

Fig. 2A.12 After removing the clutch assembly on YT 60 models, detach the snap-ring (2) and slide off the Autolube drive gear (1) (Sec 12)

special tool (see photo 12.10a). Loosen and remove the clutch locknut.  
**Note:** If the engine is being completely disassembled, loosen the primary drive gear nut as well (wedge a rag in the primary drive gears to keep them from turning — see photo 12.9).

- 21 Remove the tabbed washer and the clutch hub.
- 22 Remove the large thrust washer and the clutch housing.
- 23 Remove the spacer and the thrust washer from the transmission shaft. All of these components should be set aside for inspection.

#### Inspection — YT 125/175/YTZ 250

- 24 Measure the free length of the clutch springs and compare the results to the Specifications (photo). If the springs have sagged or if cracks are noted, replace them with new ones. Do the same for the smaller off springs (if equipped).
- 25 If the lining material of the friction discs smells burned or if it is glazed, new parts are required. If the metal clutch plates are scored or discolored they must be replaced with new ones. Measure the thickness of each friction disc (photo) and compare the results to the Specifications. Replace any severely worn discs with new ones.
- 26 Lay the metal plates one at a time on a flat surface (such as a piece of plate glass) and check for warpage by trying to slip a feeler gauge between the flat surface and plate (photo) (see the Specifications for the feeler gauge to use). Do this at several places around the plate cir-

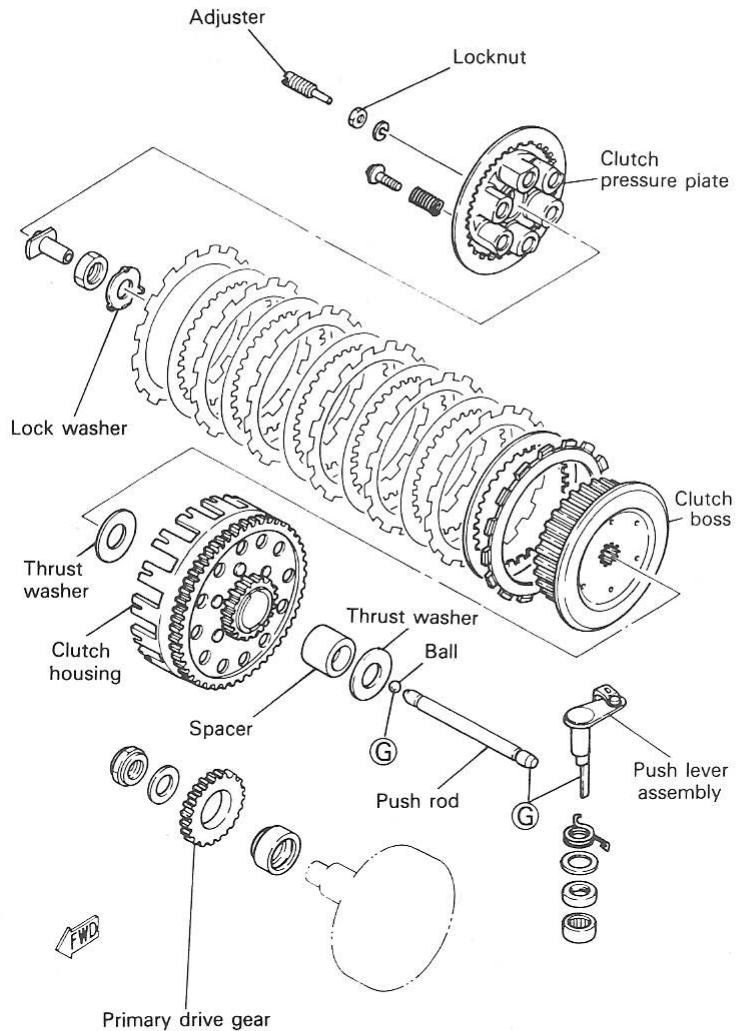
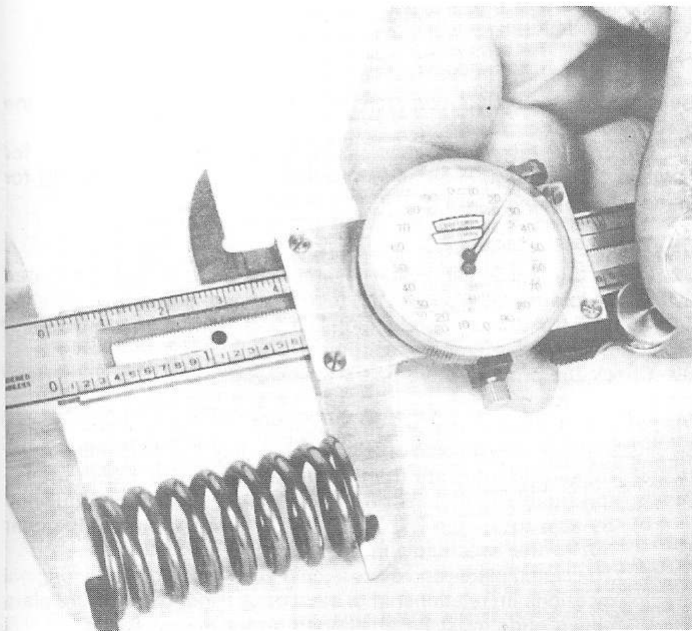
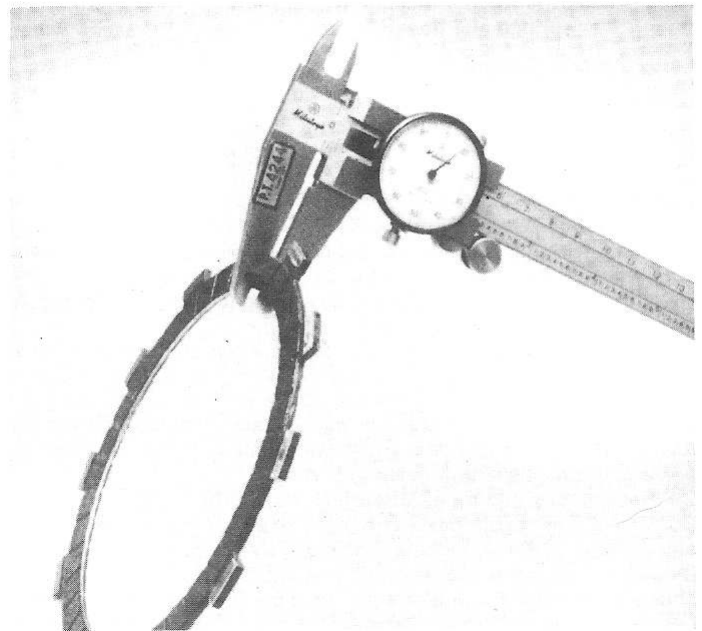


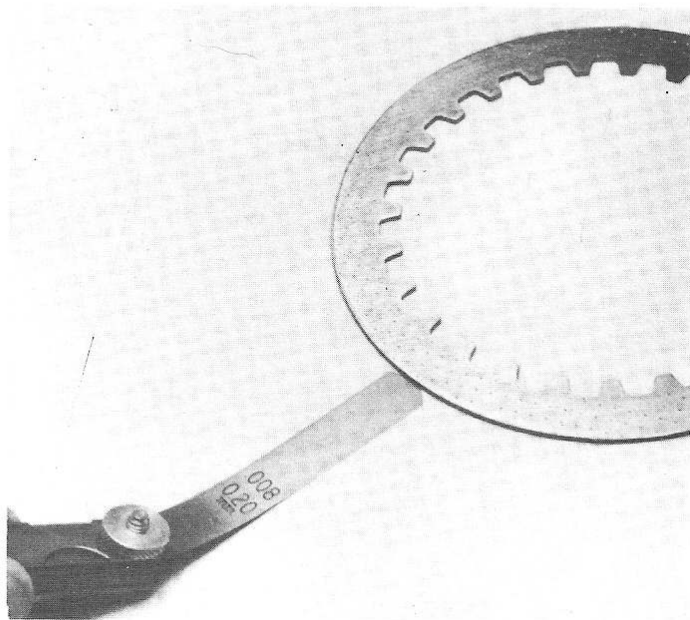
Fig. 2A.13 YTZ 250 clutch components — exploded view (Sec 12)



