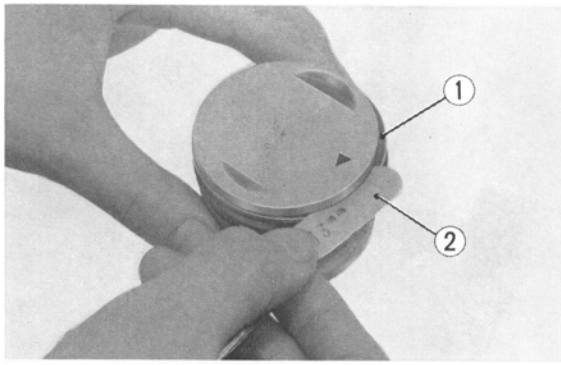


Fig. 73 ① Piston ring ② Feeler gauge

8. Measure piston ring side clearance.
   Install the rings on the piston and measure the side clearance of the piston ring in the ring groove with a feeler gauge.

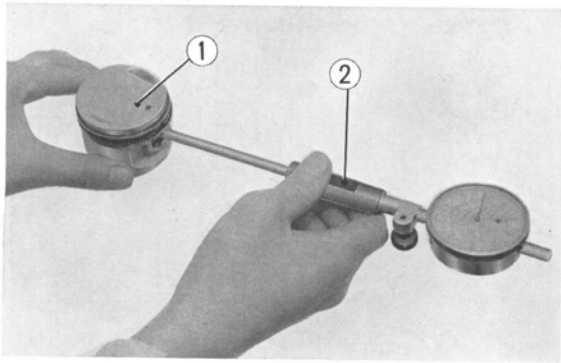


Fig. 74 ① Piston ② Cylinder gauge

9. Measure the piston pin hole using an inside micrometer or cylinder gauge.
10. Inspect the piston for damage, distortion and excessive wear.

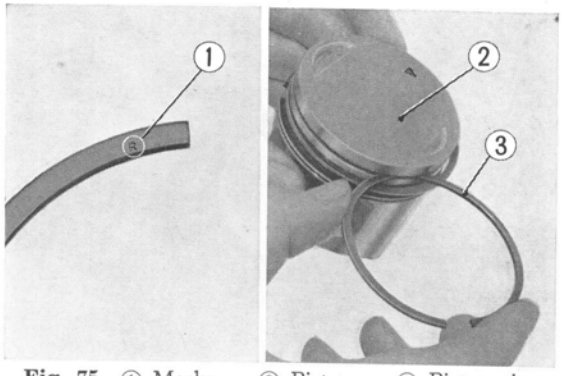


Fig. 75 ① Marks ② Piston ③ Piston ring

C. Reassembly

1. Install the rocker arm and the rocker arm shaft in the cylinder head cover.
   Install the rocker arm shafts with the side having a hole facing outward.
2. Install the piston rings on the piston with the marking on the rings toward the top.

Note:
When installing new rings on the piston, roll the rings in the ring grooves to assure proper clearance. If the rings roll smoothly, the clearance is satisfactory.
Use piston rings of the same maker as a set.

3. Install the piston on the connecting rod with the piston pin and clips so that the ▲ mark on the piston head points toward the front (exhaust side) as shown in the figure.

Note:
Always use new pin clips.

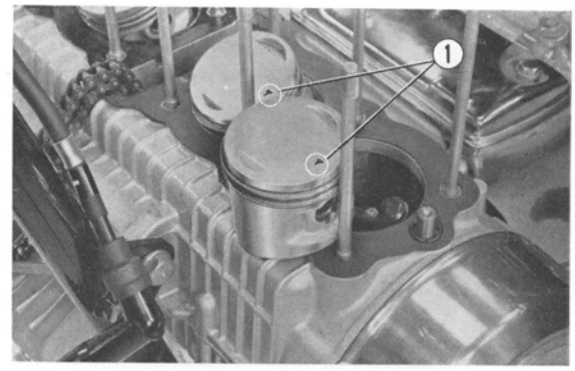


Fig. 76 ① ▲ marks

4. Stagger the end gaps of the top, 2nd and oil rings 120° apart.
   Install so that none of the gaps are on the piston boss axis or 90° away from it.

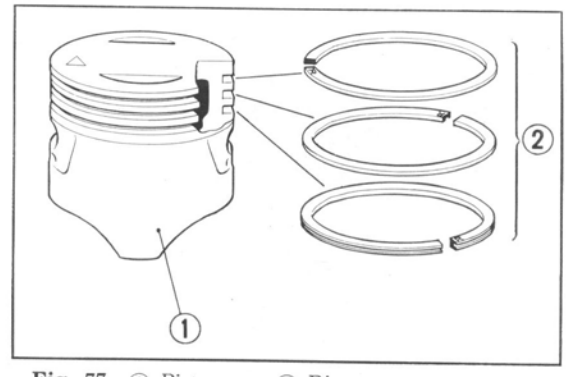


Fig. 77 ① Piston ② Rings

(Three-piece type oil ring)

a. When installing the oil ring, first place the spacer and then the rails in position.
b. The spacer and rail gaps must be staggered **2~3 cm (0.783~1.181 in.)**.

Note:
The gap of the oil ring refers to that of the spacer.

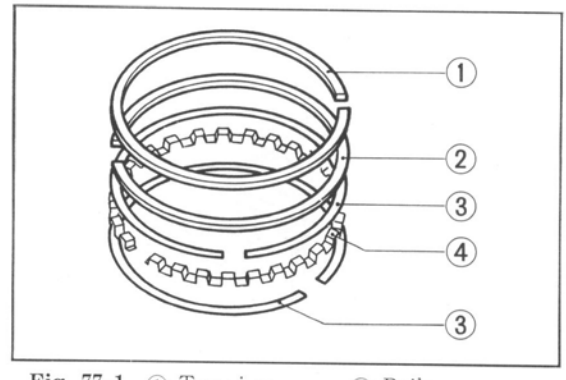


Fig. 77-1 ① Top ring ② Second ring ③ Rails ④ Spacer

5. Install the cylinder gasket, two dowel pins (orifice valve) and two O-rings on the upper crankcase.

Note:
Before installing the dowel pin, blow compressed air through the hole to assure that it is not clogged.

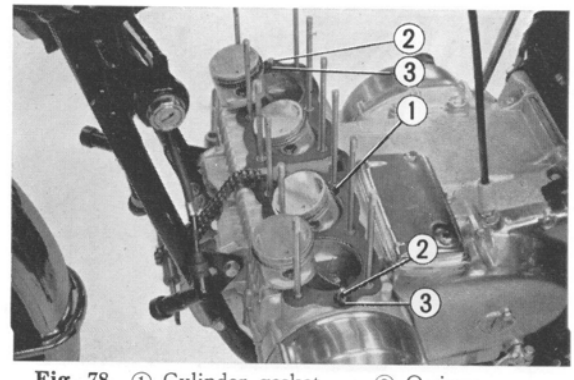


Fig. 78 ① Cylinder gasket ② Dowel pins ③ O-rings

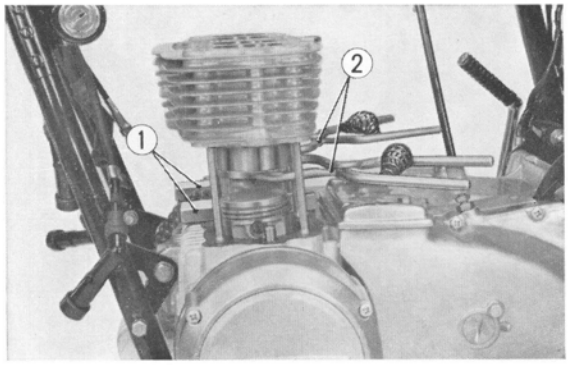


Fig. 79 ① Piston bases ② Piston ring compressors

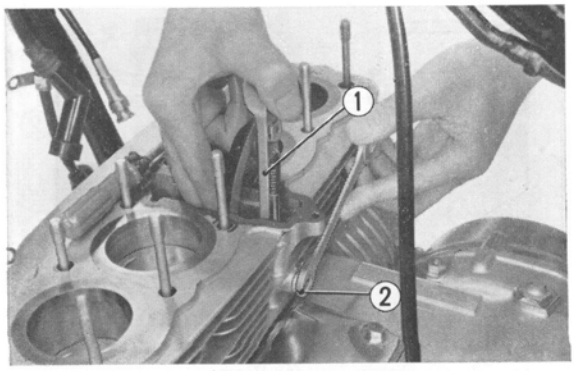


Fig. 80 ① Cam chain tensioner ② Lock nut

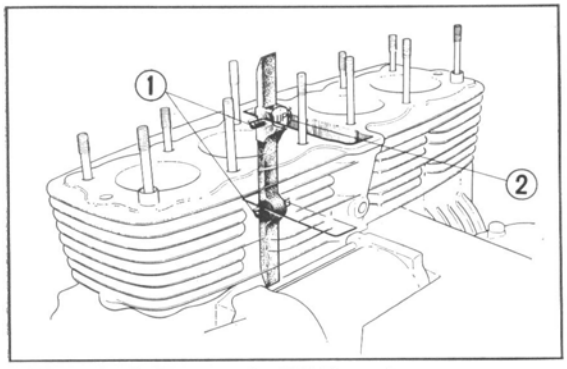


Fig. 81 ① Pins ② "UP" mark

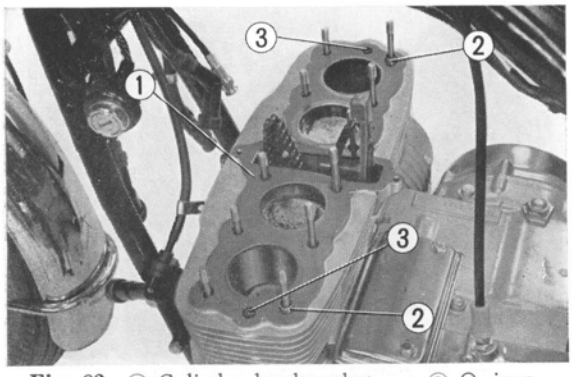


Fig. 82 ① Cylinder head gasket ③ O-rings
② Dowel pins

6. Turn the crankshaft and place the piston base (Tool No. 07958-2500000) under No. 2 and 3 pistons, and install the piston ring compressors (Tool No. 07957-3230000) on the piston rings, and insert the pistons into the cylinder. When the No. 2 and 3 pistons have entered the cylinder, remove the bases and piston ring compressors. Next turn the crankshaft slightly and install the No. 1 and 4 pistons being careful not to expose the rings of the No. 2 and 3 pistons. Raise the cam chain at the same time.
7. With the cylinder held approx. 20 mm from the crankcase, install the cam chain tensioner in the cylinder, hold the tensioner down by hand and install the O ring, steel washer, and tighten the lock nut.
8. Insert the cam chain guide into the cylinder as shown in Fig. 81.
9. Install the cylinder head gasket, two dowel pins and two O-rings on the cylinder.

10. Place the cylinder head and hold the cam chain with a screw driver to prevent cam chain from dropping.
11. Tighten the twelve 8 mm nuts uniformly with the special tool (Tool No. 07906-3230000) to a torque of **2.0~2.2 kg-m. (14.46~16.63 ft-lbs)** in the sequence shown in Fig. 83.
    Next, install and torque two 6 mm flange bolts.
    Mount the cam chain tensioner on the cylinder head with the aluminum washer and 6 mm bolt.

    Note:
    Exercise care not to drop nuts or washers into the cylinder head as it will be difficult to remove them.
12. Hold the cam chain sprocket and cam chain together and slide the camshaft through them from the right side, and set it on the bearings in the cylinder head. Install the cam chain on the cam sprocket.
13. Adjustment of valve timing
    Remove the point cover, rotate the crankshaft in the clockwise direction and align the "T" (1.4) mark of the spark advancer to the timing mark. Next, position the camshaft so that the center of the cutout notch on the right end of the camshaft is aligned to the cylinder head flange surface.
14. Mount the cam sprocket on the camshaft with two 7 mm bolts.
15. Mount the carburetor assembly on the cylinder head.
16. Install the two dowel pins and six sealing rubbers on the cylinder head.

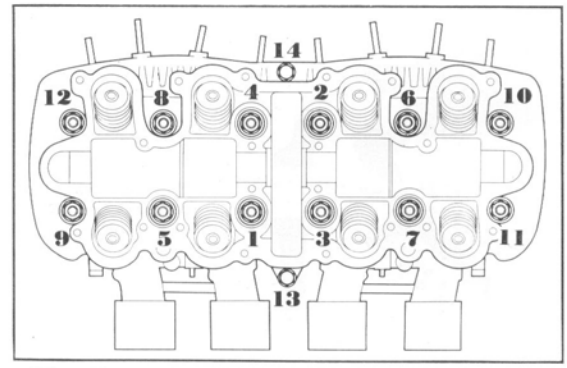


Fig. 83

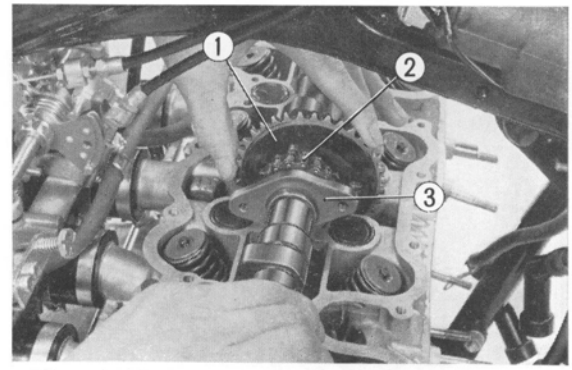


Fig. 84 ① Cam sprocket ② Cam chain ③ Camshaft

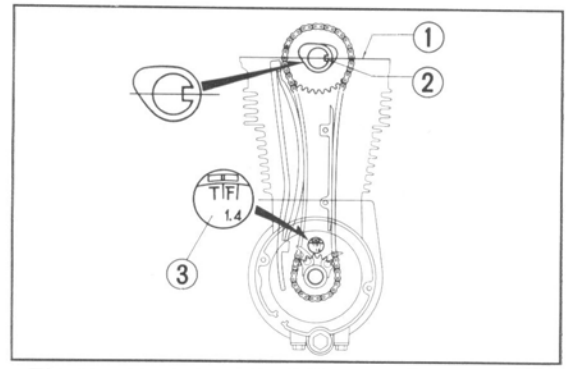


Fig. 85 ① Cylinder head flange surface ② Cutout notch ③ Spark advancer

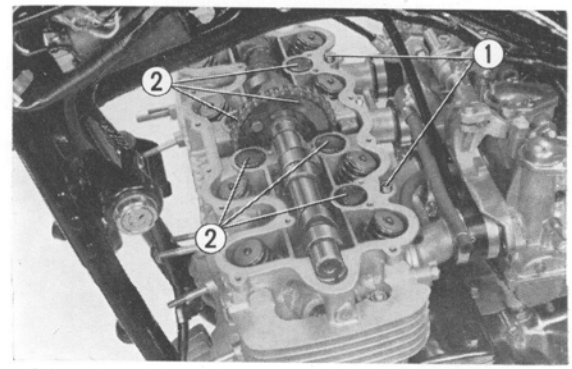


Fig. 86 ① Dowel pins ② Sealing rubbers

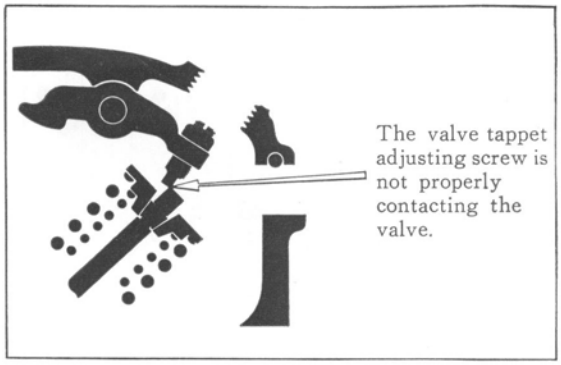


Fig. 87

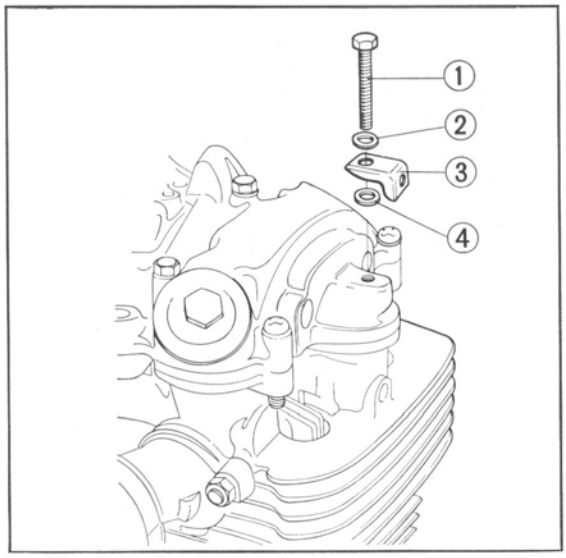


Fig. 88 ① 6 mm screw
② Chromium-plated copper washer
③ Head side cover set plate
④ Alminum washer

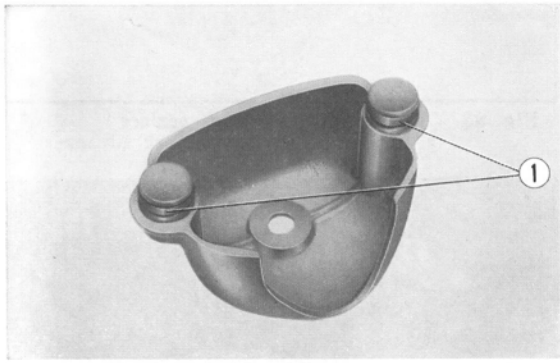


Fig. 89 ① O-ring

17. Install the cylinder head cover with twelve 6 mm screws and six 6 mm bolts, and torque to **0.8~1.2 kg-m** (**5.78~8.67 lbs-ft**) so that torque difference is not over **0.2 kg-m** (**1.44 lbs-ft**).