12.24 Measuring the clutch spring free length with a dial caliper



12.25 Measuring the thickness of a clutch friction disc with a dial caliper



12.26 Checking a clutch metal plate for warpage with a feeler gauge (make the check at several points around the plate)

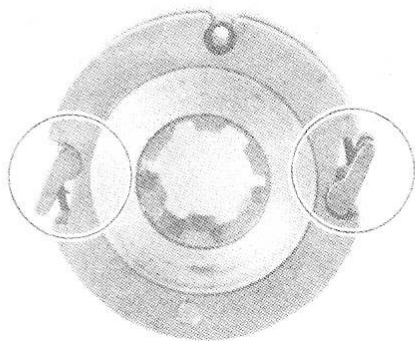


Fig. 2A.15 On YT 125/175 models, check the ratchet mechanism pawls, springs and dogs (Sec 12)

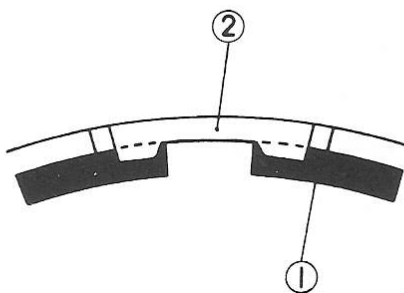


Fig. 2A.16 On YT 125/175 models, make sure the ends of the large circlip are located under one of the clutch housing tabs when reassembling the clutch (Sec 12)

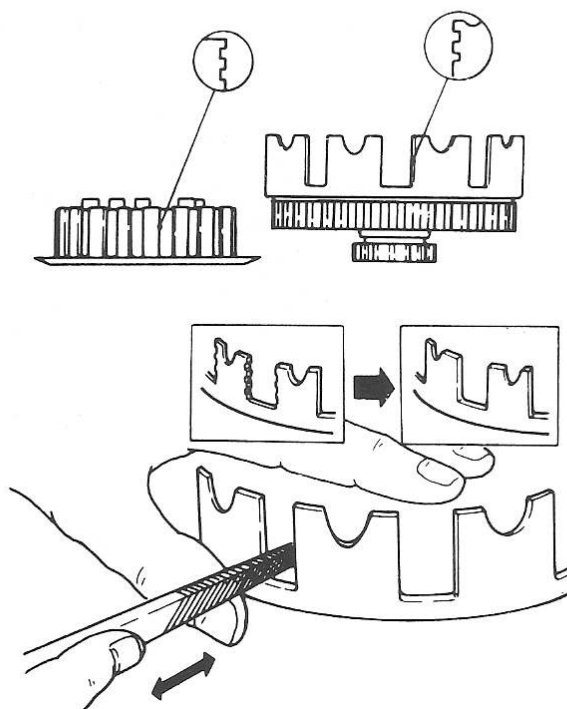


Fig. 2A.14 If the indentations in the clutch housing tabs are slight, they can be removed with a file and the housing won't require replacement (Sec 12)

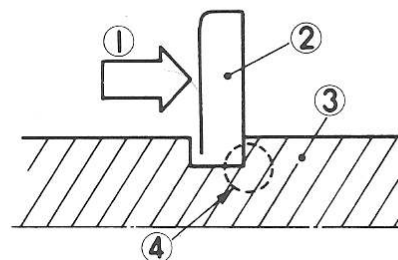


Fig. 2A.17 When reinstalling the clutch housing on YT 60 models, the sharp edge of the snap-ring must face out (Sec 12)

- |                |                           |
|----------------|---------------------------|
| 1 Thrust force | 3 Shaft                   |
| 2 Snap-ring    | 4 Sharp edge of snap-ring |

cumference. If the feeler gauge can be slipped under the plate it is warped and should be replaced with a new one.

27 Check the tabs on the friction discs or plates for excessive wear or mushroomed edges. They can be cleaned up with a file if the deformation is not severe. Check the edges of the slots in the clutch housing for indentations made by the tabs. If the indentations are deep they can prevent clutch release, and the housing should be replaced with a new one. If the indentations can be removed easily with a file the life of the housing can be prolonged to an extent. Look for indentations in the clutch hub (boss) splines.

28 Check the primary gear teeth for cracks, chips and excessive wear. If the gear is worn or damaged, the clutch housing must be replaced with a new one. **Note:** If the primary drive or driven gears are worn and are being replaced, make sure the replacement gears have the correct numbers scribed on them to provide the correct gear backlash and prevent further wear and noisy operation.

29 Roll the pushrod on a flat surface to see if it is bent.

30 On YT 125/175 models check the release mechanism for wear and damage. Look for indentations made by the balls and make sure it operates smoothly. Reassemble the clutch discs and plates in the housing and install the pressure plate and circlip. Measure the distance between the outer friction disc and the inside of the pressure plate with a feeler gauge. This is known as the adjustment gap. If it is incorrect, replace the metal plates with ones of different thicknesses.

**Caution:** Place a 0.063 inch (1.6 mm) plate on the outside, with the machined surface facing in.

31 Check the ratchet mechanism in the clutch housing. Look for damage and wear on each pawl and dog. Check the pawl spring for damage and correct tension.

#### Inspection — YT 60

32 Check the housing and shoe assembly for heat damage (indicated by blue discoloration). Measure the friction lining material on each shoe and compare it to the specifications. If it is thinner than specified, replace the shoe assembly with a new one.

33 Check the primary drive gears for obvious wear and damage.

#### Installation — YT 125/175 models

34 Installation is the reverse of removal, but note the following points:

- Be sure to lubricate the thrust plate and spacer with grease (preferably moly-base) before installing the clutch housing.
- Be sure to tighten the clutch hub nut and primary drive gear nut to the specified torque.
- The clutch plates and discs should be reinstalled in their original locations (in relationship to each other) and the pressure plate circlip ends must be positioned under the tabs.
- Use thread-locking compound on the release lever-to-shaft shoulder bolt.

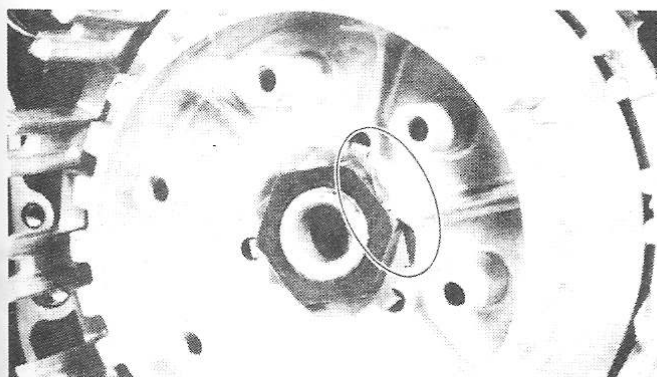


Fig. 2A.18 On YTZ 250 models, bend up the lock washer tab to keep the clutch hub nut from loosening (Sec 12)

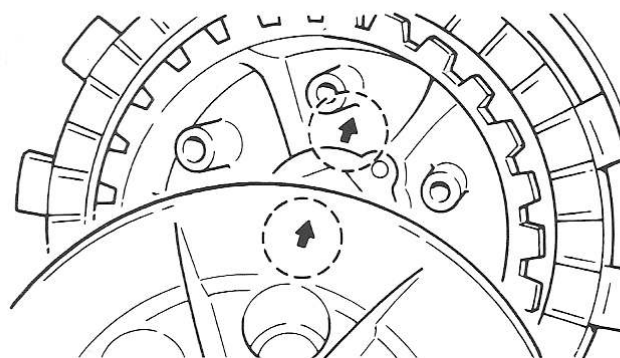


Fig. 2A.19 On YTZ 250 models, the arrows on the clutch hub and pressure plate must be aligned before the springs and screws are installed (Sec 12)

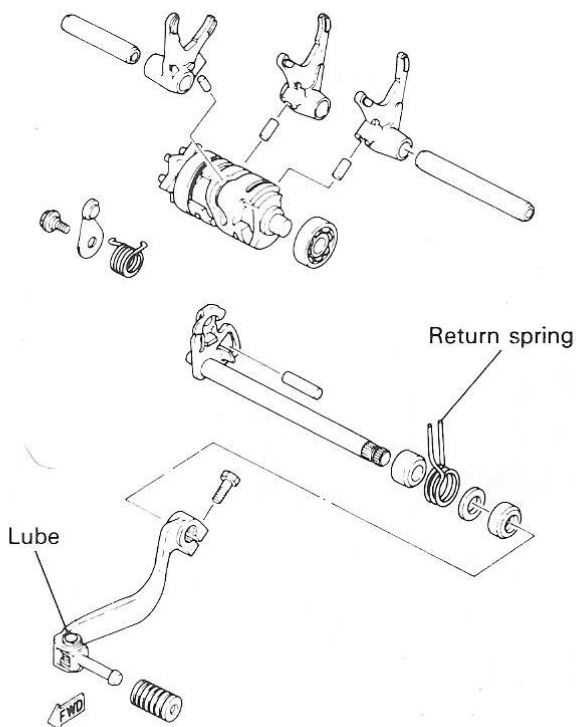


Fig. 2A.20 YTZ 250 shift linkage components — exploded view (Sec 3)

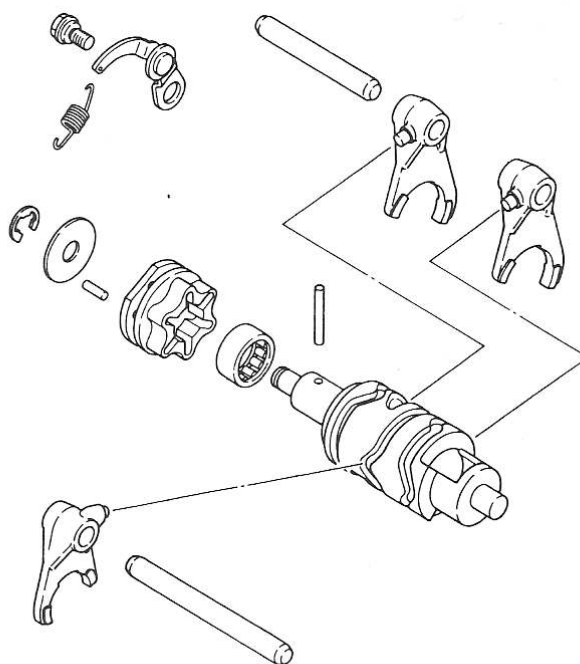


Fig. 2A.21 YT 125/175 shift drum components — exploded view (Sec 3)

- e) Adjust the release mechanism by tightening the inner nut until the bolt can be turned with your fingers but has no thrust play (in-and-out). Tighten the outer nut against the inner nut. If the bolt is too loose, the clutch will drag. If it is too tight, the clutch will slip.

#### Installation — YT 60 models

35 Installation is the reverse of removal. Be sure to install the snap-rings with the sharp edge facing out.

#### Installation — YTZ 250 models

36 Installation is the reverse of removal, but note the following points:

- Lubricate the pushrod, ball, spacer and thrust washers with grease (preferably moly-base) when installing the clutch housing and hub.
- Use a new tabbed washer when installing the clutch hub nut, tighten the nut to the specified torque and bend the tabs up to keep the nut from loosening.
- When installing the pressure plate, align the arrow with the arrow on the clutch hub.
- Tighten the primary drive gear nut to the specified torque.

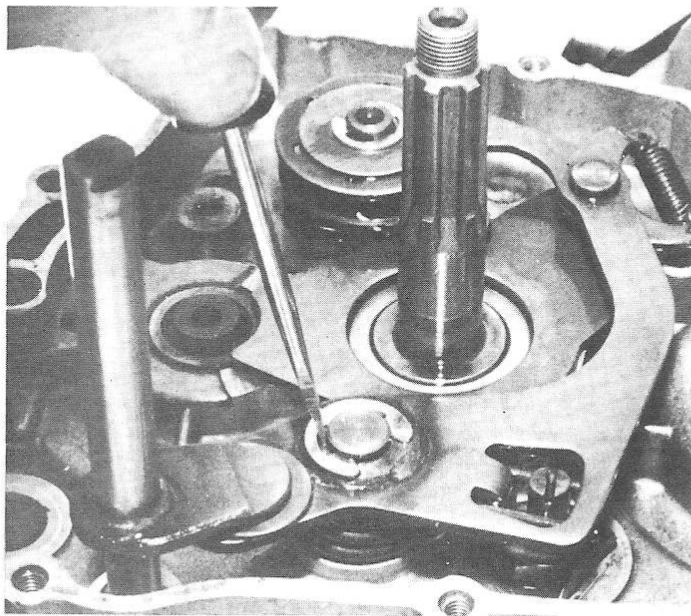
### 13 Shift linkage — removal, inspection and installation

- 1 Servicing of the shift linkage can be done with the engine in the frame.

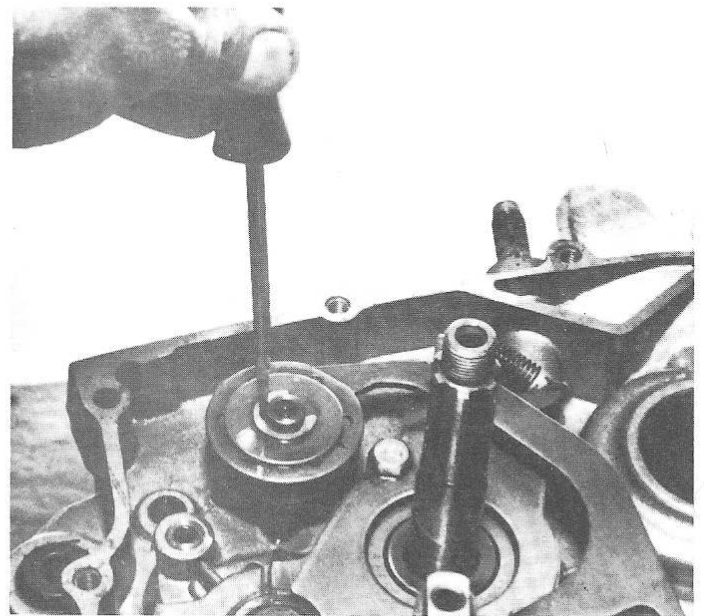
#### Removal

- 2 Refer to Section 12 and remove the clutch assembly.
- 3 **Note:** During the remainder of the engine rebuild procedure it is very important that you pay attention to how the engine is put together. There are often several ways that parts may fit together, but only one is the correct way. Make a sketch or take an instant photo of anything that may present a problem.
- 4 Below and behind the clutch assembly is the shift linkage. Note how the parts fit together. On YTZ 250 models grasp the gearshift spindle and pull it directly out of the crankcase. Lay it aside for later inspection.
- 5 Remove the bolt and release the spring, then detach the shift drum stopper (photo).
- 6 On YT 125/175 models remove the shift linkage pivot circlip





13.6a Removing the shift linkage pivot clip with a screwdriver



13.6b Removing the shift drum stub shaft clip with a screwdriver

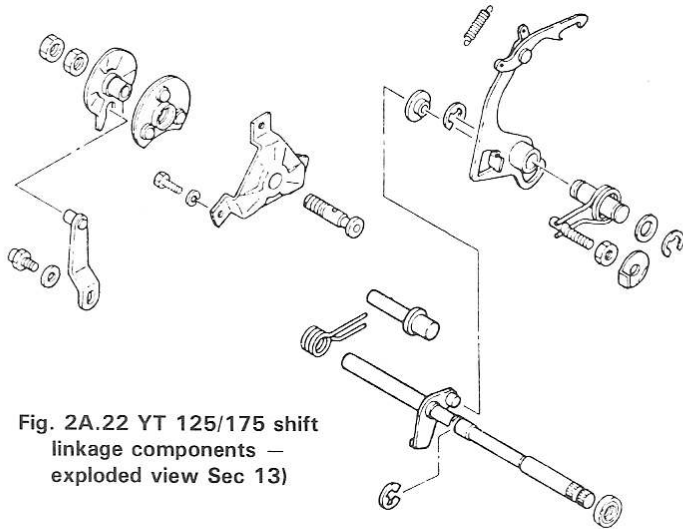
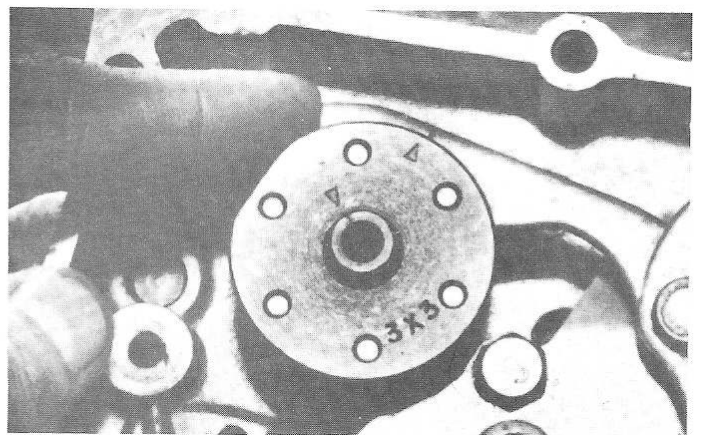


Fig. 2A.22 YZ 125/175 shift linkage components — exploded view Sec 13



13.13 The index marks on the shift drum shaft and the shift cam must be aligned (the cam plate can be installed more than one way)

(photo) and the shift cam retaining circlip (photo). Pull the gearshift spindle out (don't lose the bushing that fits in the linkage slot), then lift the large washer and shift cam off the drum stub shaft (don't lose the pins in the shift cam). Remove the pin from the hole in the end of the shift drum stub shaft.