Note:

- **Insert fingers into the tappet hole cap opening and lift the valve tappet adjusting screw to check that they are properly meeting the valves.**
- **Use the six 6 mm copper washers as shown in Fig. 57.**
- **Install the head side cover set plate with washers mounted on both sides of the 6 mm screws (Chromium-plated copper washer on top and alminum washer on bottom).**

18. Install O-rings on the dowel pins of the the left and right side covers, and install the side covers on the cylinder head.
19. Install the breather cover with six 6 mm screws.

Note:

High tension cord clips are mounted on both sides with the clips facing forward.

20. Adjust the cam chain by referring to page 12.
21. Adjust the tappets by referring to page 7.

4. VALVES AND VALVE SPRINGS

A. Disassembly

1. Remove the cylinder head by referring to section 3. A.
2. Compress the valve springs with a valve spring compressor (Tool No. 07957-3290000), remove the valve cotters, and the valves.

Note:
Do not compress the springs more than necessary. Compressing them excessively may damage the valve stem seals.

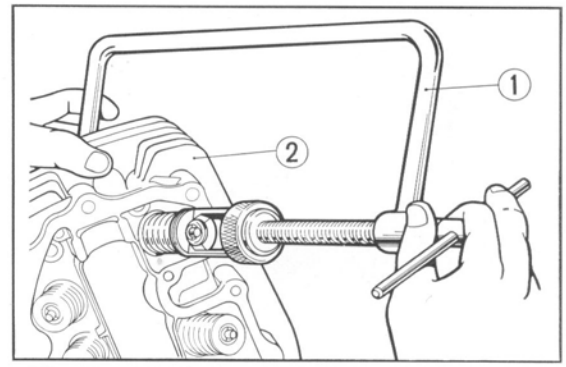


Fig. 90 ① Valve spring compressor ② Cylinder head

3. Drive the valve guide out of the cylinder head using the valve guide remover (Tool No. 07046-32301).

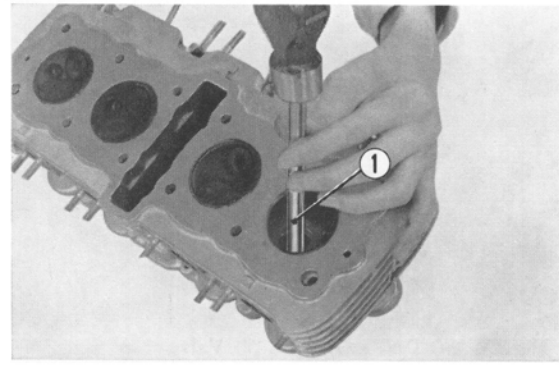


Fig. 91 ① Valve guide remover

B. Inspection

1. Measure valve stem clearance.
   Insert the valve into the guide and measure the clearance in both the X and Y directions using a dial gauge. Replace the valve and guide in set if clearance beyond the serviceable limit.
   Drive the guide into the cylinder head using a valve guide driver (Tool No. 07942-3290100) and finish ream the guide to the proper size with the reamer (Tool No. 07984-0980000). Standard valve guide inside diameter for both the inlet and exhaust is **5.475~5.485 mm (0.2153 in.~0.2157 in.)**

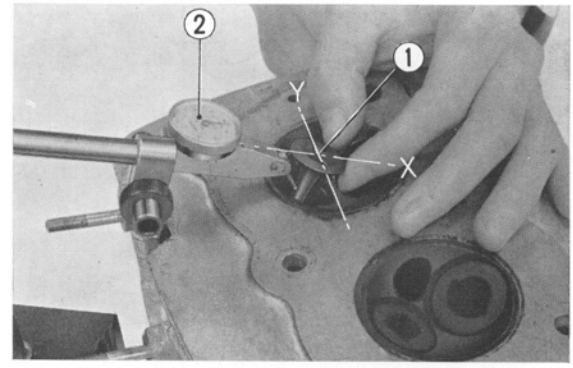


Fig. 92 ① Valve ② Dial gauge

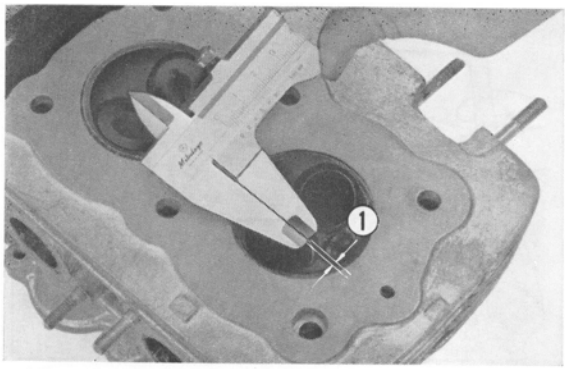


Fig. 93 ① Valve seat width

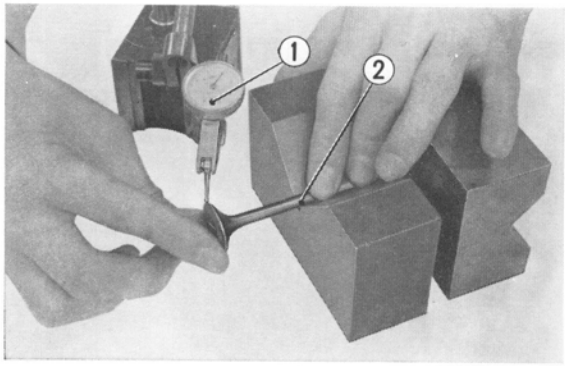


Fig. 94 ① Dial gauge ② Valve

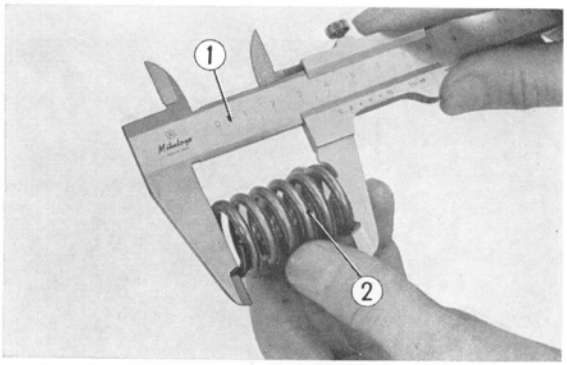


Fig. 95 ① Vernier caliper ② Valve spring

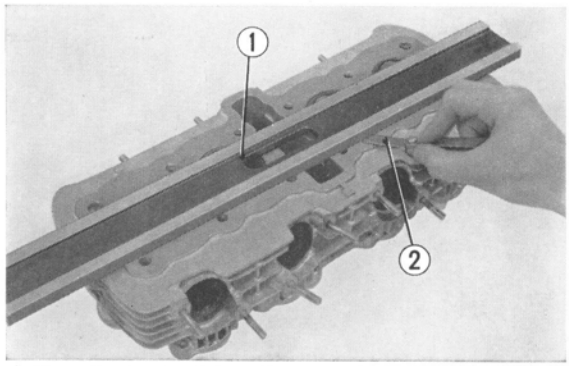


Fig. 96 ① Straight edge ② Feeler gauge

2. Check the valve seat contact width and if necessary recondition.
   Apply a thin coat of red lead to the valve seat surface. Press the valve against the seat and rotate it to check if the contact width is uniform. If not, lap the valve, seat and again check the contact width. If necessary, recondition the valve seat using a valve seat grinder. Seat width **1.0~1.5 mm (0.039~0.059 in.)**.

   Caution:
   Use the valve seat grinder in accordance with the instruction manual.
3. Measure valve runout.
   Place the valve on V-block and measure the runout of the valve with a dial gauge applied to the face of the valve while turning the valve. Replace the valve if the runout beyonds the serviceable limit.
4. Measure the valve spring.
   Measure the free length of the valve spring with a vernier caliper.
5. Measure the flatness of the cylinder head.
   Place a straight edge on the cylinder head surface and measure the clearance at several points with a feeler gauge. If there is a clearance of over the serviceable limit, lap the cylinder head surface on the surface plate using lapping compound or replace the head if it cannot be repaired.

C. Reassembly

1. Wash all of the component parts in kerosene and reassemble the parts in the reverse order of disassembly.

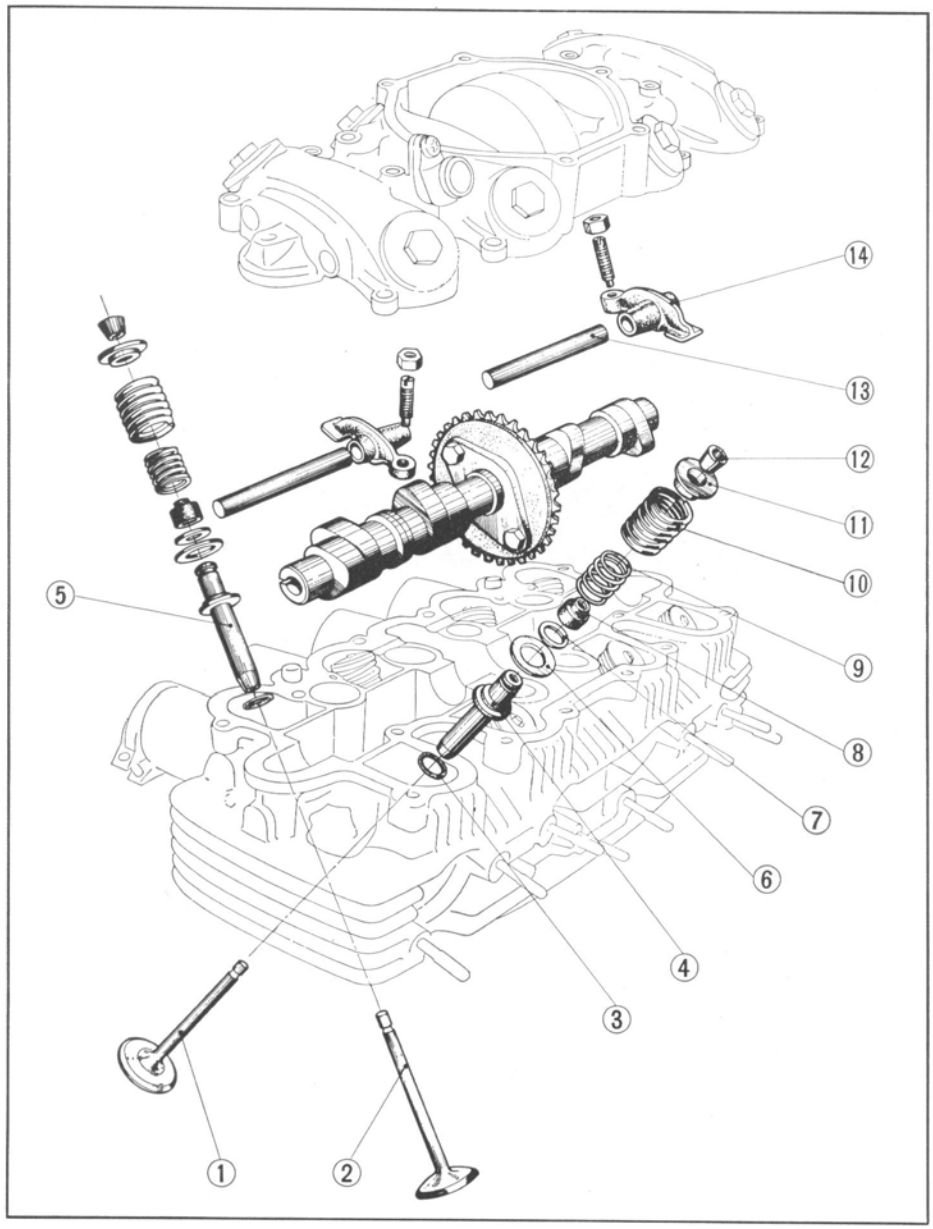


Fig. 97 Component parts of the cylinder head

① Exhaust valve
② Inlet valve
③ 10×1.6 O ring
④ Exhaust valve guide
⑤ Inlet valve guide
⑥ Valve spring outer seat
⑦ Valve spring inner seat
⑧ Valve stem seal
⑨ Inner valve spring
⑩ Outer valve spring
⑪ Retainer
⑫ Cotter
⑬ Valve rocker arm shaft
⑭ Valve rocker arm

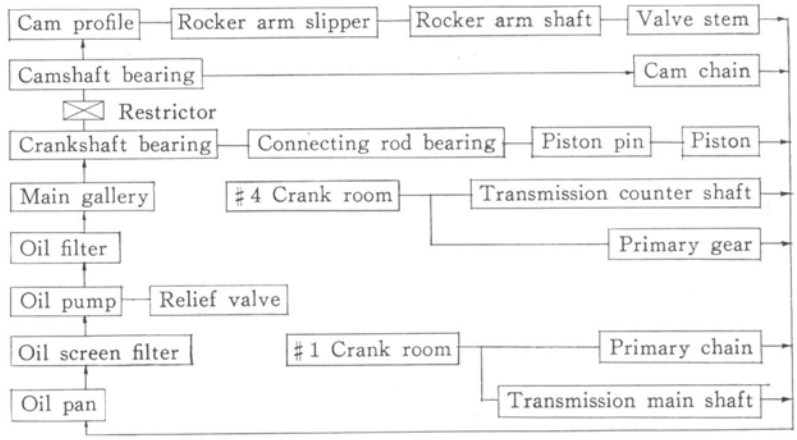
Note:
When installing the valves, apply a liberal amount of oil on the valve stem.

2. Install the cylinder head in accordance with section 3. C.

5. Oil Pump and Oil Filter

The oil pump is a trochoid type driven by the primary shaft. Screen and paper element filters are used to provide clean oil to the engine.

Lubricating System Block Diagram



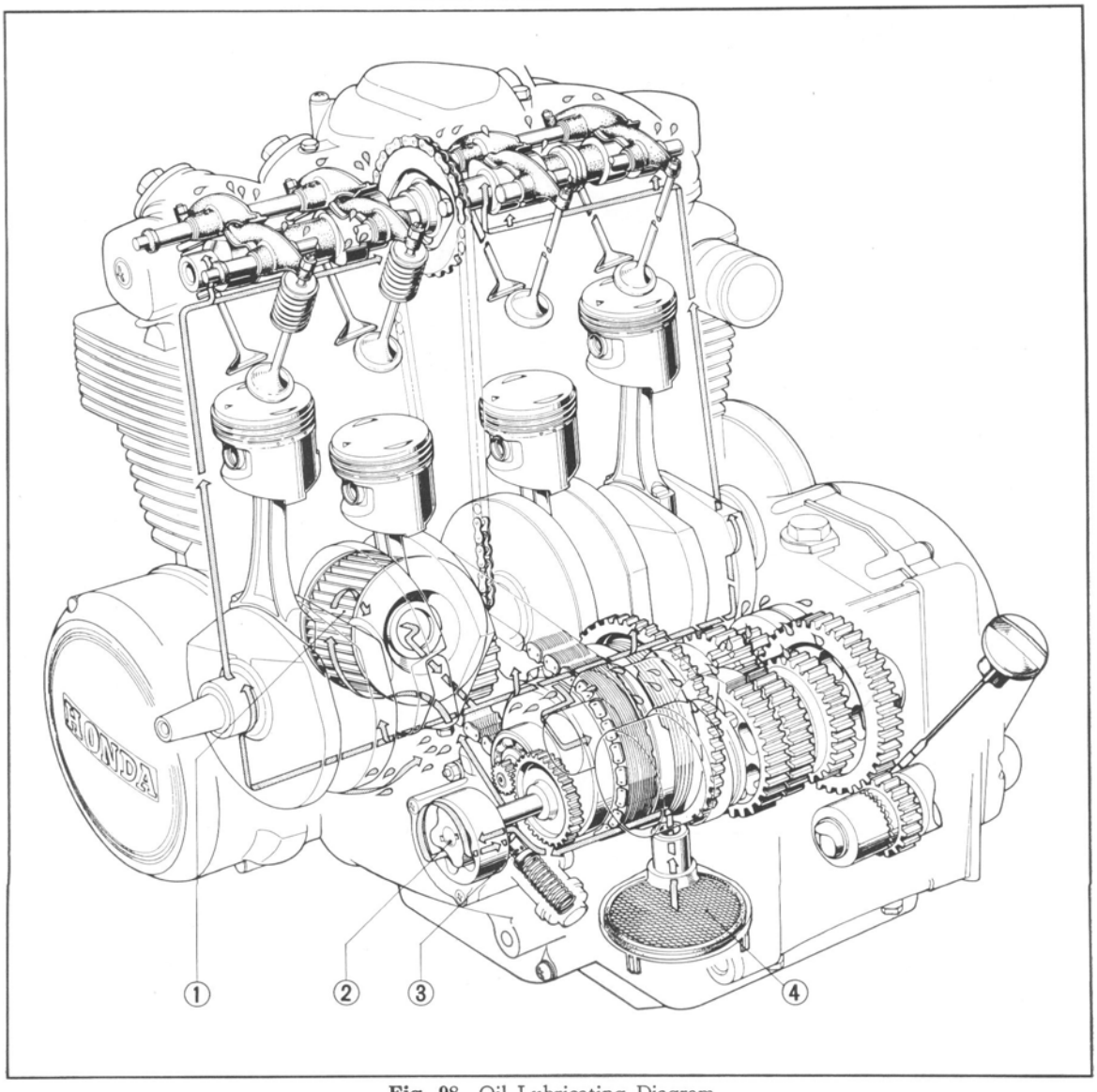


Fig. 98 Oil Lubricating Diagram
① Oil cleaner element ② Oil pump ③ Relief valve ④ Oil screen filter

A. Disassembly

Oil Pump

1. Drain the engine oil in accordance with section 2. A.
2. Remove the starting motor cover and the left crankcase cover.
3. Unscrew the 4 mm bolt and remove the pressure switch wiring. Next remove three 6 mm screws, and the oil pump.