- 7 Pull the linkage assembly off the pivot shaft and spring post.
- 8 Clean all parts with solvent and dry them thoroughly.

### Inspection

9 Examine the gearshift mechanism for wear, particularly at the upper arm shift pawls and at the shaft splines. Make sure the shaft is not bent and check the springs for cracks or excessive stretch. The upper arm must be free to move at the pivot point. Check the return spring for cracks and wear.

10 Check the drum stopper roller, the cam plate and the shift pins for excessive wear and replace any worn or damaged parts with new ones.

11 If the shift shaft oil seal has been leaking, replace it with a new one. Wrap electrician's tape around the splines on the end of the shaft to avoid damaging the new seal as the shaft passes through.

### Installation

12 Installation is the reverse of removal. Be sure to lubricate the gearshift shaft before inserting it into the crankcase. Engage the return spring on the gearshift spindle tab and the crankcase post. Hook the

stopper arm spring under the crankcase projection (YZ 250 only) and be careful to engage the shift arm with the shift pins.

13 On YZ 125/175 models the index marks on the shift drum stub shaft and the shift cam must be aligned (photo) before installing the large washer and circlip. Shift the transmission into first gear and check to see if the index marks on the shift cam and linkage arm (photo 13.13) are aligned. If not, loosen the locknut on the return spring post in the crankcase and turn the post until they are, then retighten the locknut (a tabbed washer may be used on the nut — if it is, the tab must be flattened to loosen the nut and bent back up to keep it locked in place). **Note:** Do not loosen the locknut and turn the post unless it is absolutely necessary to adjust the shift linkage.

14 After the components have been reassembled check the shifter for proper operation.

### 14 Water pump — disassembly, inspection and reassembly

1 The water pump (YZ 250 models only) should not be disassembled unless the coolant level drops continually and there is no evidence of leaks, the transmission oil appears milky or the coolant is discolored.

2 Refer to Section 12 and remove the right crankcase cover.

3 Remove the bolts and separate the pump cover from the crankcase



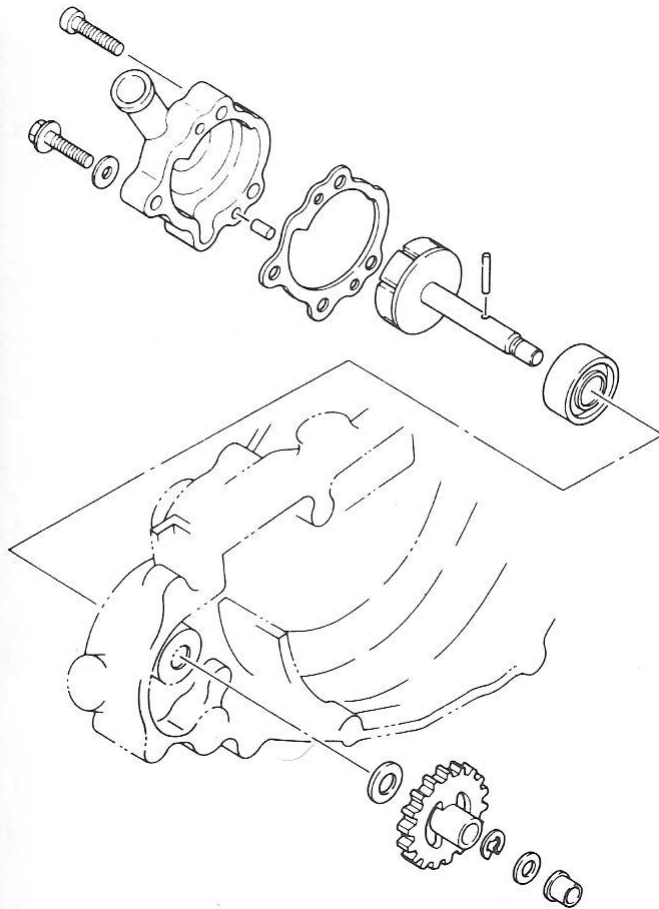


Fig. 2A.23 Water pump components — exploded view (Sec 14)

cover. You may have to tap it with a soft-face hammer to break the gasket seal.

4 Slide off the bushing and washer, then remove the circlip from the shaft with a screwdriver. Remove the gear, pull out the pin and remove the washer before sliding the shaft/impeller out of the case.

5 Remove any deposits from the impeller and housing, then check the impeller for wear, cracks or damage.

6 Check the oil seal for wear and rotate the bearing by hand. If it is rough or does not turn easily, have the bearing/seal assembly replaced by a Yamaha dealer service department. If you replace it yourself, the seal must be installed with the *Water Side* mark facing out.

7 Installation is the reverse of removal. Apply grease to the oil seal lip and the impeller shaft. Turn the shaft while installing it to avoid damage to the seal.

### 15 Autolube pump — removal and installation

1 On YT 60 models the pump is attached to the upper rear side of the engine. On YT 125/175 models it is attached to the front of the right crankcase cover under a plastic cover.

2 Wear and malfunction of the pump is rare, but if incorrect output is suspected, check for the following before replacing the pump:

- Obstructions in line to pump or from pump to cylinder.
- Worn or damaged pump body seal or crankcase cover seal.
- Missing or improperly installed check ball or spring.
- Improperly installed or routed oil line(s).
- Loose fitting(s) allowing air to enter pump and/or engine.

3 Check the pump output by removing the outlet line from the pump fitting and attaching a short section of hose to the fitting. Direct the end of the hose into a graduated container and turn the engine with the recoil starter. The pump should deliver the specified amount of oil.

4 If replacement is necessary, detach the cable and oil lines and remove the screws to separate the pump from the mount. Installation is the reverse of removal.

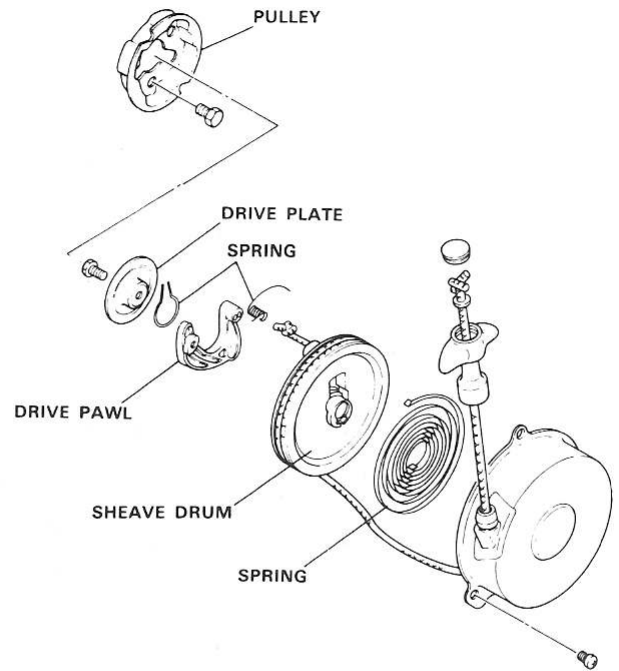


Fig. 2A.24 YT 60 recoil starter components — exploded view (Sec 17)