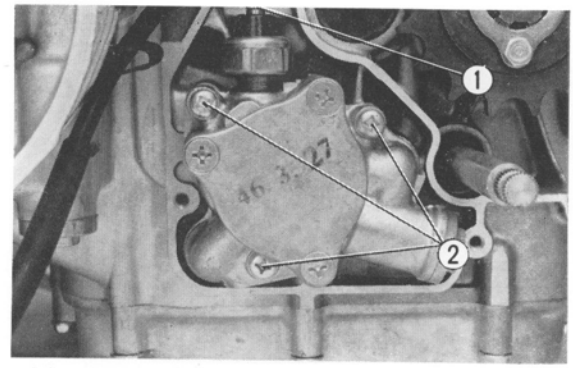


Fig. 99 ① 4 mm bolt
② 6 mm screws

4. Remove the cap and disassemble the relief valve and spring.

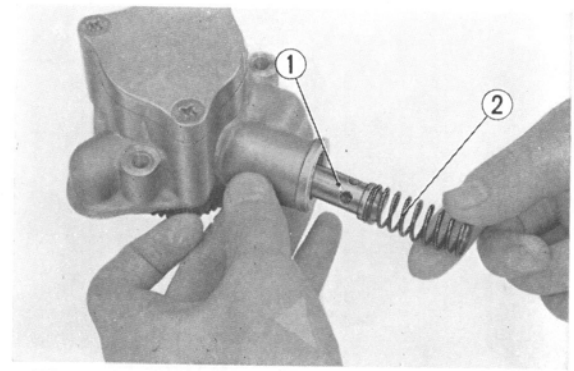


Fig. 100 ① Relief valve ② Spring

Oil Screen Filter

1. Drain the engine oil in accordance with section 2. A.
2. Unscrew ten 6 mm bolts from the oil pan. Remove the oil pan, and the oil screen filter can be removed.

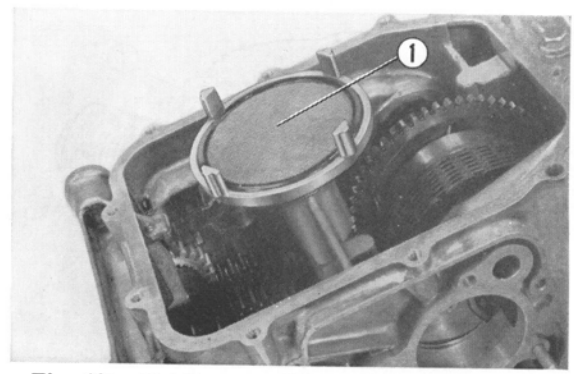


Fig. 101 ① Oil screen filter

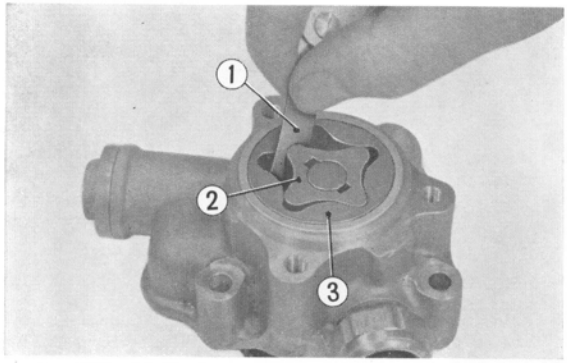


Fig. 102 ① Feeler gauge ③ Outer rotor
② Inner rotor

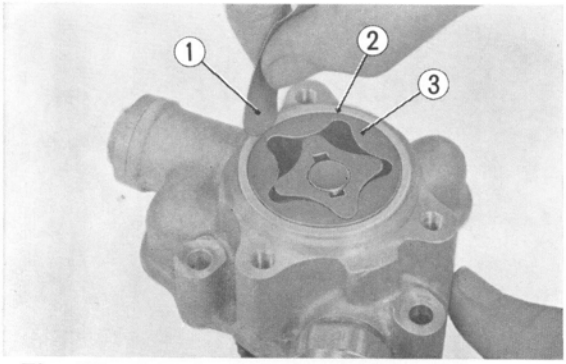


Fig. 103 ① Feeler gauge ③ Outer rotor
② Pump body

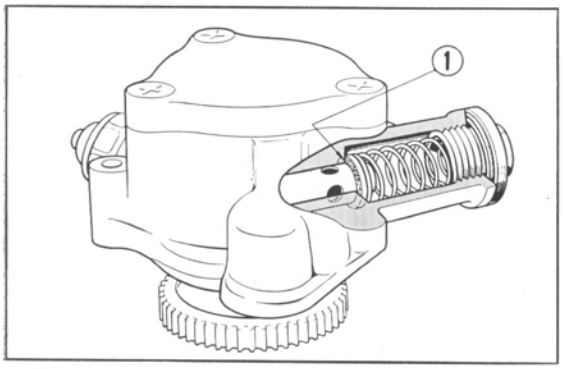


Fig. 104 ① Relief valve seat

Oil Filter

1. Drain the engine oil in accordance with section 2. A.
2. Unscrew the center bolt to remove the oil filter.

B. Inspection

1. Measure the clearance between the inner and outer rotors.
   Use a feeler gauge to measure the clearance between the rotors. If the clearance beyonds the serviceable limit, replace the pump.
2. Measure the clearance between the outer rotor and the pump body.
   Use a feeler gauge to measure the clearance between the outer rotor and the pump body. If the clearance beyonds the serviceable limit, replace the pump.
3. Inspect the operation of the relief valve.
   Make sure that the relief valve is not stuck in the pump body. Also check for any foreign objects which may be lodged between the valve and seat.
4. Inspect the screen filter
   Wash and inspect the screen filter. Replace the filter if damaged.

C. Reassembly

Oil Filter

1. Insert the oil filter center bolt through the oil filter case and assemble the spring, spring seat and element. Screw the center bolt into the engine.

Oil Screen Filter

1. Mount the screen filter on the lower crankcase.
2. Mount the oil pan on the engine with ten 6 mm bolts.

Oil Pump

1. Insert the drive pump shaft into the oil pump body and install the drive pin into the shaft.
2. Align the outer and inner rotor punch marks and install into the pump body (the surfaces with the punch marks may be set to the pump body side or the pump cover side).
3. Install the 47 mm O-ring on the oil pump body and install the oil pump cover with three 6 mm screws.
4. Install the relief valve and spring into the oil pump body, and install the cap.
5. Install the two O-ring collars, two 14 mm O-rings, and a 47 mm O-ring into the oil pump body and then install the oil pump on the crankcase with three 6 mm screws.
6. Connect the pressure switch wires.
7. Install the left crankcase with four 6 mm screws, and the gear change pedal.
8. Install the starting motor cover.

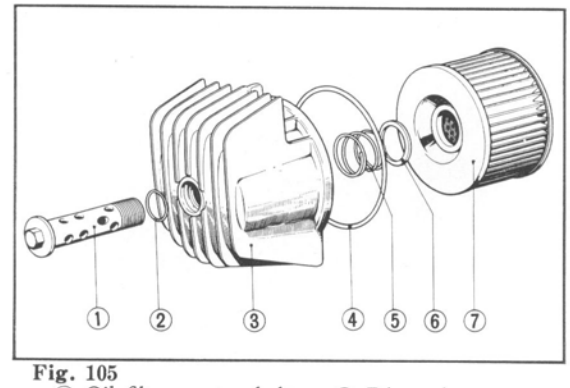


Fig. 105
① Oil filter center bolt
② 15×2.5 O-ring
③ Oil filter case
④ 89×4.5 mm O-ring
⑤ Filter element set spring
⑥ Oil filter spring seat
⑦ Oil filter element

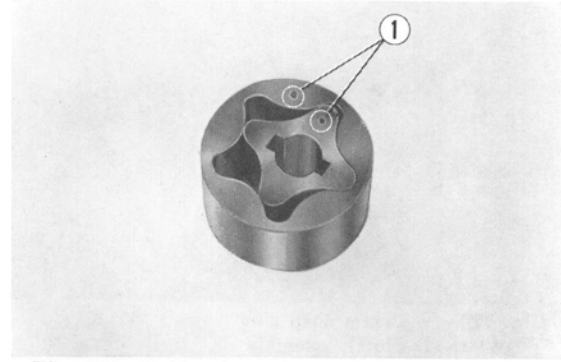


Fig. 106 ① Punch marks

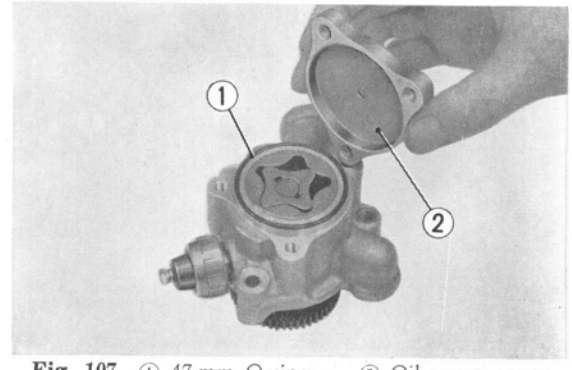


Fig. 107 ① 47 mm O-ring ② Oil pump cover

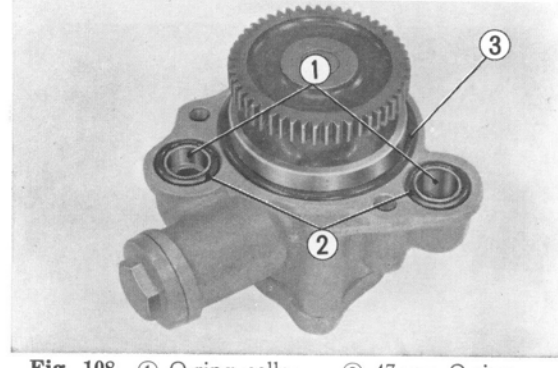


Fig. 108 ① O-ring collar ② 14 mm O-ring ③ 47 mm O-ring

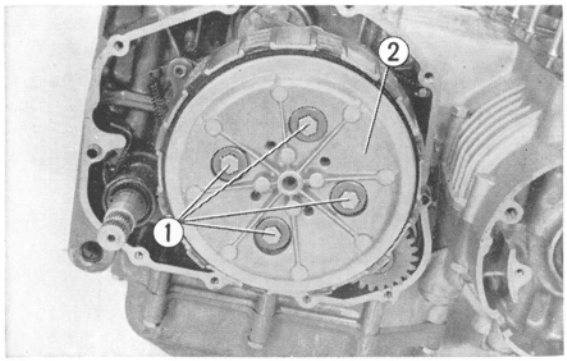


Fig. 109 ① Bolts ② Clutch pressure plate

6. CLUTCH

A. Disassembly

1. Drain the engine oil in accordance with section 2. A.
2. Remove the kick starter pedal.
3. Unscrew ten 6 mm screws and remove the R. crank case cover.
4. Unscrew the four clutch pressure plate mounting bolts, and remove the clutch pressure plate and four clutch springs.

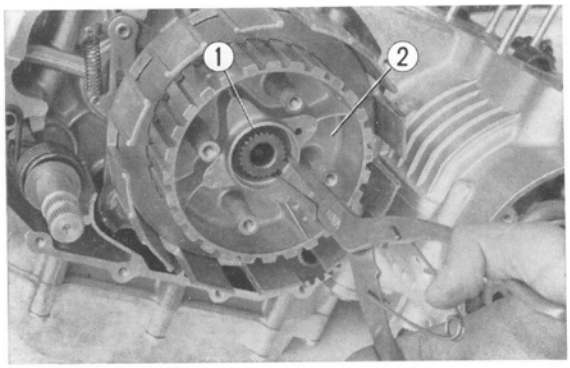


Fig. 110 ① 25 mm snap ring
② Clutch assembly

5. Remove the clutch lifter joint piece.
6. Remove the 25 mm snap ring, shims (some engine may not have shims installed), and the clutch assembly from the main shaft.

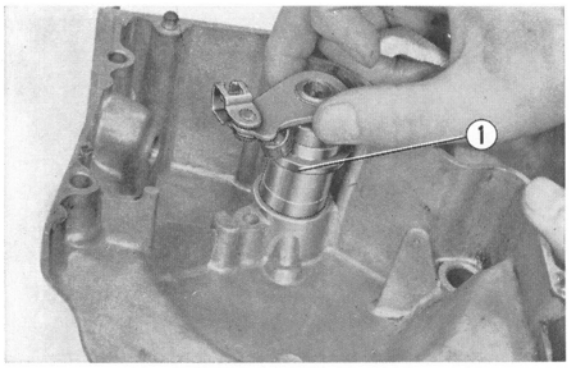


Fig. 111 ① Clutch adjuster

7. Disassemble the clutch disc, clutch plate and clutch center from the clutch outer.
8. Remove the left crankcase cover.
9. Disconnect the clutch cable from the clutch lifter.
10. Unscrew the clutch adjuster lock bolt and remove the clutch adjuster from the left crankcase cover.

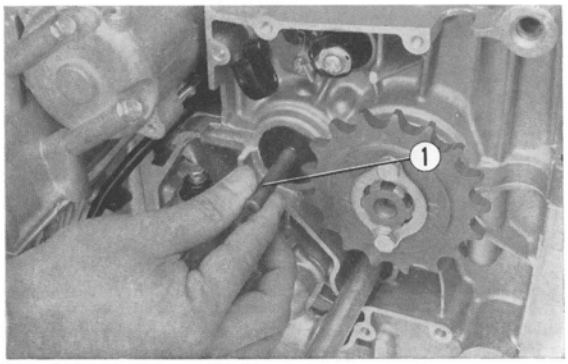


Fig. 112 ① Clut ch lifter rod

11. Pull out the clutch lifter rod.

B. Inspection

1. Measure the thickness of the friction disc. Measure the thickness with a vernier caliper and replace if beyond the serviceable limit.

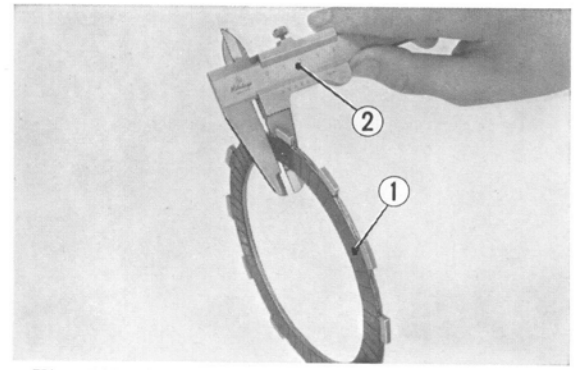


Fig. 113 ① Friction disc ② Vernier caliper

2. Check the clutch plate for warp.
   Place the clutch plate on the surface plate and measure the amount of warp using a feeler gauge. If the warp beyonds the serviceable limit, replace the clutch plate.
3. Measure the clutch spring.
   Measure the free length of the clutch spring with a vernier caliper and replace if beyond the serviceable limit.

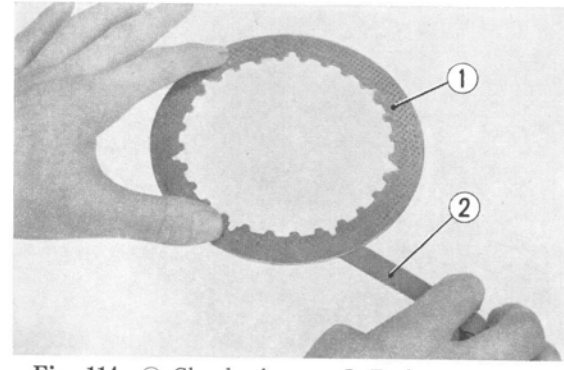


Fig. 114 ① Clutch plate ② Feeler gauge

4. Inspect the rivets mounting the clutch outer to the driven gear for looseness, and replace the clutch outer if any of rivets are loose.