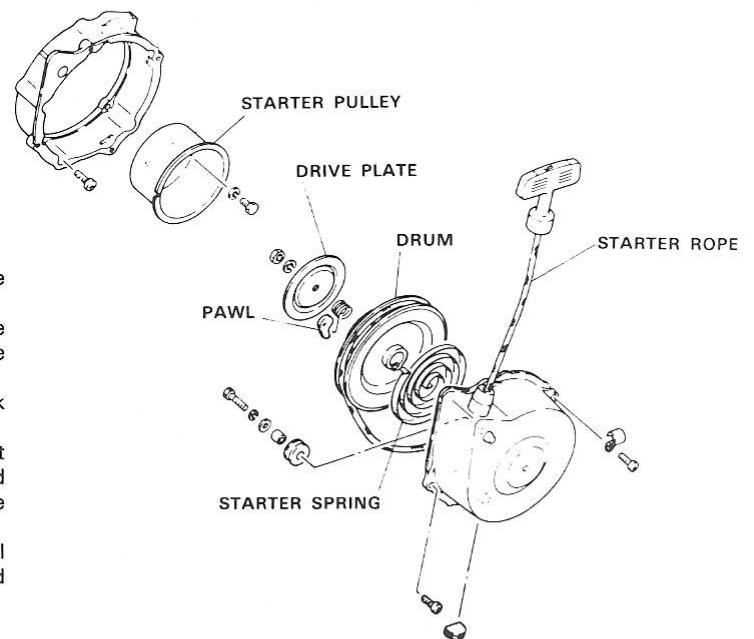


Fig. 2A.25 YT 125/175 recoil starter components — exploded view (Sec 17)

### 16 Recoil starter — removal and installation

- The recoil starter is attached to the left side of the engine.
- Removal is accomplished by removing the screws/bolts and separating the starter assembly from the crankcase mount.
- The starter pulley is bolted to the AC generator rotor. If it is damaged, remove the bolts to detach it.
- Installation is the reverse of removal.

### 17 Recoil starter — disassembly, inspection and reassembly

- To disassemble the starter when replacement of the rewind spring or rope is necessary, untie the knot in the outer end and detach the handle, then slowly release the drum so the spring winds itself back

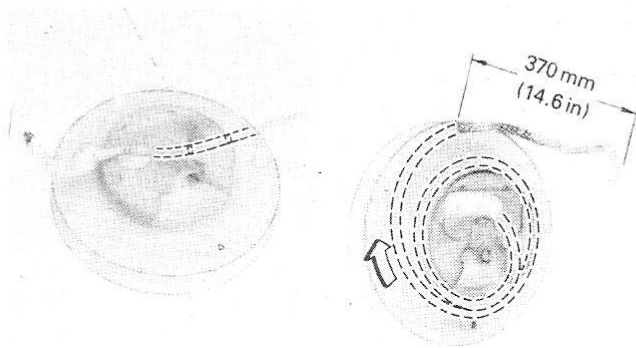


Fig. 2A.26 Installing the rope in the recoil starter drum (Sec 17)

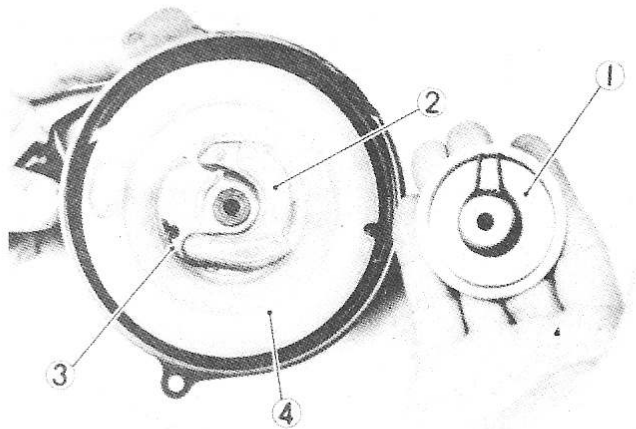


Fig. 2A.27 Correctly installed recoil starter spring and pawl (YT 60) (Sec 17)

- |               |               |
|---------------|---------------|
| 1 Drive plate | 3 Pawl spring |
| 2 Pawl        | 4 Drum        |

gradually (this won't be necessary if either the spring or rope is broken). Remove the nut from the shaft and lift out the components. **Note:** Keep pressure on the rewind spring so it doesn't fly out and note its installed direction (which way it is wound).

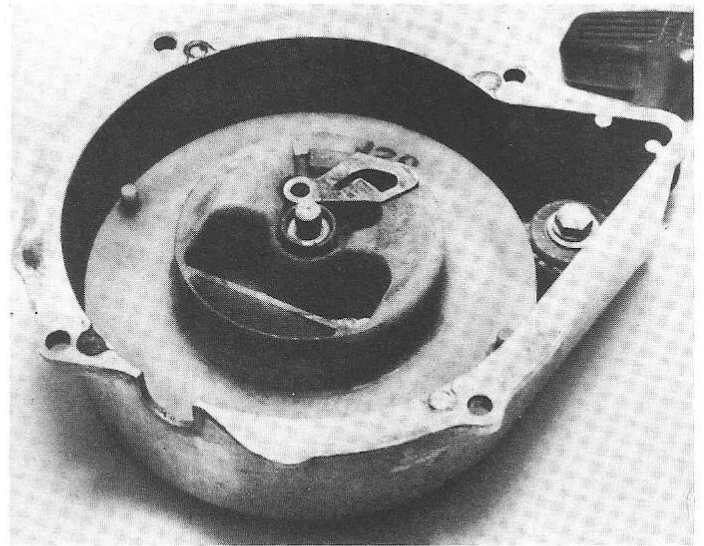
2 Clean the case, drum and drive pawl components and install the new spring after winding it up tightly. Hook the loop on the outer end of the spring over the tab in the starter case, then grease the spring.

3 Tie a knot in one end of the new rope and thread the other end into the drum through the rope hole and out the side. Wind the rope around the drum in a clockwise direction (viewed from the back side) until 14-1/2 inches remain (15-1/2 inches on YT 60 models), then route it through the cutout on the upper edge of the drum.

4 Position the drum in the starter case and make sure the inner end of the spring engages it. When first placed in the case the drum will rest on the spring. Rotate the drum until it drops slightly, then turn it counterclockwise until spring tension is felt. Turn the drum four turns in a counterclockwise direction to preload the spring, then pass the end of the rope through the case hole and starter handle. Tie a knot in the outer end of the rope so it will not pull back through the handle. Keep slight pressure on the drum and let the spring rewind the rope until the handle stops it.

5 Keep downward pressure on the drum so the spring doesn't fly out. On YT 125/175 models install the spring over the shaft and position the drive pawl over the spring (photo). On YT 60 models insert the longer end of the drive spring into the hole in the drum, then install the drive pawl so the spring end fits into one of the notches. The spring clip fits onto the drive plate.

6 Lay the drive plate in place over the shaft, then install the washer and nut. Use thread locking compound on the nut and tighten it securely. Check the starter for smooth operation. When the rope has been pulled out three to five inches the drive pawl should move out. When the rope is retracted the drive pawl should move in.