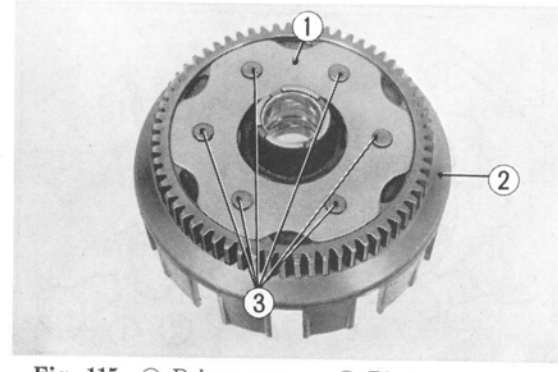


Fig. 115 ① Driven gear ② Clutch outer ③ Rivets

C. Reassembly

1. Assemble the clutch lifter rod into the main shaft so that the spherical end is toward the right side.
2. Apply grease to the clutch lifter and assemble it to the left crankcase cover together with the adjuster. Tighten the lock bolt and reconnect the clutch cable to the clutch lifter.
3. Install the clutch lifter rod, set the steel ball into the clutch lifter, and mount the left crankcase cover with four 6mm screws.

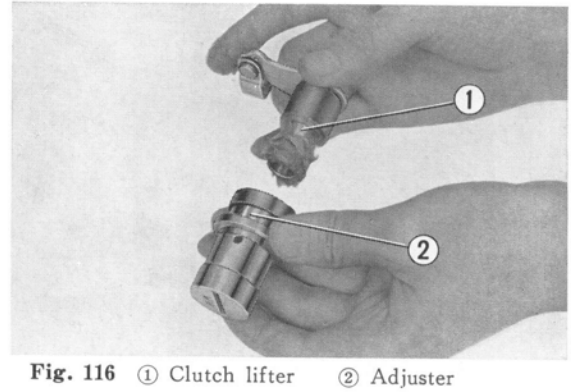


Fig. 116 ① Clutch lifter ② Adjuster

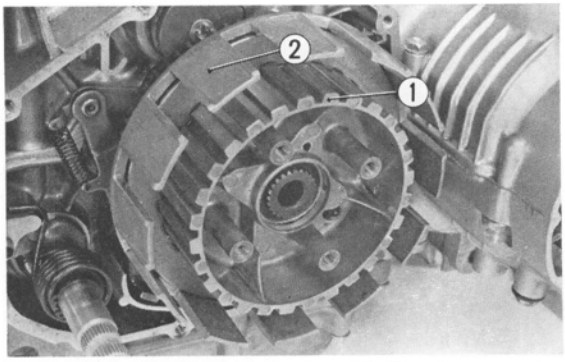


Fig. 117 ① Clutch center ② Clutch outer

4. Install the clutch outer to the mainshaft and then, install the clutch center.

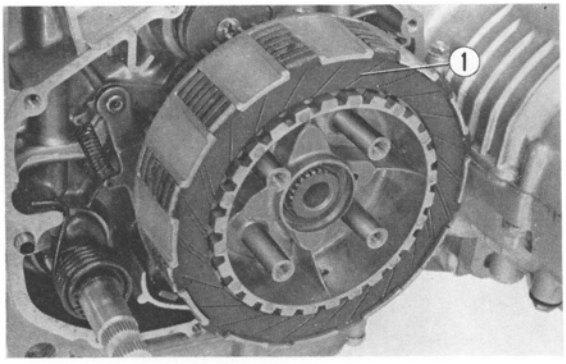


Fig. 118 ① Oil grooves

5. Apply engine oil on the friction discs (7 pcs.) and assemble them on the clutch center alternately with the clutch plates (6 pcs.), and then, assemble into the clutch outer.

Note:
When assembling the friction discs, assemble them on the clutch center so that the oil grooves are facing as per Fig. 118.

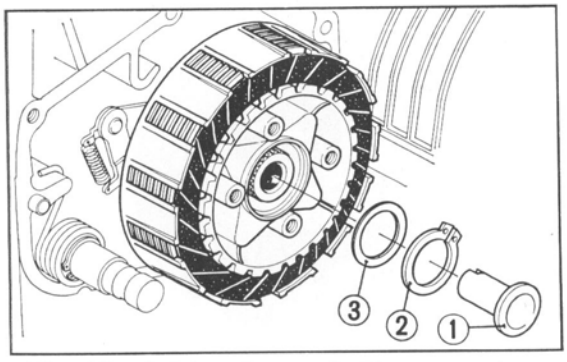


Fig. 119 ① Joint piece ② Spacer ③ 25 mm snap ring

6. After assembling the friction discs and clutch plates, set them with the snap ring. Place a dial gauge against the end of the clutch assembly to check for looseness. If the measured value of looseness is greater than **0.1 mm (0.004 in.)**, install a spacer on the inside of the snap ring. Spacer are available in the thickness of 0.1, 0.3 and 0.5 mm.

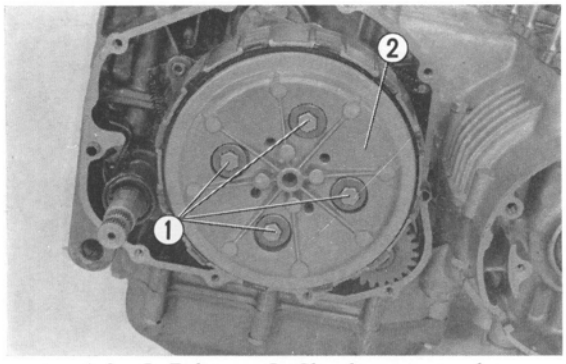


Fig. 120 ① Bolts ② Clutch pressure plate

7. Insert the clutch lifter joint piece into the mainshaft and fix the clutch plates with four pcs. each of the clutch spring, washer and 6 mm screw.
8. Install the R. crank case cover.
9. Ajast the clutch.

7. GEAR SHIFT MECHANISM

A. Disassembly

1. Disassemble the clutch in accordance with the section 6. A.
2. Remove the gear change pedal.
3. Remove the gear shift arm while holding the gear shift arm down.

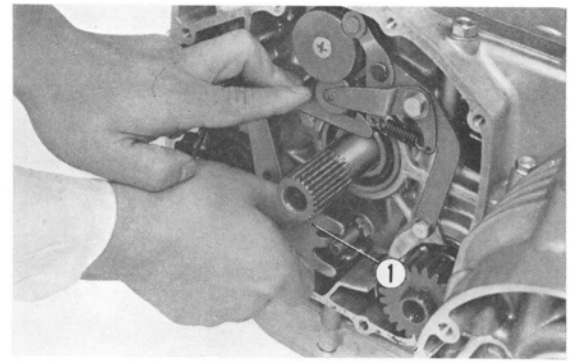


Fig. 121 ① Gear shift arm

4. Remove the shift drum stopper bolt and shift drum neutral stopper bolt, and then, remove the shift drum stopper and shift drum neutral stopper.
5. Unscrew the 6 mm screw and then, remove the oil guide plate and bearing set plate.
6. Unscrew the 6 mm screw and cam plate.
7. Disassemble the upper and lower crankcase and disassemble the transmission gears in accordance with the section 9. A.
8. Remove the neutral stopper switch from the gear shift drum.
9. Remove the shift drum guide screw from the upper crankcase and then remove the guide screw collar.

10. Remove the guide pin clip and guide pin and pull out the gear shift drum from the crankcase.

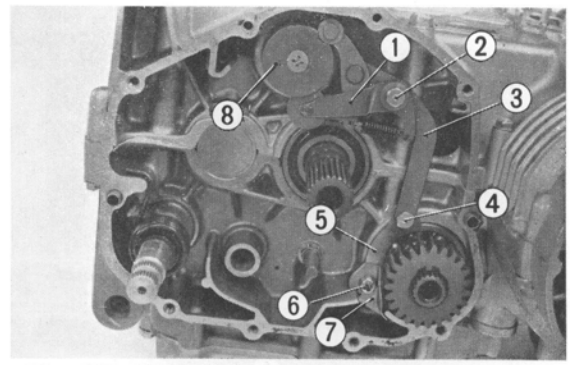


Fig. 122 ① Shift drum stopper
② Shift drum stopper bolt
③ Shift drum neutral stopper
④ Shift drum neutral stopper bolt
⑤ Bearing set plate
⑥ 6 mm screw
⑦ Oil guide plate
⑧ Cam plate

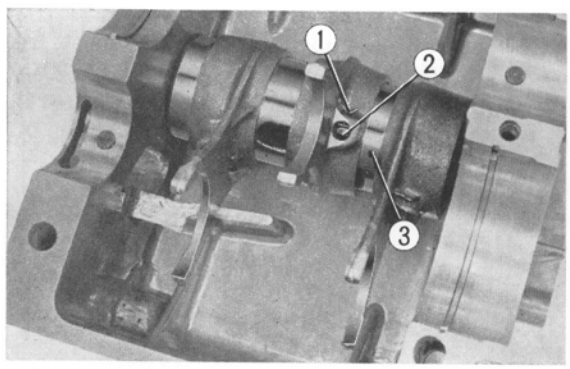


Fig. 124 ① Guide pin clip ③ Gear shift drum
② Guide pin

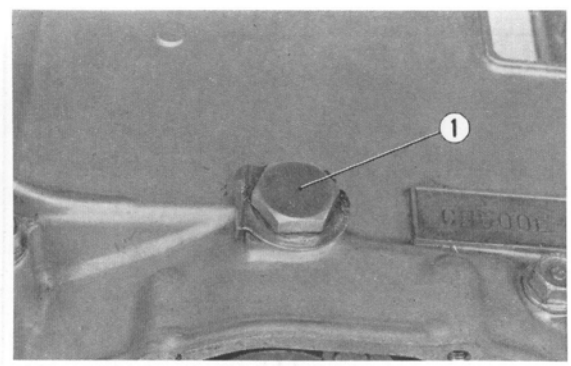


Fig. 123 ① Shift drum guide screw

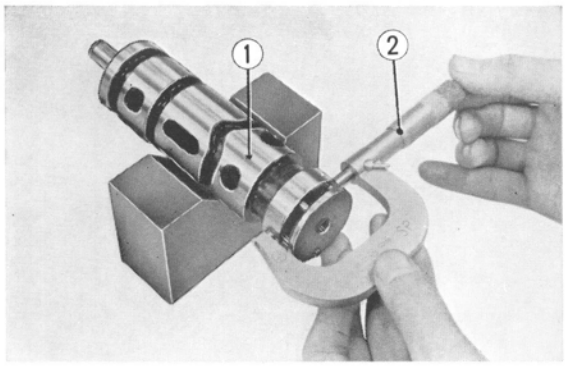


Fig. 125 ① Gear shift drum ② Micrometer

B. Inspection

1. Measure the diameter of the gear shift drum with a micrometer and the shift fork with an inside micrometer. Replace any part which exceeds the serviceable limit.

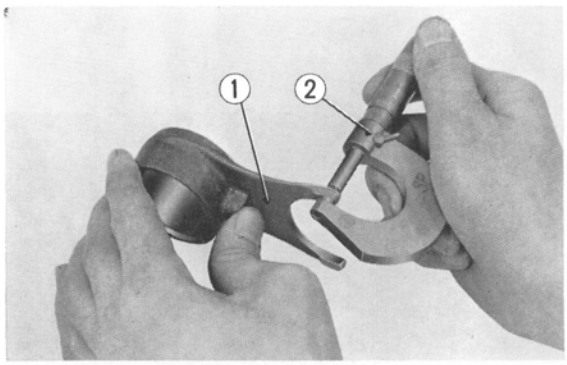


Fig. 126 ① Gear shift fork ② Micrometer

2. Measure the width of the gear shift fork fingers with a micrometer.
Replace if beyond serviceable limit.

C. Reassembly

1. Set the left, right and center gear shift forks into the upper crankcase as shown in Fig. 126, then install the gear shift drum.

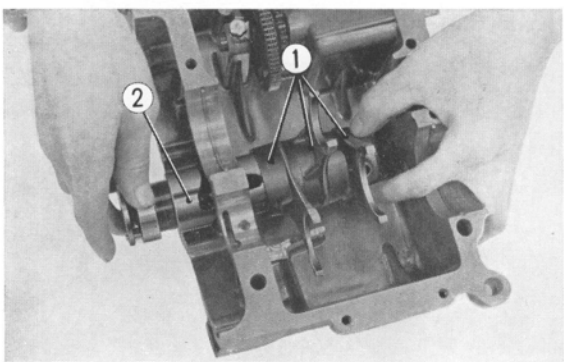


Fig. 127 ① Gear shift forks ② Gear shift drum

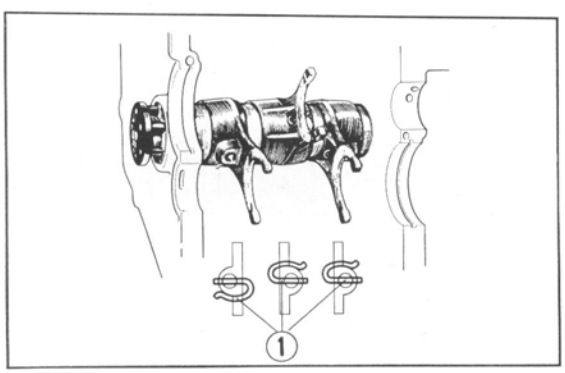


Fig. 128 ① Guide pin clips

2. Insert the guide pin into the shift fork and fix it with the guide pin clip.

Note:
Make sure that the guide pin clip is installed in the proper direction.

3. Place the counterbored section of the shift drum as shown Fig. 128, and install the steel ball, the spring cap, and the spring then lock with the shift drum screw.
   Next, bend up the tab on the guide screw lock washer to lock the guide screw.

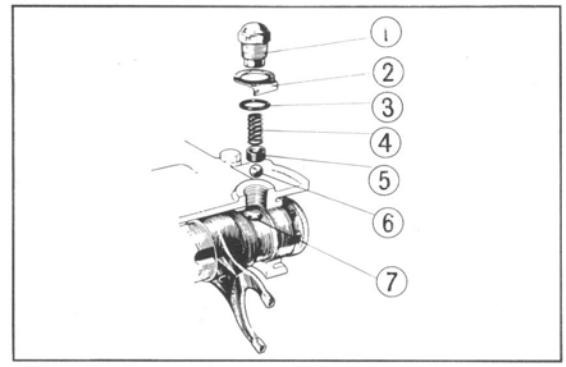


Fig. 129 ① Guide screw ② Guide screw lock washer ③ O-ring ④ Spring ⑤ Spring cap ⑥ Steel ball ⑦ Counterbored section

4. Align the neutral switch to the groove in the gear shift drum and lock in place with the 6 mm screw.

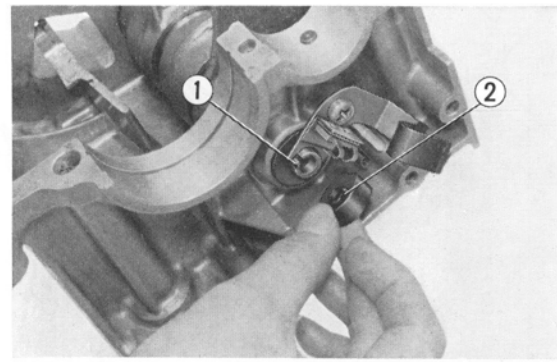


Fig. 130 ① Gear shift drum ② Neutral switch

5. Assemble the transmission into the upper crankcase in accordance with section 10. C, and assemble the upper and lower crankcase.
6. Install the cam plate on the pin of the gear shift drum with the 6 mm flat head screw which has been coated with thread lock cement.

Note:
The pin and the pin hole in the cam plate must be aligned.

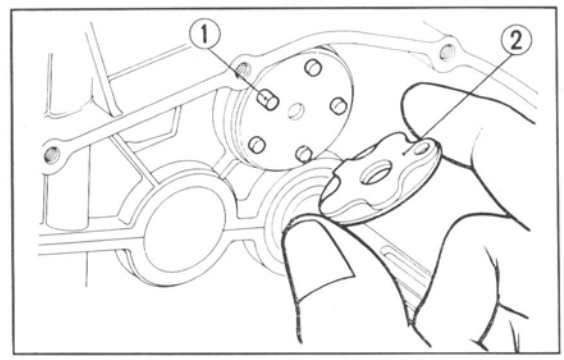


Fig. 131 ① Pin ② Cam plate

7. Attach the shift drum stopper spring to the drum stopper and to the drum neutral stopper as shown in Fig. 132, then tighten the drum stop bolt and neutral stop bolt. Also tighten the bearing set plate together.
8. Tighten the oil guide plate. After tightening, rotate the shift drum and check to be sure that each component part operates smoothly.

Note:
Check if the guide plate comes in contact with the primary drive gear.

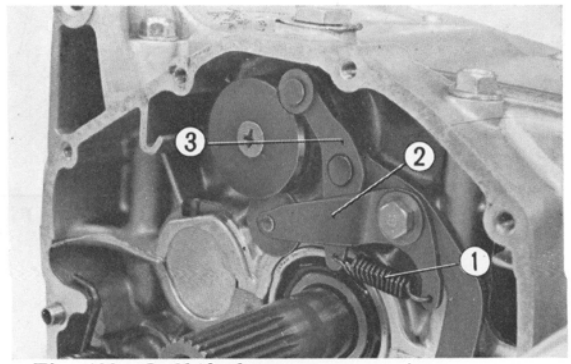


Fig. 132 *① Shift drum stopper spring ② Shift drum stopper ③ Shift drum neutral stopper*

9. Install the gear shift arm and make sure that it operates smoothly in both direction.
10. Install the clutch in accordance with section 6. C.

8. CAM CHAIN TENSIONER

The cam chain tensioner is constructed of spring steel on which a layer of heat resistant rubber is vulcanized and a sheet of teflon cemented. It applies pressure against the cam chain and absorbs the shocks produced by the chain. The cam chain guide on the tension side of the cam chain also controls chain vibration.
An adjustment screw is located at the rear of the cylinder block.

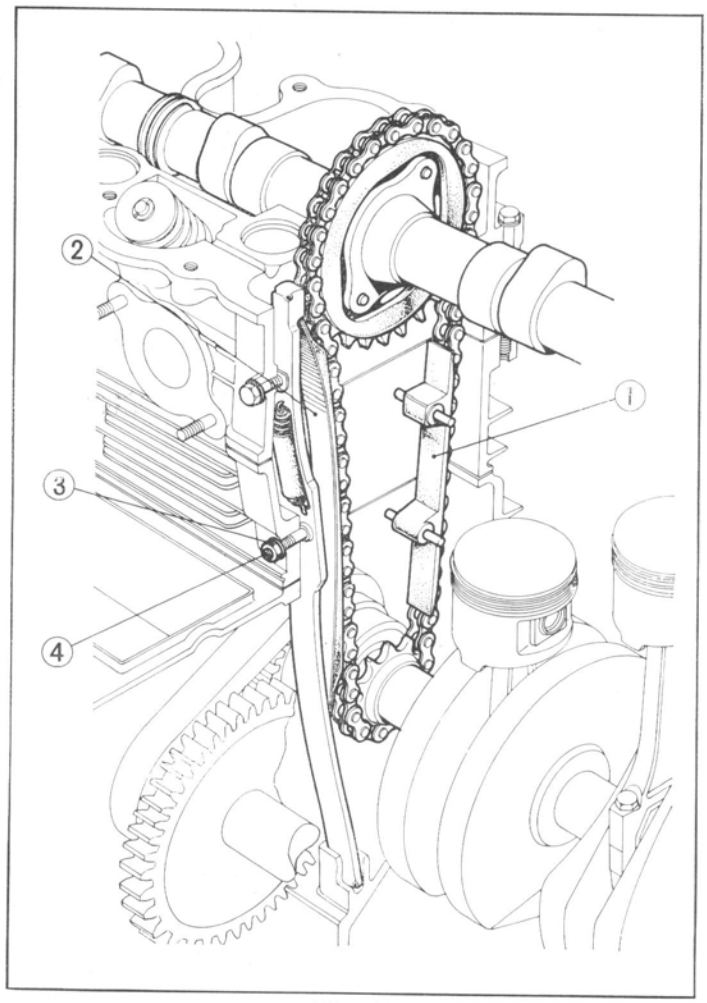


Fig. 133

① Cam chain guide
② Cam chain tensioner
③ Lock nut
④ Screw

A. Disassembly

1. Remove the cam chain tensioner and the chain guide in accordance with section 3. A.

B. Inspection

1. Make sure that the gear of the cam chain tensioner adjuster is properly meshed with the rack, and inspect for smooth operation.
   To adjust the cam chain, see page 13.

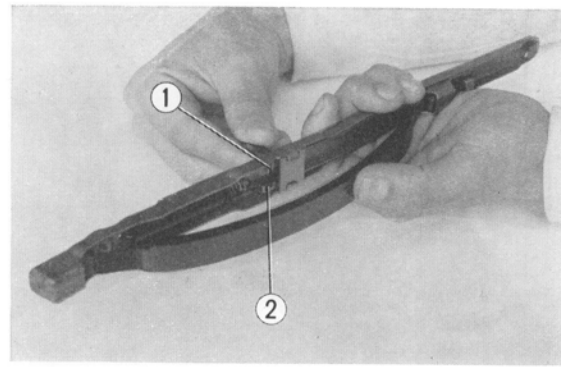


Fig. 134 ① Gear ② Rack

C. Reassembly

1. Perform reassembly in accordance with section 3. C.

9. CRANKSHAFT AND CONNECTING ROD

A. Disassembly

1. Dismount the engine in accordance with section 2. A.
2. Disassemble the cylinder head, cylinder, and piston in accordance with section 3. A.
3. Remove the generator cover and remove the rotor using a generator rotor puller. (Tool No. 07933-2160000)
4. Remove the point cover, and the special washer by removing the 6 mm bolt. Next, unscrew the three 5 mm screws and remove the contact breaker assembly and the spark advancer.

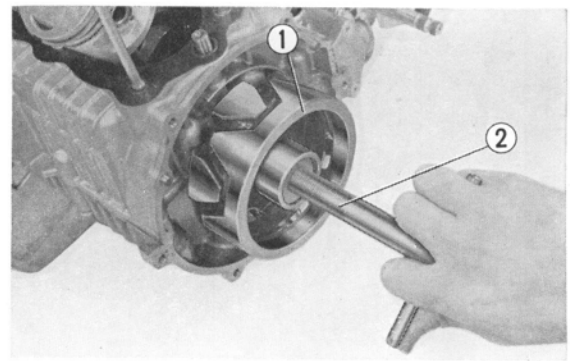


Fig. 135 ① Generator rotor
② Generator rotor puller

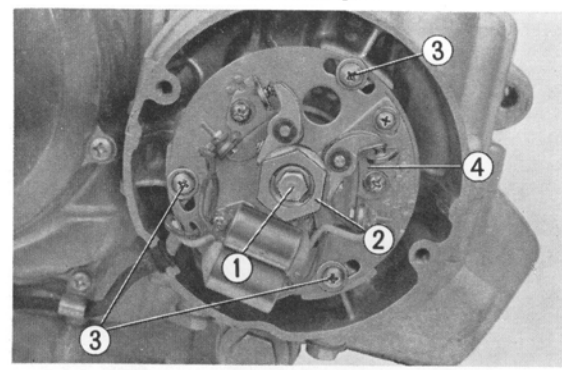


Fig. 136 ① 6 mm bolt
② Special washer
③ 5 mm screws
④ Contact breaker assembly

5. Remove the clutch and the gear shift arm in accordance with section 6. A.
6. Remove the starting motor cover, and dismount the starting motor.

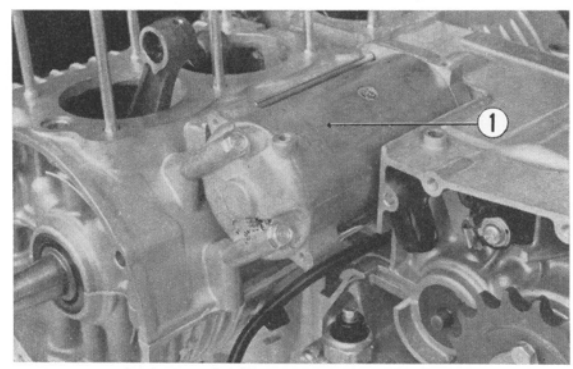


Fig. 137 ① Starting motor

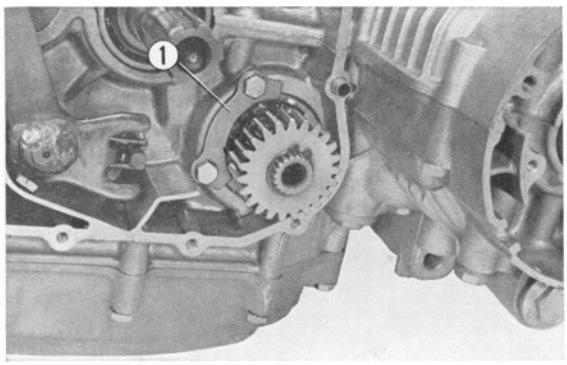


Fig. 138 ① Bearing set plate

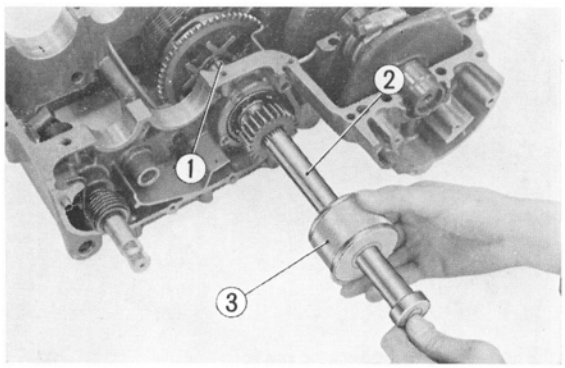


Fig. 139 ① Primary shaft ② Primary shaft puller ③ Weight hammer

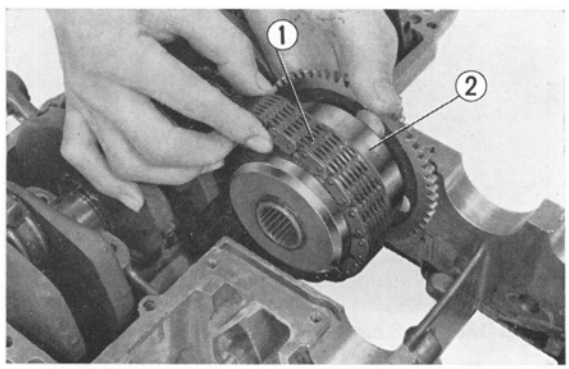


Fig. 140 ① Primary chain ② Starting clutch

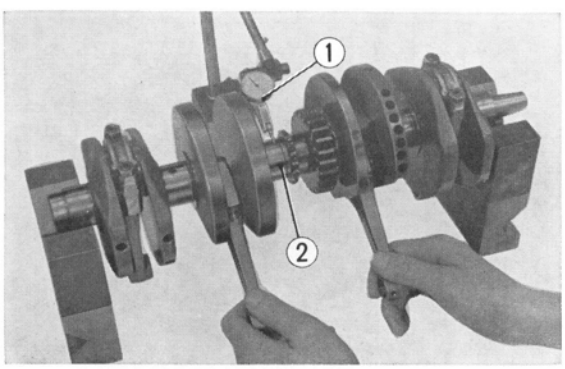


Fig. 141 ① Dial gauge ② Crankshaft

7. Place the engine upside down and unscrew the ten 6 mm bolts to remove the oil pan.
8. Unscrew ten 8 mm bolts and twelve 6 mm bolts from the lower crankcase. Loosen the 8 mm bolts in the reverse order shown in Fig. 151.
9. Then, put the engine in correct position and unscrew three each 8 mm and 6 mm bolts. Tap the upper crankcase lightly with a wooden hammer and separate the upper and lower crankcases.
10. Unscrew two 6 mm bolts and remove the bearing set plate.
11. Pull out the primary shaft using a primary shaft hammer (Tool No. 07936-3230100) and weight hammer (Tool. No. 07936-3230200). On the model CB 550, use a primary shaft hammer (Tool No. 07936-3740100) and weight hammer (Tool No. 07945-3000500).

Note:

Disassembly of the primary shaft, transmission, and kick starter can be performed without removing the cylinder head, cylinder or piston. When removing lower crankcase, follow the sequence 10, 11, 9 and 8 above.

12. Remove the starting clutch from the primary chain.
13. Remove the primary chain and the cam chain from the crankshaft.

B. Inspection

1. Measure crankshaft runout

Support both ends of the crankshaft on V-block and measure the amount of bend in the crankshaft by applying a dial gauge to the center journal and rotating the crankshaft. If the runout beyonds the serviceable limit on the dial gauge, the crankshaft should be replaced.

2. Inspect the crankshaft journals for scoring and uneven wear with a micrometer. If any journal is out-of-round or tapered more than serviceable limit, the crankshaft should be replaced.

3. Measure the crankshaft journal wear.
   Cut a length of plasti gauge to the width of the bearing cap. Place the gauge on the bearing parallel to the crankshaft, assemble the crankshaft and torque down the crankcase in accordance with Fig. 151.
   Disassemble the crankcase and measure the plasti gauge using the scale provided. If there is a clearance in excess of **0.08 mm (0.0031 in.)**, the bearing should be replaced.

Note:
When measuring with the plasti gauge, do not turn the crankshaft.

Selection of The Bearing

1. Remove the bearing, assemble and tighten the upper and lower crankcases. Refer to Fig. 151.
2. Measure the inside diameter of all the bearing seats in the vertical direction with a cylinder gauge and select out the corresponding alphabet from the table below.

mm (in.)

C	36.016~36.024 (1.4179~1.4182)
B	36.008~36.016 (1.4176~1.4179)
A	36.000~36.008 (1.4173~1.4176)

3. Measure the diameter of all the crankshaft journal with a micrometer and also select out the corresponding figure 1 or 2 from the table below.

1	2
32.99~33.00 (1.2987~1.2992)	32.98~32.99 (1.2983~1.2987)

4. According to the alphabet and the figure from item 2 and 3, pick out the proper bearing from A, B, C and D.

Crankshaft classification No. / Crankcase classification mark	1	2
C	B (Brown)	A (Black)
B	C (Green)	B (Brown)
A	D (Yellow)	C (Green)

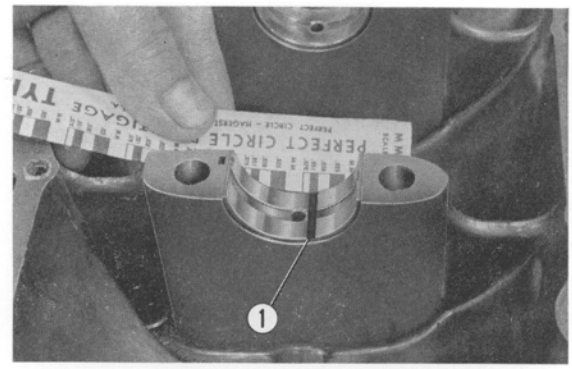


Fig. 142 ① Plasti gauge

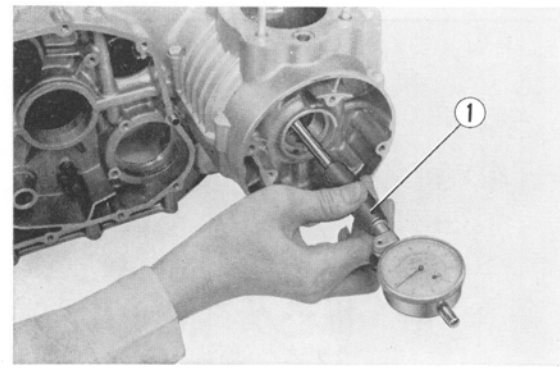


Fig. 143 ① Cylinder gauge

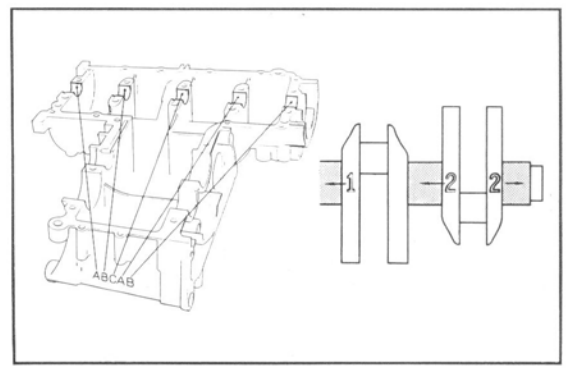


Fig. 144

Note:
The lower crankcase and crankshaft are marked with letters or number at the factory. These are production codes and should not be used or refered to during servicing or repair.

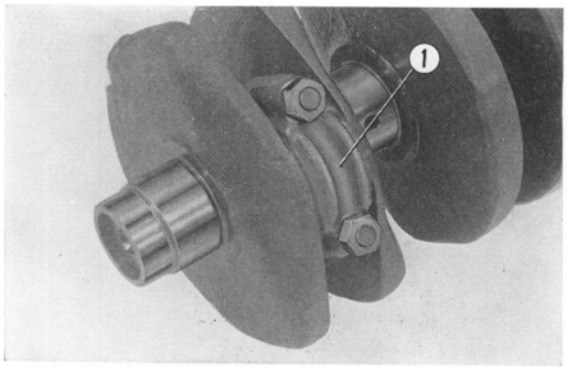


Fig. 145 ① Connecting rod cap

5. Measure connecting rod large end wear. Separate the cap from the connecting rod and after setting the plasti gauge in place, torque the two rod nuts to **2.0–2.2 kg-m (14.46–15.91 lbs-ft)**.
   Disassemble the cap and measure the plasti gauge. Replace the bearing with new one if beyond the serviceable limit.