17.5 On YT 125/175 models, the spring is installed over the shaft before the pawl is positioned (the spring end fits into the pawl slot)

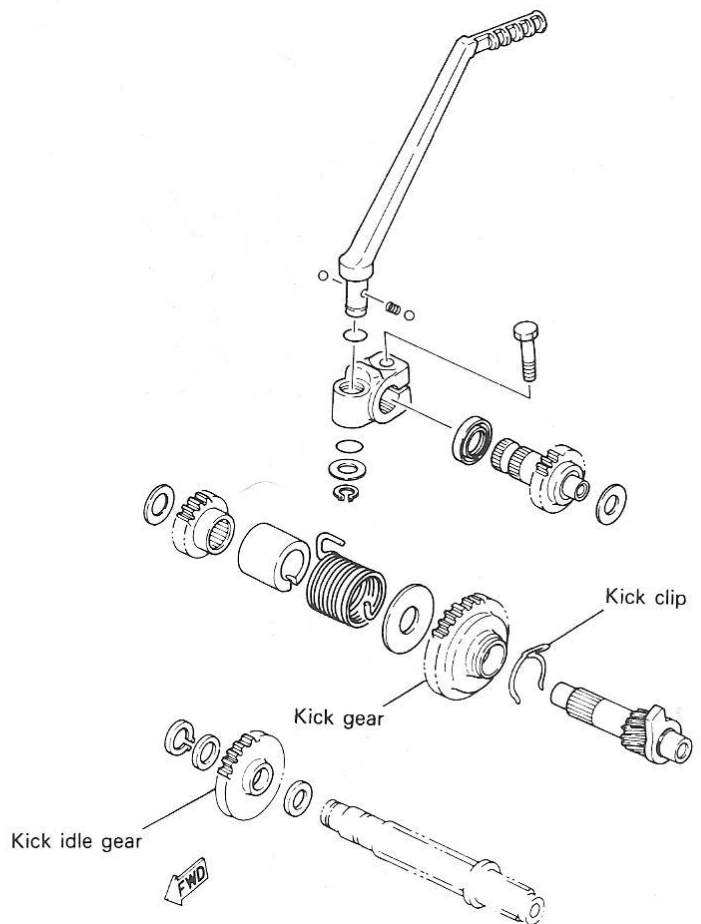
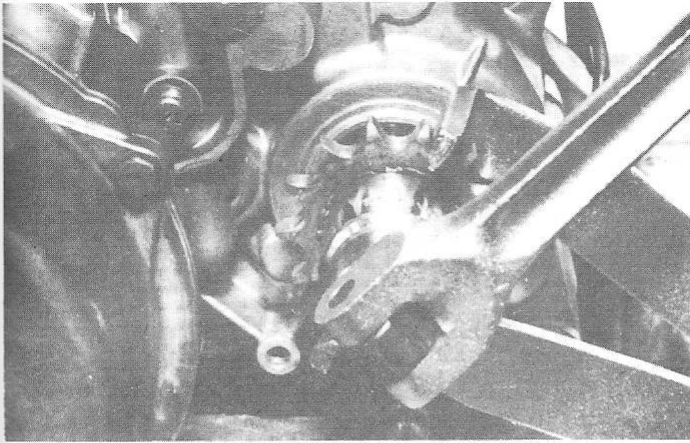


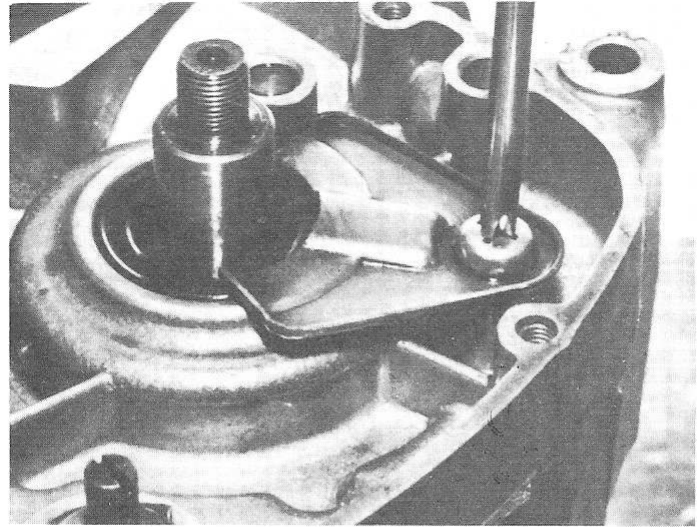
Fig. 2A.28 YTZ 250 kick starter components — exploded view (Sec 18)

## 18 Kickstarter — removal and installation

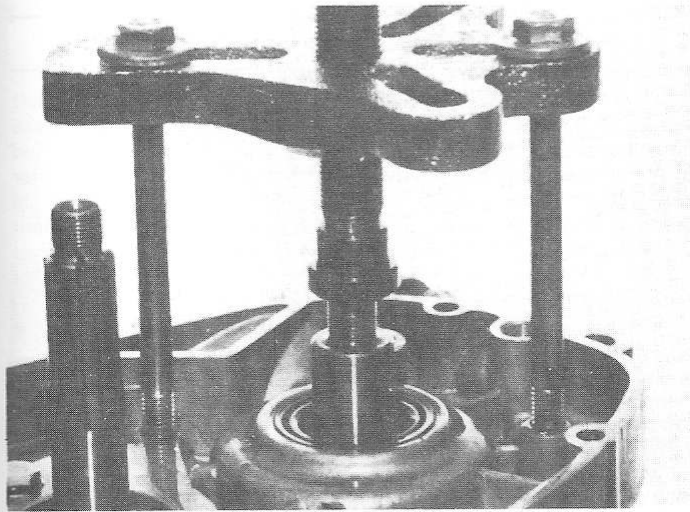
- 1 The kickstarter assembly can be removed with the engine in the frame. Refer to Section 12 and remove the right-side crankcase cover.
- 2 Unhook the end of the spring from the hole in the crankcase and let it unwind. Remove the shaft assembly by rotating it counterclockwise and pulling it out.



20.2 Removing the drive sprocket nut (use a chain wrench or the special tool to keep the shaft from turning)



20.10 Remove the seal retainer plate before splitting the crankcase (the screw hole is needed for the puller)



20.13 Correctly installed crankcase separating tool (the puller must be parallel to the crankcase gasket surface — turn the bolts as required to adjust it)

- 3 To install the kickstarter slide it into the case and make sure the kick clip fits into the groove in the crankcase.
- 4 Rotate the return spring clockwise and hook the end into the hole in the crankcase.
- 5 Rotate the outer gear to make sure the inner (large) gear engages and disengages with the idler gear.

### 19 Kickstarter — disassembly, inspection and reassembly

- 1 It is very important during this procedure to note exactly how the assembly components fit together. As you remove each piece lay it out on the workbench in the order of removal. Use the accompanying illustration as a guide.
- 2 Slide the washer and outer gear off, followed by the sleeve and return spring, the inner washer and the inner gear and kick clip.
- 3 Inspect the spindle for damage to the splines and bearing surfaces.
- 4 Check the gears for broken or worn teeth and splines. Check the idler gear teeth as well. If the idler gear must be replaced the clutch will have to be removed. The gear is held on the shaft with a large snap-ring.
- 5 Inspect the starter return spring for fatigue and damage.
- 6 Inspect the sleeve with the slot in it for cracks and signs of wear. Check the slot for indentations and wear. Replace any worn parts with new ones (ask your dealer to confirm your findings before buying new parts).
- 7 Reassembly is the reverse of disassembly. Be sure to grease the gear bearing surfaces.

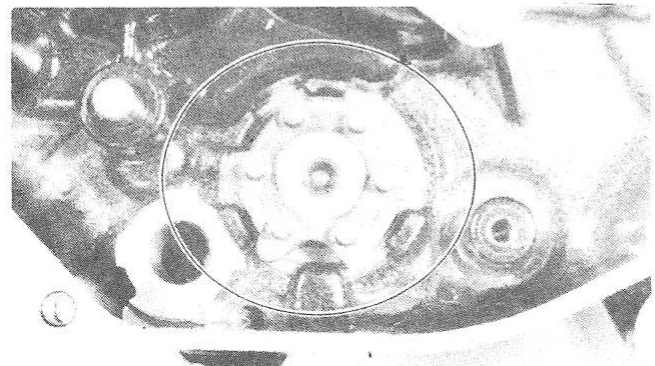


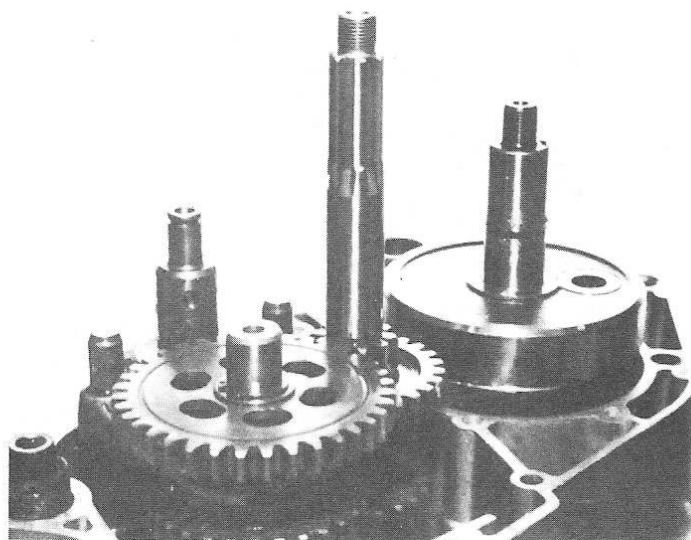
Fig. 2A.29 Before splitting the cases on YTZ 250 models, the cam plate segments must be aligned with the cutouts in the case (Sec 20)