Note:
Do not turn the crankshaft while the plasti gauge is installed.

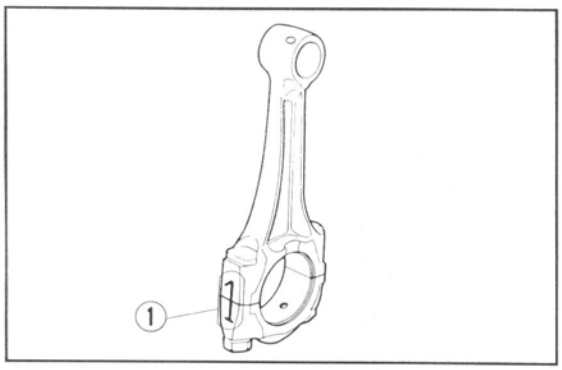


Fig. 146 ① Connecting rod code number

Selection of The Bearing

1. Measure crankshaft pin diameter with a micrometer and select out the corresponding alphabet from the table below.

A	B
34.99~35.00 (1.3775~1.3780)	34.98~34.99 (1.3771~1.3775)

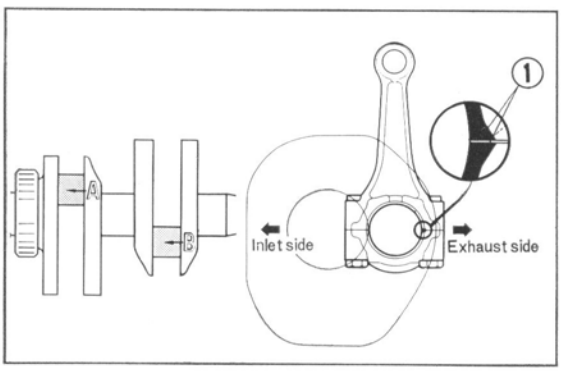


Fig. 147 ① Key (projection)

2. Select out the bearing from the table below which coincides with the number (1, 2, 3) stamped on the large end of the connecting rod.

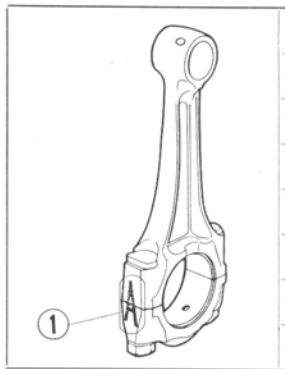
Crank pin classification mark / Connecting rod code No.	A	B
3	B (Brown)	A (Black)
2	C (Green)	B (Brown)
1	D (Yellow)	C (Green)

Note:
- **The numbers marked on the crankshaft are production codes and should not be referred to during servicing.**
- **The bearings must be installed on the connecting rod with the key toward the front.**

6. Method of designating connecting rod weight.
   When replacing connecting rod, replace with one having the same weight code. The weight code is stamped at the large end of the connecting rod. When replacing all of the connecting rods, the tolerance of the respective rods should be within 5 grams.

Note:
In the connecting rod weight, that weight of cap and two bolts are included but does not include the bearings.

7. Measure axial clearance using a feeler gauge.
   Replace if beyond the serviceable limit



Code	Weight (gr.)
A	281~285
B	286~290
C	291~295
D	296~300
E	301~305
F	306~310
G	311~315

Fig. 148 ① Weight code number

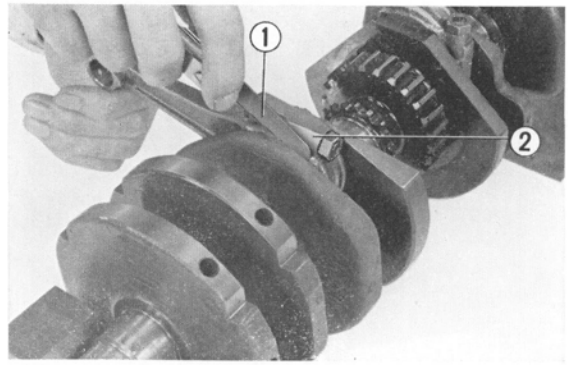


Fig. 149 ① Feeler gauge
② Connecting rod

8. Measure the connecting rod small end.
   Measure the diameter of the connecting rod small end with an inside dial gauge. Replace if beyond serviceable limit.

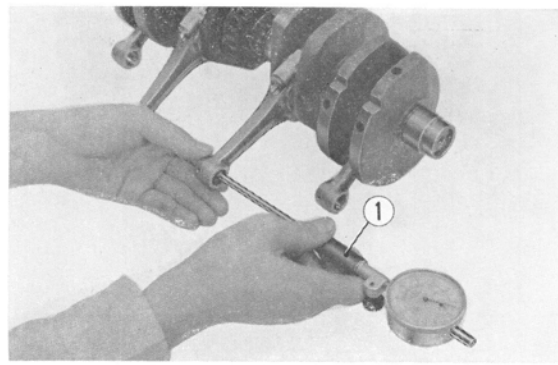


Fig. 150 ① Inside dial gauge

C. Reassembly

1. Install the primary chain and cam chain on the crankshaft.
2. Install the crankshaft into the lower crankcase.
3. Position the starting clutch and starter gear as in Fig. 150, then drive the primary shaft in from the right to left. Exercise care in the needle bearing assembly sequence shown in Fig. 165.

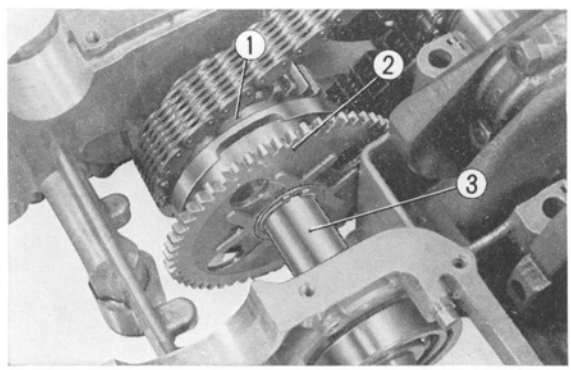


Fig. 151 ① Starting clutch
② Starter gear ③ Primary shaft

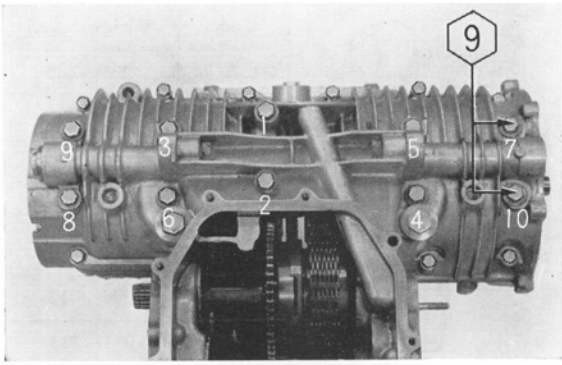


Fig. 152 8 mm mounting bolts

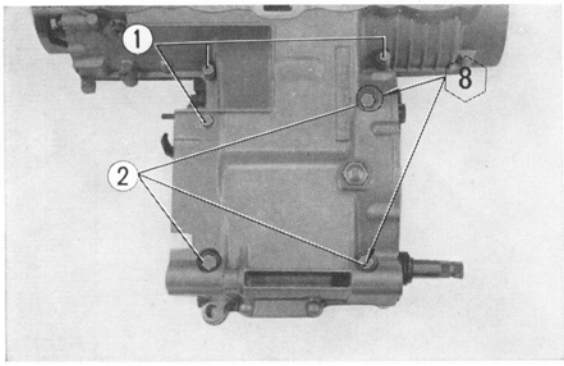


Fig. 154 ① 6 mm bolts
② 8 mm bolts

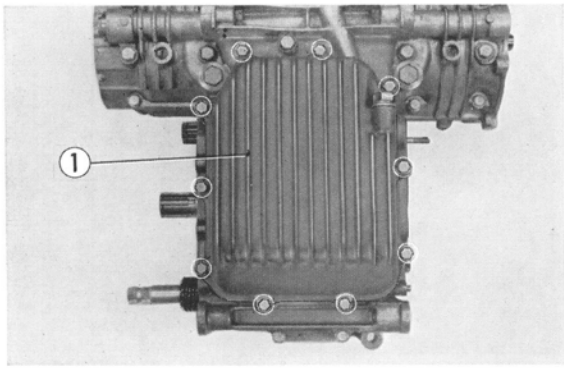


Fig. 155 ① Oil pan

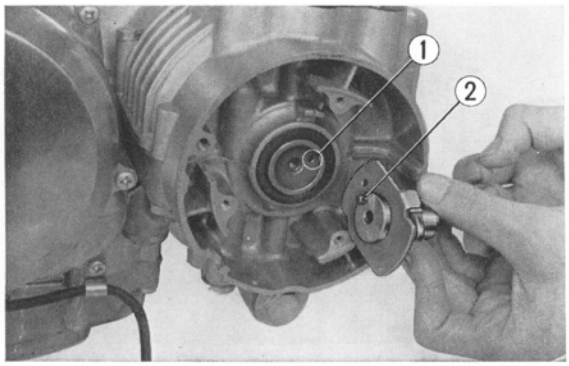


Fig. 156 ① Dowel pin hole ② Dowel pin

4. Install the bearing set plate with two 6 mm bolts.
5. Apply a thin coat of gasket paste on the mounting flange of the lower crankcase (heavy coat will cause the paste to fall inside the crankcase).
   Install two dowel pins, mount the upper crankcase on the lower crankcase.

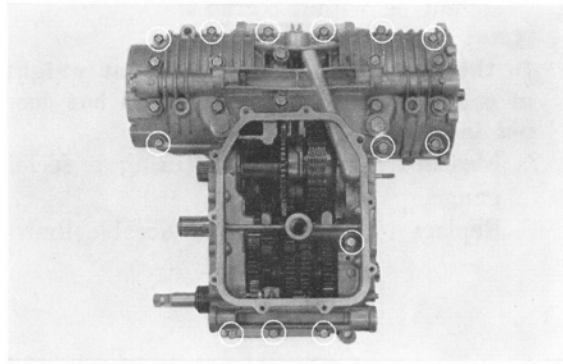


Fig. 153 6 mm mounting bolts

6. Place the engine upside down so as not to separate the parting surfaces by holding them by hands and install the ten 8 mm bolts. Torque the 8 mm bolts in the sequence shown in Fig. 151 to a torque of **2.3–2.5 kg-m**. (**16.63–18.08 lbs-ft**).
   Next, tighten thirteen 6 mm bolts. (Fig. 152)

Note:
Note position of the two 8 mm bolts which are stamped on the bolt head with numeral "9".

7. Position the upper crankcase on top and install with three each, 6 mm and 8 mm bolts. (Fig. 153)

Note:
Note position of the two 8 mm bolts which are stamped on the bolt head with numeral "8".

8. Install the oil screen filter and mount the oil pan with ten 6 mm bolts.
9. Mount the starting motor with two 6 mm screws.
10. Install the gear shift arm in accordance with section 7. C.
11. Install the clutch in accordance with section 6. C.
12. Insert the spark advancer dowel pin into the pin hole in the crankshaft, and then mount the contact breaker with three 5 mm screws.

13. Install the special advancer washer with the 6 mm bolt, and install the point cover.
14. Mount the generator rotor with the 10 mm bolt.
15. Install the generator cover.
15. Assemble the piston, cylinder, cylinder head, and head cover in accordance with section 3. C.

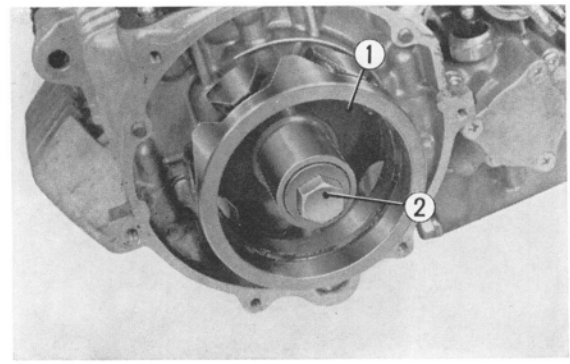


Fig. 157 ① Generator rotor
② 10 mm bolt

10. TRANSMISSION, KICK STARTER AND PRIMARY SHAFT

A. Disassembly

1. Dismount the engine from the frame in accordance with section 2. A.
2. Remove the clutch in accordance with section 6. A.
3. Separate the upper and lower crankcase in accordance with section 9. A.
4. Remove the transmission and disassemble the gears from the respective shafts.

Kick Starter

5. Remove the 18mm snap ring and the return spring.
6. Remove the 12 mm snap ring and disassemble the kick starter shaft from the lower crankcase.

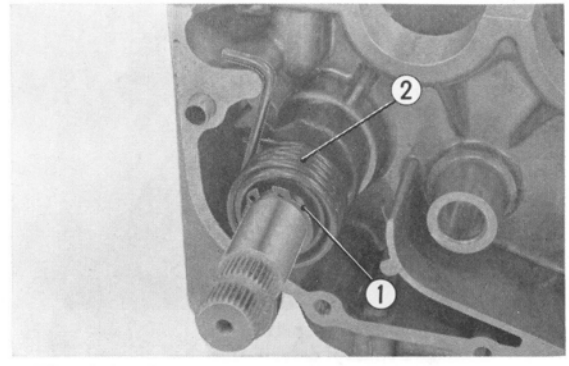


Fig. 158 ① 18 mm snap ring
② Return spring

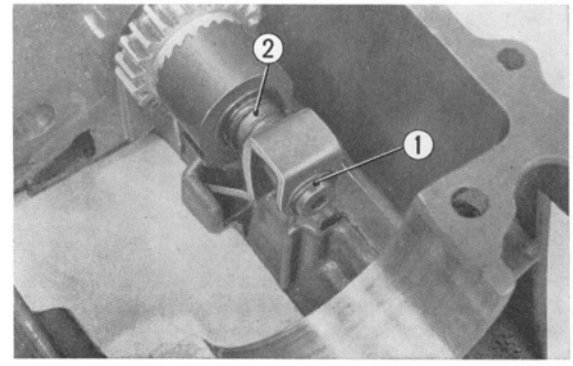


Fig. 159 ① 12 mm snap ring ② Kick starter shaft

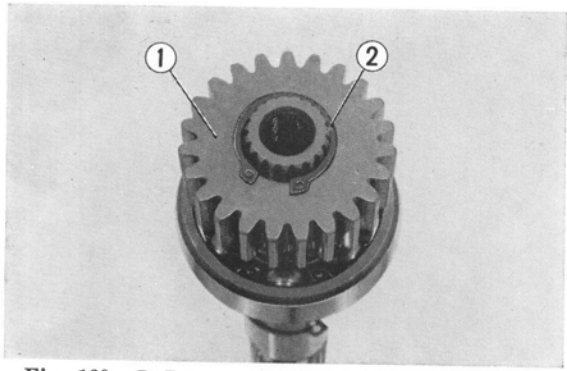


Fig. 160 ① Primary drive gear ② 20 mm snap ring

Primary Shaft

7. Remove the primary shaft in accordance with section 9. A, and remove the 20 mm snap ring and primary drive gear.

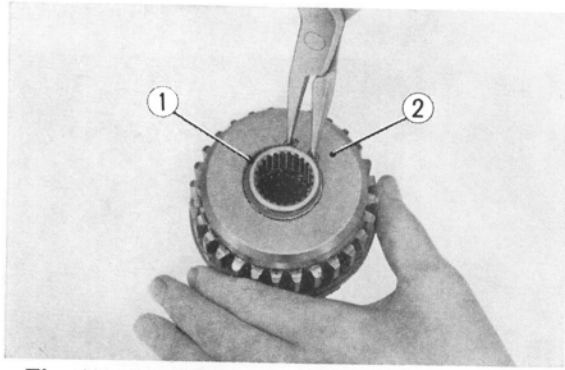


Fig. 161 ① 30 mm snap ring
② Primary driven sprocket

8. Remove the side collar and pull out the #6205 ball bearing.
9. Remove the 30 mm snap ring, primary driven sprocket, starting clutch, and pull out the damper rubbers.

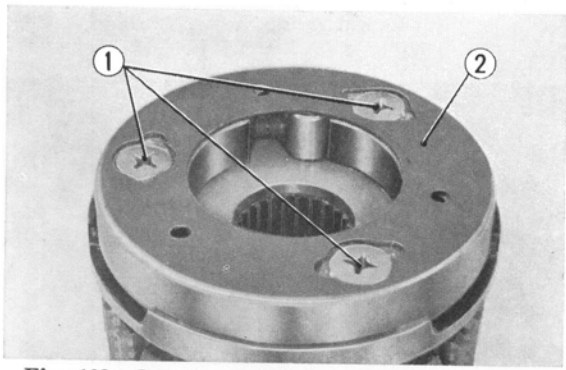


Fig. 162 ① 6 mm flat head screws
② Starting clutch outer

10. Unscrew the three 6 mm flat head screws and remove the starting clutch outer.

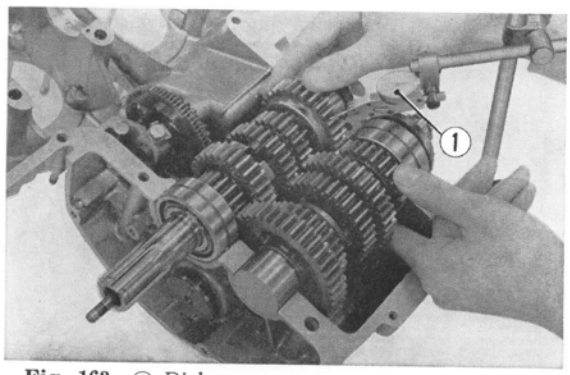


Fig. 163 ① Dial gauge

B. Inspection

1. Measure gear backlash.
Set the pointer of a dial gauge against the tooth of the gear and measure the backlash.

2. Inspect the dogs and replace any gears with excessively worn dogs. Also, make sure that the gears slide smoothly over the splined shaft.

C. Reassembly

Primary Shaft

1. Install the starting clutch outer and primary driven sprocket hub with the three 6 mm flat head screws coated with thread lock cement, and then stake the screw heads with a punch to prevent loosening.

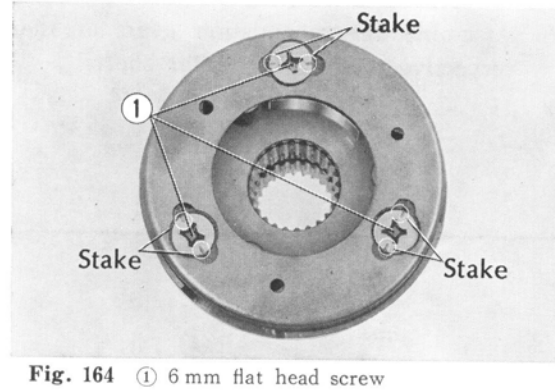


Fig. 164 ① 6 mm flat head screw

2. Assemble the damper rubbers on the primary driven sprocket, and install on the starting clutch with 30 mm set ring.
3. Drive the #6205 ball bearing into the primary shaft.

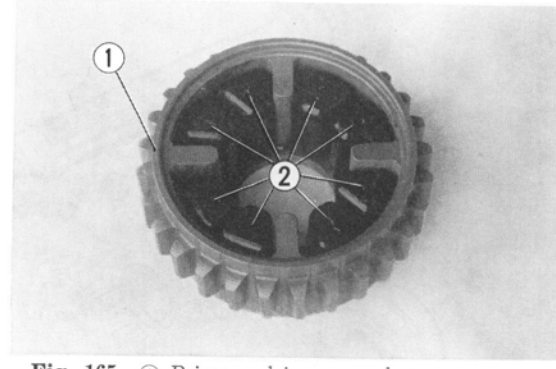


Fig. 165 ① Primary driven sprocket
② Damper rubbers

4. Mount the starting clutch gear on the starting clutch, insert the needle bearing and 25 mm spacer into the starting clutch gear, fit the 25 mm thrust washer and the snap ring on the primar shaft, and install the primary shaft in the crankcase.

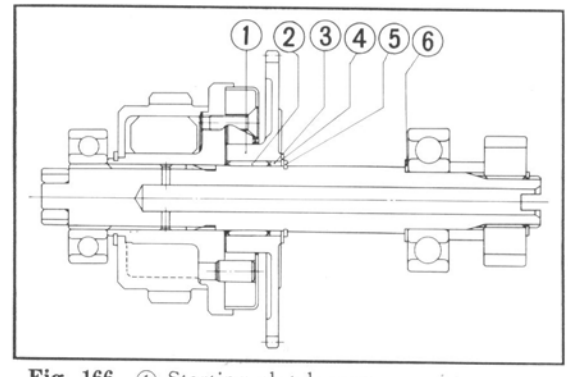


Fig. 166 ① Starting clutch gear
② Needle bearing (25×29×17)
③ 25 mm spacer
④ 25 mm thrust washer
⑤ 25 mm snap ring
⑥ 22 mm thrust washer

Kick Starter

5. Reassemble the kick starter components in accordance with Fig. 166.

Note:

Do not forget to install the 18 mm washer.

Transmission

6. Assemble the transmission gears on the respective main and counter shafts.

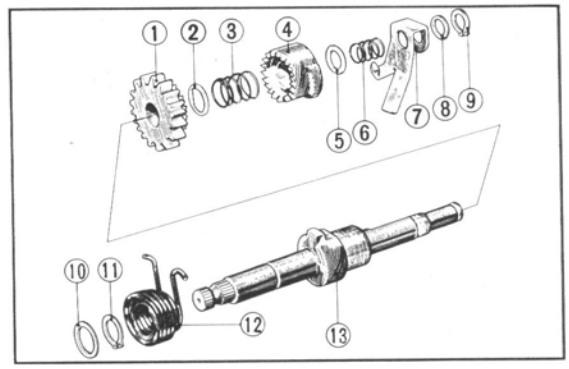
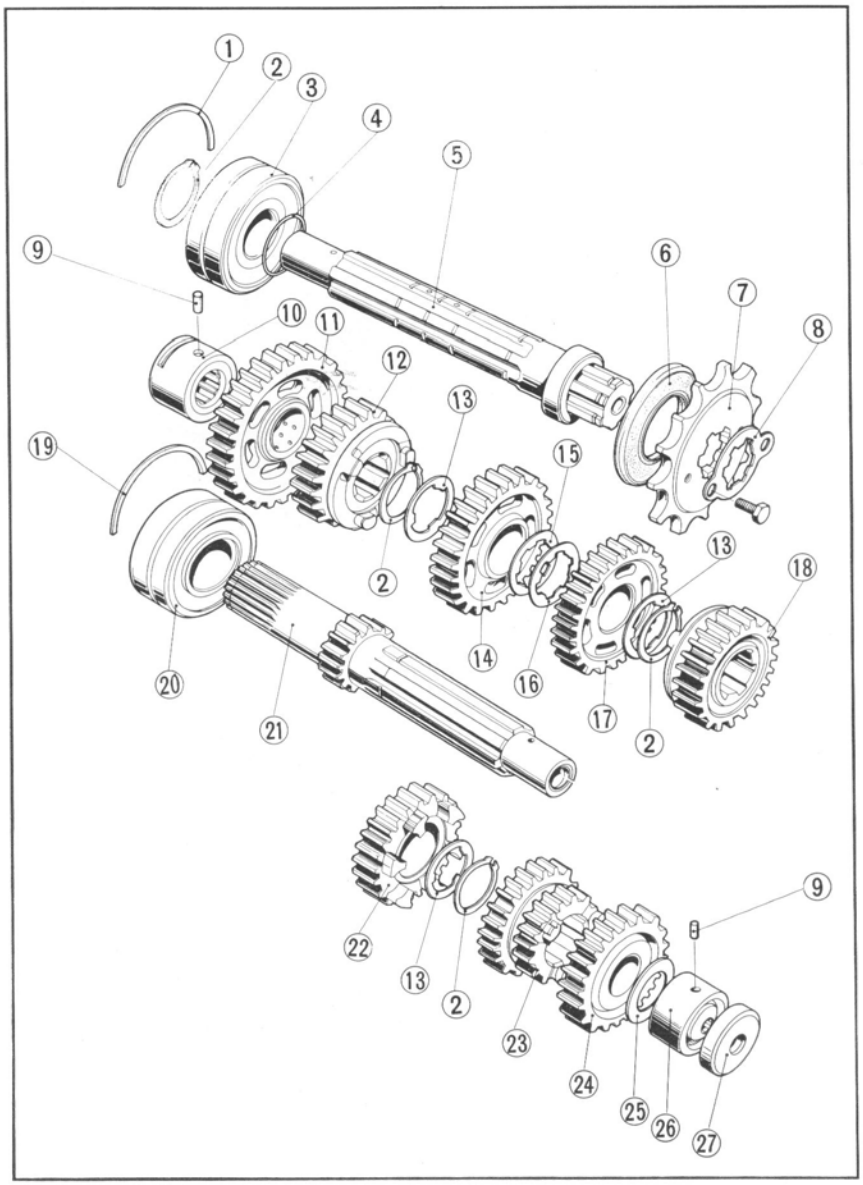


Fig. 167
① Kick starter pinion
② 20 mm thrust washer
③ Starter pinion set spring
④ Kick starter rachet
⑤ 15 mm thrust washer
⑥ Kick starter rachet spring
⑦ Rachet guide plate
⑧ Chain guide thrust
⑨ 12 mm snap ring
⑩ 18 mm washer
⑪ 18 mm snap ring
⑫ Kick starter spring
⑬ Kick starter spindle



① 57 mm bearing set ring
② 25 mm snap ring
③ 5205 special ball bearing
④ 24.5 mm O-ring
⑤ Transmission counter shaft
⑥ 33×57×7 oil seal
⑦ Drive sprocket (17T)
⑧ Drive sprocket fixing plate
⑨ Gear shift fork pin
⑩ 20 mm needle bearing
⑪ Counter shaft low gear (40 T)
⑫ Counter shaft fourth gear (29 T)
⑬ 25 mm thrust washer
⑭ Counter shaft third gear (33T)
⑮ 25 mm lock washer
⑯ 25 mm thrust washer
⑰ Counter shaft second gear (36 T)
⑱ Counter shaft top gear (27 T)
⑲ 52 mm bearing set ring
⑳ 5205 HS ball bearing
㉑ Transmission main shaft (24 T)
㉒ Main shaft fourth gear (28 T)
㉓ Main shaft second, third gear (22 T, 26 T)
㉔ Main shaft top gear (30 T)
㉕ 20 mm thrust washer
㉖ 22 mm needle bearing
㉗ 8×34×8 oil seal

Fig. 168

7. Install the two each bearing set rings and the dowel pins in the upper crankcase, and install the transmission.
8. Reassemble the upper and the lower crankcase in accordance with section 9. C.
9. Install the clutch in accordance with section 6. C.
10. Mount the engine in the frame in accordance with 2. B.

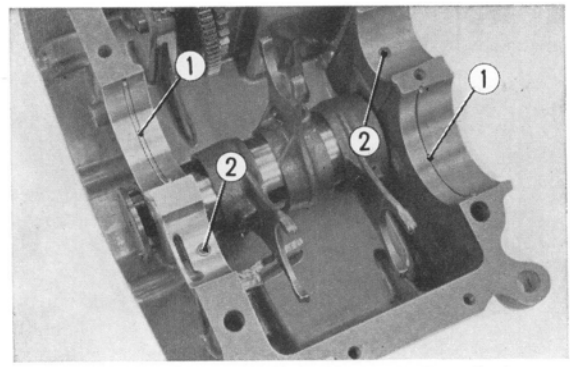


Fig. 169 ① Bearing set rings ② Dowel pins

11. CARBURETOR

A. Disassembly

1. Remove the carburetor unit from the engine in accordance with section 2 A.

Stay Plate And Carburetor

2. Unhook the throttle return spring off the link lever.

Note:
Exercise care not to damage the hook end of the spring.

3. Unscrew the hex. nuts, and remove the dust plate B. Remove the cap nuts.

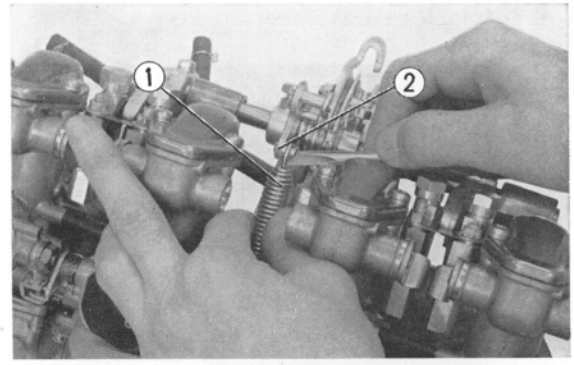


Fig. 170 ① Throttle return spring
② Link lever

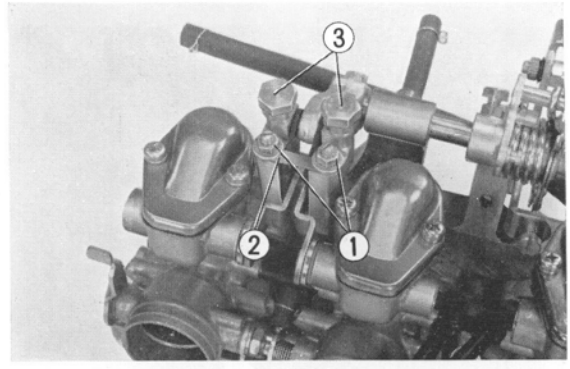


Fig. 171 ① Hex. nuts ③ Cap nuts
② Dust plate B

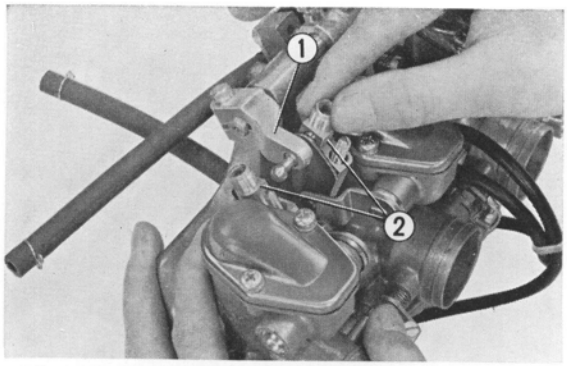


Fig. 172 ① Link arm ② Adjuster holders

4. Remove the adjuster holders from the link arm.
5. Unscrew the eight 6 mm flat head screws from the stay plate and remove the carburetor unit.

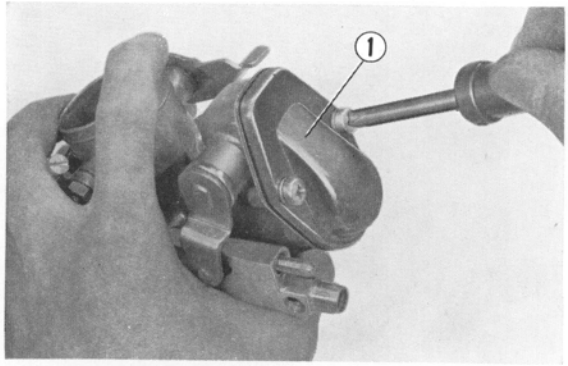


Fig. 173 ① Carburetor top

Throttle Valve And Jet Needle

6. Unscrew the two carburetor top mounting screws from each carburetor and remove the tops.

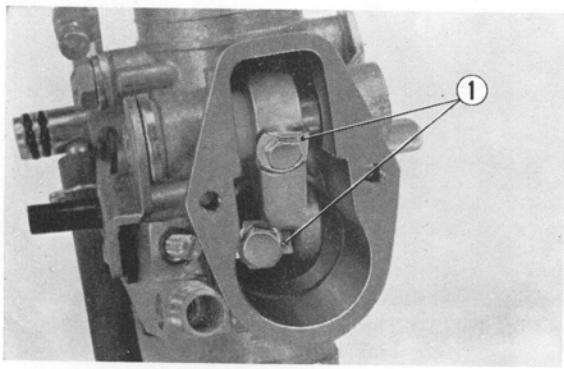


Fig. 174 ① Tongued washer

7. Position the throttle valve to full open and straighten the tab of the two tongued washers.

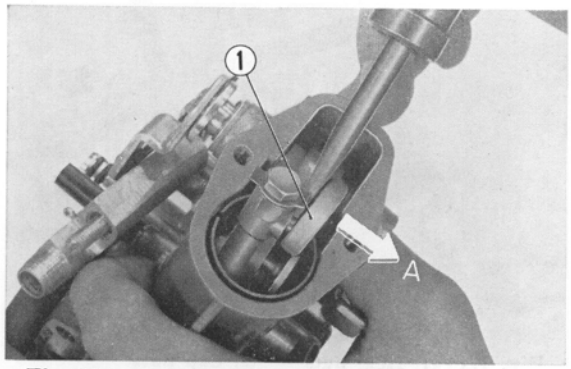


Fig. 175 ① Link arm

8. Remove the 6 mm bolt from the shaft end and remove the link arm in direction A using a screw driver.

9. Loosen the 6 mm bolt on the throttle side about 1/2 turn, insert a screwdriver between the throttle shaft and link arm and pry loose in direction A.

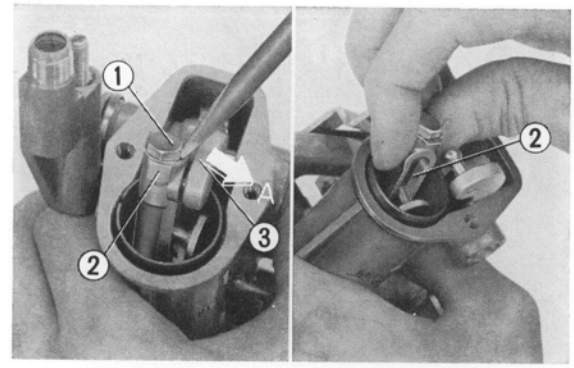


Fig. 176 ① 6 mm bolt ② Throttle shaft ③ Link arm

10. Unscrew the two 3 mm screws, rotate the valve plate 90° in either direction and align the tab on the valve plate to the groove in the shaft, and remove the valve plate.
11. Remove the jet needle from the throttle valve.