## 20 Crankcase — disassembly and reassembly

### Disassembly

- 1 Remove the engine from the frame (Section 5).
- 2 Loosen and remove the drive sprocket nut after flattening the washer tab with a hammer and punch. Hold the sprocket with a chain wrench or holding tool to keep it from turning as the nut is loosened (photo).
- 3 Remove the cylinder head (Section 7).
- 4 Remove the cylinder (Section 8).
- 5 Remove the piston and rings (Section 9).
- 6 Remove the clutch (Section 12).
- 7 Remove the gearshift linkage (Section 13).
- 8 Remove the recoil starter assembly (if equipped) (Section 16) or the kick starter shaft (Section 18).
- 9 Remove the AC generator rotor (Section 11).
- 10 Remove the primary drive gear nut (it should have been loosened when the clutch was removed — Section 12), then slide off the washer, gear, square key and spacer. Remove the screw and separate the oil seal retainer plate from the crankcase (photo).
- 11 Loosen the crankcase screws 1/4-turn at a time, in a criss-cross pattern, then remove them. Fabricate a cardboard holder for the screws to ensure that they are reinstalled in their original locations.
- 12 On YT 125/175 and YTZ 250 models the cases must be separated with a special tool that will push the crankshaft out of the right main bearing (the crankshaft is press fit into each bearing and the bearings are press fit into the crankcase sections).
- 13 Install the crankcase separating tool as shown in the photo. Make sure the puller bolts are threaded as far as possible into the crankcase





20.16 The crankshaft, shift forks and drum and transmission shafts must be in place in the left-side case section before the cases are rejoined

holes. The puller body must be parallel to the crankcase gasket surfaces. Protect the end of the crankshaft with a thick washer so it isn't damaged by the puller. **Note:** On YTZ 250 models, position the shift drum so the cam plate will pass through the cutouts in the crankcase.

14 Carefully tighten the puller center screw while tapping on the crankcases with a soft-face hammer to help break the seal. **Caution:** Work slowly and make sure the cases separate evenly. If one end hangs up, loosen the puller screw, realign everything and start over. If the cases are reluctant to separate, check for a remaining case screw or fitting. Do not force them apart or pry between the mating surfaces.

15 The shift drum and forks can be removed by referring to Section 22. The transmission shafts will lift out, although you may have to tap lightly on the end of the countershaft with a soft-face hammer to separate it from the bearing. Refer to Section 24 for crankshaft removal and Section 21 for inspection and replacement of crankcase bearings, seals, etc.

### Reassembly

16 Before rejoining the cases the transmission components and the crankshaft and connecting rod must be in place in the left crankcase section (photo). **Note:** On YT 60 models no transmission components are involved.

17 The crankcase should be supported on wood blocks or a homemade engine stand. Clean the mating surfaces with lacquer thinner or acetone, then apply a thin coat of Yamabond-4 semi-drying liquid gasket to both crankcase mating surfaces (be sure to follow the directions on the container).

18 Make sure the dowel pins are in place.

19 Make sure the transmission is in Neutral, then slowly and carefully lower the right crankcase section into position. **Note:** On YTZ 250 models the shift drum cam plate should pass through the cutouts in the crankcase opening. Tap the case very gently with a soft-face hammer to seat it.

20 Make sure the cases are mated, then install the screws. Tighten the screws gradually, in a criss-cross pattern, until they are tight.

21 Turn the crankshaft and transmission shafts several times to check for any obvious binding or rough spots. Do not proceed with the engine reassembly if the crankshaft and transmission shafts do not rotate freely.

22 Install the right crankshaft seal retainer plate and tighten the screw securely.

23 Install a new O-ring on the primary drive gear end of the crankshaft. Lubricate the O-ring and crankshaft seal lip with grease before installing the spacer. Position the square key in the crankshaft groove, then install the primary drive gear, washer and nut. Tighten the nut to the specified torque after the clutch is installed. **Note:** YT 60 models have a multi-piece primary drive gear damper assembly. Refer to the accompanying illustration when reassembling the components.

24 The remaining steps are the reverse of disassembly.

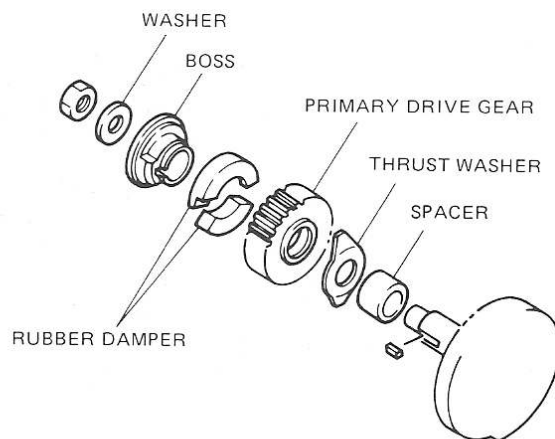


Fig. 2A.30 YT 60 primary drive gear/damper components — exploded view (Sec 20)

### 21 Crankcase components — inspection and servicing

1 After the crankcases have been separated and the crankshaft, shift drum and forks and transmission components removed, the crankcases should be cleaned thoroughly with solvent and dried with compressed air. All oil passages (particularly the delivery passages in the transfer ports) should be blown out with compressed air and all traces of old gasket sealant should be removed from the mating surfaces. **Caution:** Be very careful not to nick or gouge the crankcase mating surfaces or leaks will result. Check both crankcase sections very carefully for cracks and other damage.

2 Carefully pry the shift shaft seal out of the left crankcase with a large screwdriver.

3 Apply a thin layer of multi-purpose grease to the outer edge of the new seal and press it into position with a suitable size socket. The manufacturer's marks or numbers must face out.

4 On YTZ 250 models remove the screw from the left crankcase and withdraw the clutch push lever shaft. Check the roller bearing for wear. If it is worn or damaged (which is not likely), carefully pry out the seal with a large screwdriver. When the seal is removed the bearing will slide out. Lubricate and install the new bearing, then apply a thin layer of multi-purpose grease to the outer edge of the new seal and press it into position with a suitable size socket. The manufacturer's marks or numbers must face out.

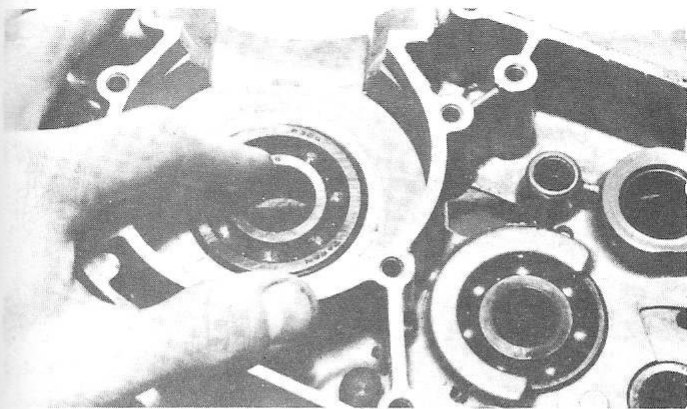
5 Check the shaft for wear then fill the groove with grease and reinstall the shaft in the crankcase. Install the screw (and washer) and tighten it securely.

6 Rotate all of the ball bearings with your fingers (one at a time) and check for noise, binding, rough spots or excessive play (photo). If wear or damage is evident, replace the bearing(s). Some are held in place with retaining plates, which must be removed first (photo). **Note:** The bearings should be removed only after the case has been heated in an oven to a temperature of from 194 to 248°F (90 to 120°C). Never use a torch, as the crankcase may be distorted and ruined. Always remove all of the seals before heating the crankcase. Any bearings not being replaced should be lubricated with oil after heating the case to prevent rust.