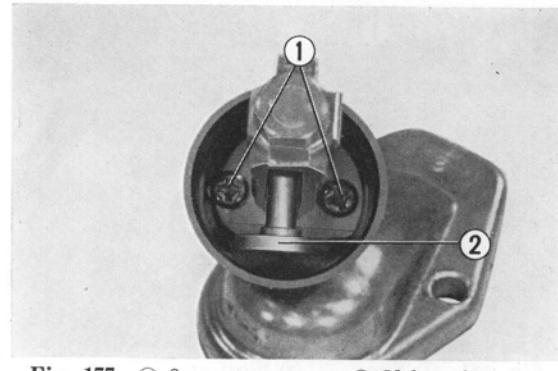


Fig. 177 ① 3 mm screws ② Valve plate

Adjuster Holder

1. Remove the carburetor from the stay plate in accordance with section 1~5.
2. Remove the adjusting screw from the adjuster holder.

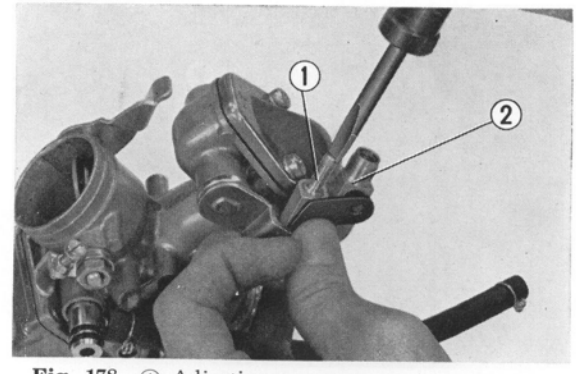


Fig. 178 ① Adjusting screw ② Adjuster holder

3. Position the throttle valve at the intermediate position and remove the adjuster holder.

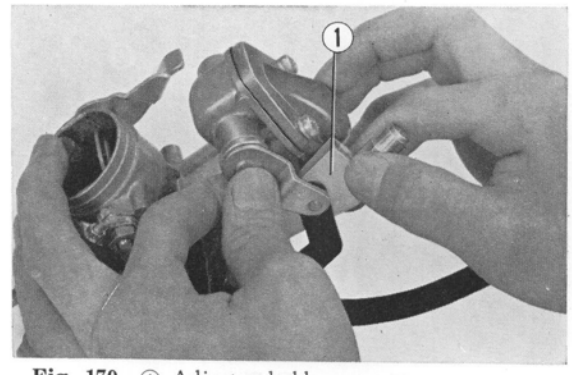


Fig. 179 ① Adjuster holder

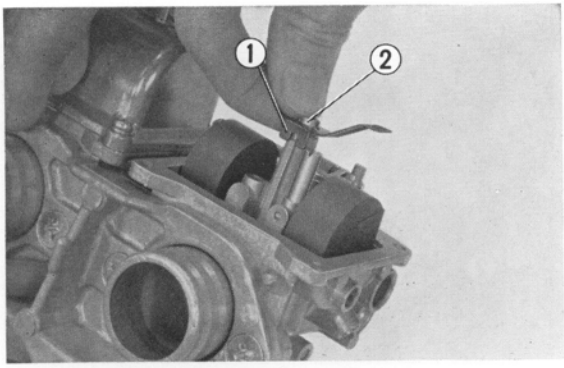


Fig. 180 ① Leaf spring ② Main jet

Float, Main Jet, And Slow Jet

1. Remove the float chamber body.
2. Remove the leaf spring and the main jet.

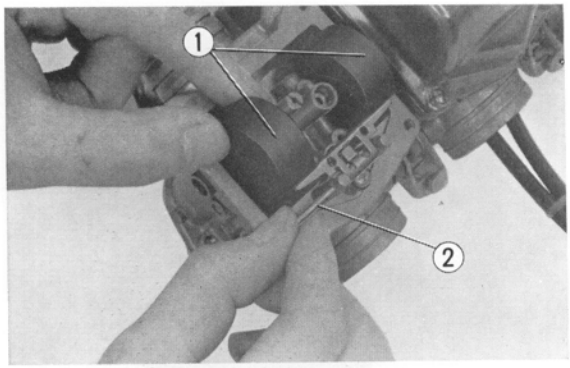


Fig. 181 ① Float ② Float arm pin

3. Pull out the float arm pin and remove the float.

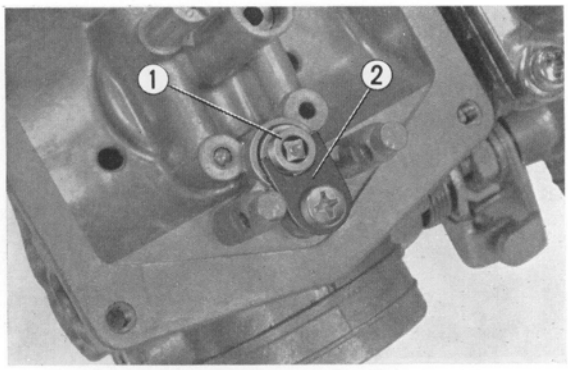


Fig. 182 ① Valve seat ② Clip plate

4. Disengage the clip plate and remove the valve seat.

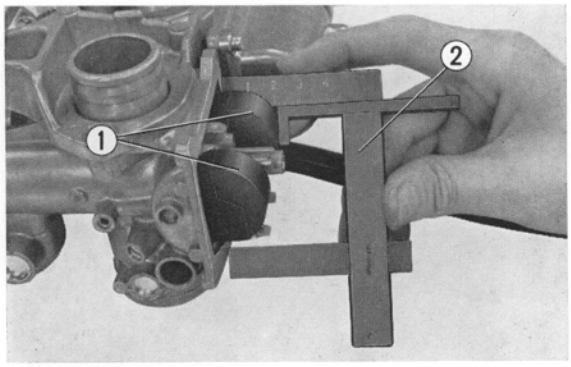


Fig. 183 ① Floats ② Float level gauge

B. Inspection

1. Fuel level adjustment.
   Position the float so that the float arm barely touches the tip of the float valve. Measure the distance from the flange to the top of the float with the float level gauge. The standard value is **22 mm (0.89 in.)**

C. Reassembly

Float, Main Jet, And Slow Jet

1. Install the valve seat with the clip plate.
2. Install the float.
3. Place the leaf spring on the main jet, and install them on top of the needle jet holder.
4. Install the float chamber body.

Carburetor setting data	
Description	No.
Main jet	#100
Air jet	#150
Slow jet	#40
Throttle valve	#2.5
Air screw opening	1±1/8

Adjuster Holder

1. Insert the coil spring B and spring seat B into the adjuster holder. Position the throttle valve to about 1/2 open and insert approximately 1/4 of the connector shaft into the holder window. Install them while holding the spring seat down with a thin screwdriver.
2. Mount the carburetor on the stay plate in accordance with section 7 and 8.

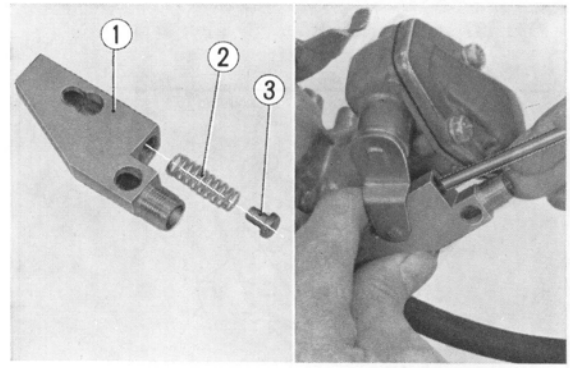


Fig. 184 ① Adjuster holder ② Coil spring B ③ Spring seat B

Throttle Valve And Jet Needle

1. Install the jet needle on the throttle valve.
2. Place two each spring washers and 3 mm screws on the valve plate, and then place the tab of the valve plate to the slot of the throttle valve and push down to the bottom. Then rotate the valve plate 90° toward the link arm and install the 3 mm screws.

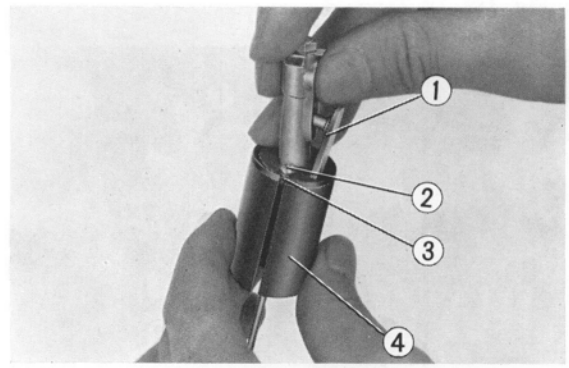


Fig. 185 ① Valve plate ② 3 mm screw ③ Spring washer ④ Throttle valve

3. Install the throttle valve in the carburetor body so that the throttle valve cutaway section is toward the choke valve.

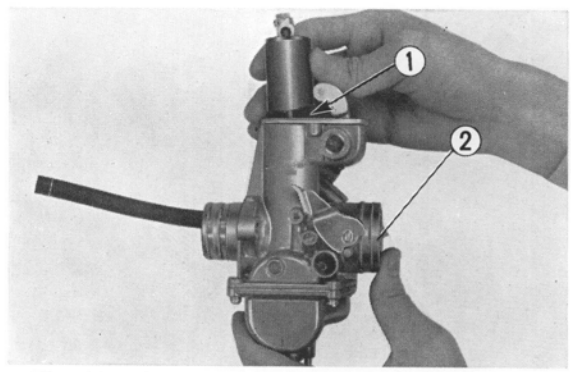


Fig. 186 ① Cutaway section ② Choke valve

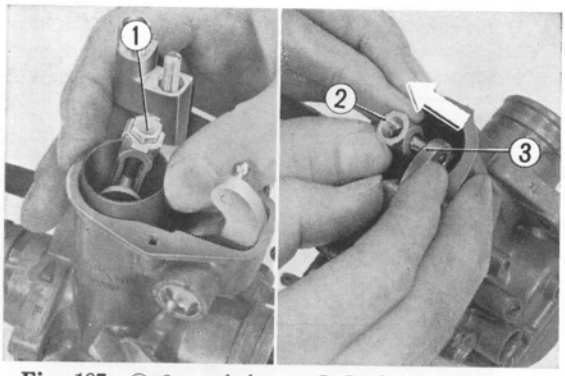


Fig. 187 ① 6 mm bolt ③ Link arm
② Throttle shaft

4. Unscrew the 6 mm bolt from the throttle shaft and push the spherical end of the link arm into the throttle shaft while pulling up the throttle shaft.

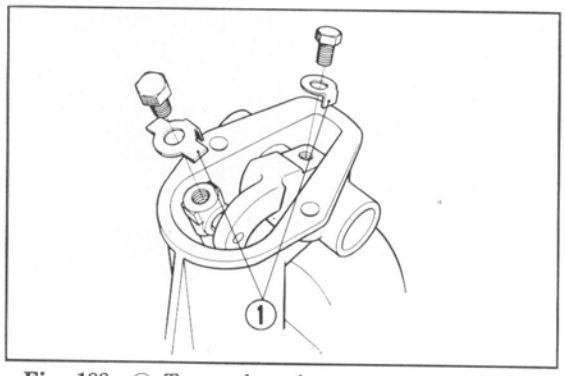


Fig. 188 ① Tongued washer

5. Install the tongued washer with the tongue positioned as shown in Fig. 187, tighten the 6 mm bolt, and then bend up the washer tongue against the bolt head.
6. Install the carburetor top with the two 5 mm screws.

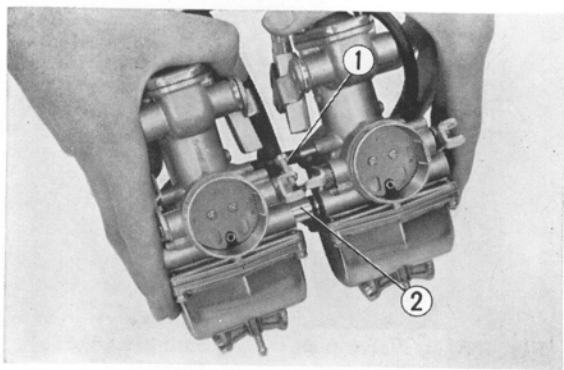


Fig. 189 ① Rubber pipe ② T type joint

7. Combine the two carburetors with the T type joint and the rubber pipe.

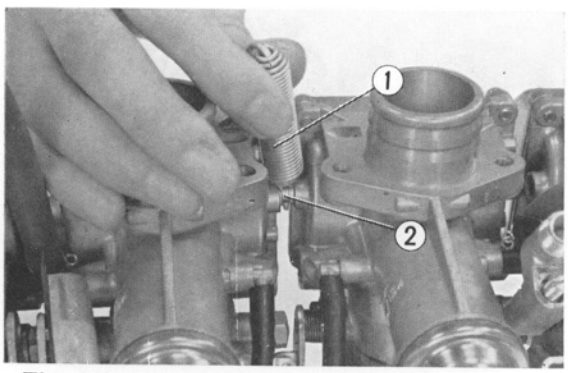


Fig. 190 ① Return spring ② Spring set plate

8. Mount the spring set plate, and then hook up the return spring.
Position the four carburetors, install the set plate, and tighten with the eight 6 mm flat head screws.

9. Install the dust plate A, and mount the adjuster holder to the link arm.

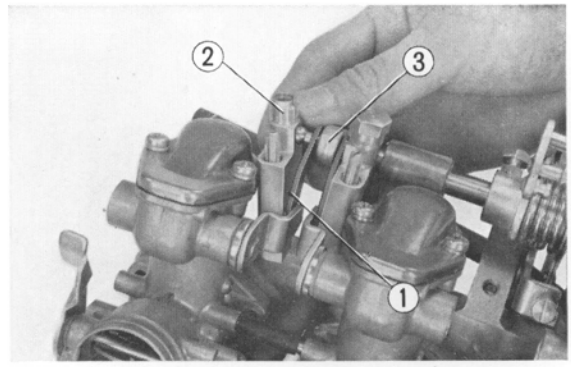


Fig. 191 ① Dust plate A ③ Link arm
② Adjuster holder

10. Insert the coil spring B and tighten it with the cap nut.

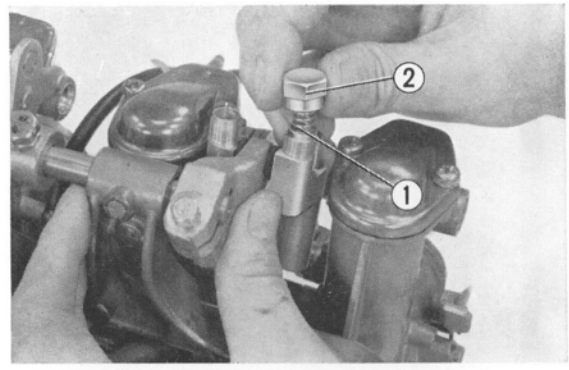


Fig. 192 ① Coil spring B ② Cap nut

11. Install the special washer D, dust plate B, and flat washer on the adjuster screw and tighten with the nuts.

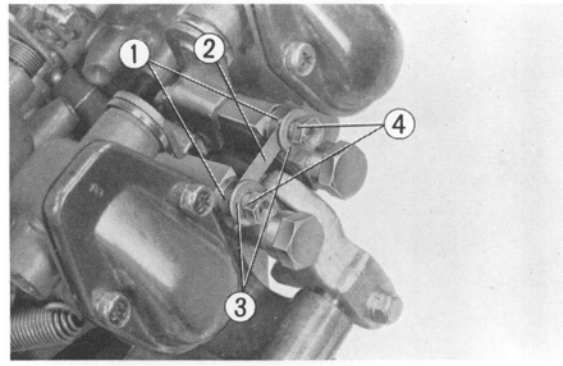


Fig. 193 ① Special washer D ③ Washers
② Dust plate B ④ Nuts

12. Connect the throttle return spring on the link lever, being careful not to damage the hook.
13. Install and route the two fuel tubes as shown in Fig. 193.
14. Mount the carburetor unit on the engine in the reverse order as described in section 2. A.

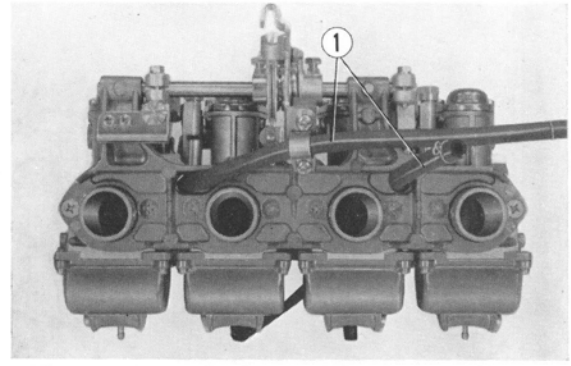


Fig. 194 ① Fuel tubes