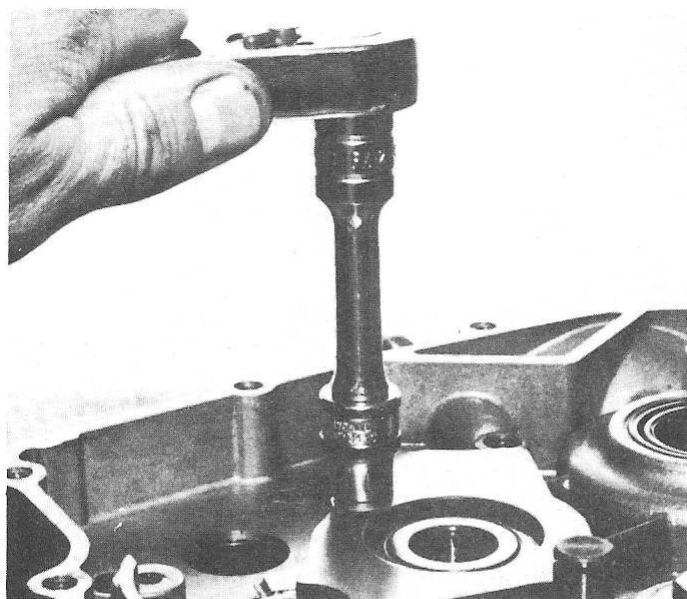
7 If an oven is not available the bearings can be driven out with a hammer and punch (photo), but damage to the crankcase can occur if this method is used. When installing new bearings apply pressure only to the outer race or the bearing will be damaged. The bearings must be installed with the manufacturer's marks or numbers facing out.

8 The crankshaft seals should be replaced with new ones whenever the crankshaft is removed. Carefully pry the seals out of the cases with a large screwdriver or pry bar. Cushion the case with a piece of wood or a rag to prevent damage to the gasket surfaces (photo). **Caution:** Do not push the screwdriver in too far or the seal mounting surface in the case could be gouged by the tool.

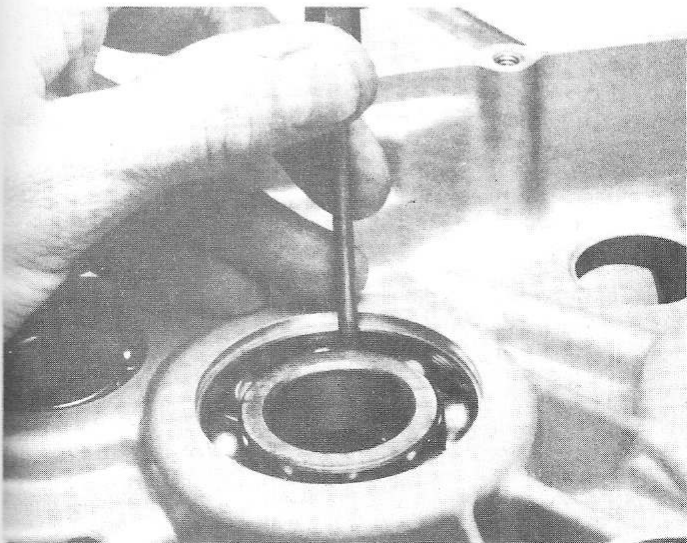
9 Apply a light coat of grease to the outer edge of the new seal and carefully tap it into the case with a hammer and large socket (photo). The socket should have a diameter that matches the outer diameter of the seal. The manufacturer's marks or numbers must face out when the seal is installed.



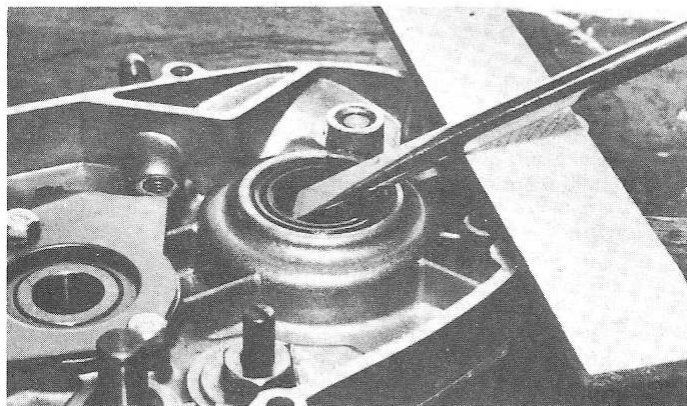
21.6a Check the bearings by rotating the inner races by hand (they should be smooth and quiet, with no excess play)



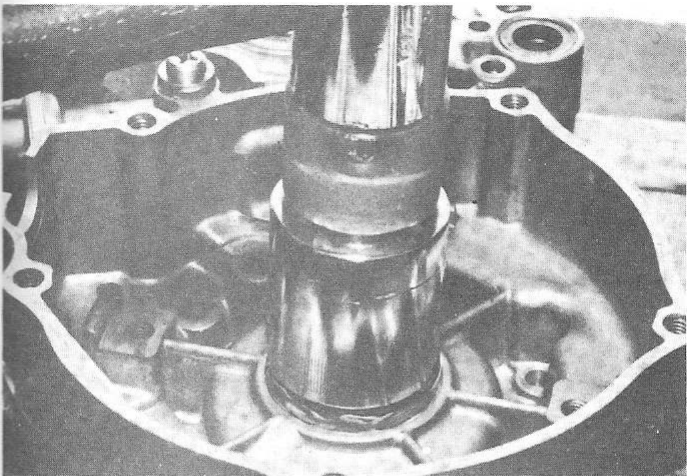
21.6b Some bearings are retained by plates, which must be removed before the bearing



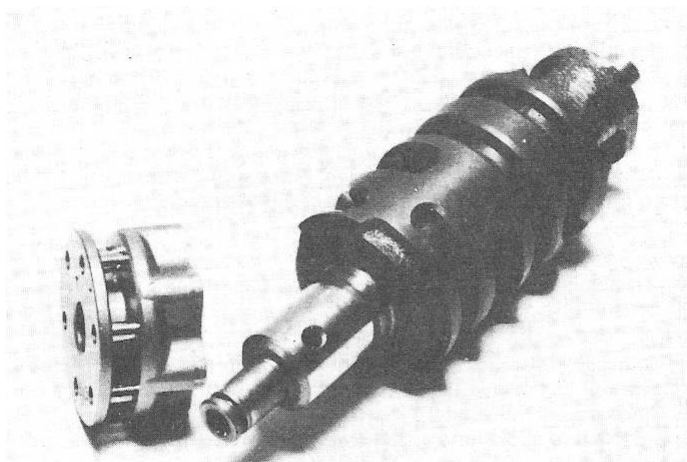
21.7 Removing a bearing by tapping on the outer race with a punch and hammer



21.8 Removing the right-side crankshaft seal



21.9 Tapping the new seal into the case with a hammer and large socket (apply grease to the outer edge of the seal)



22.3 Check the shift drum slots, the shift cam pins and the stopper recesses for wear

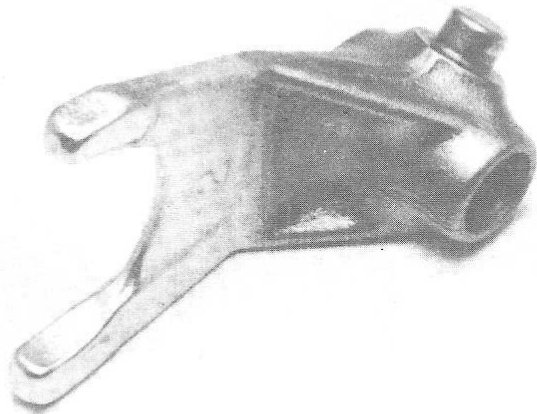
## 22 Shift drum/shift forks — removal, inspection and installation

### Removal

- 1 Support the shift forks and pull straight up on the shift fork shafts, then separate the forks from the gears.
- 2 Pull straight up on the shift drum to remove it from the crankcase.

### Inspection

- 3 Check the edges of the grooves in the drum for signs of excessive wear. Inspect the end plate, the shift pins and the cam plate for wear (photo). On Y TZ 250 models make sure the screw is tight. If wear is evident new parts will be required.
- 4 Check the ball bearings for smooth operation (Section 2.3). If noise or binding is evident the bearing must be replaced.



22.5 Check the shift fork ends, the bore and the guide pin for wear and galling

5 Check the shift forks for distortion and wear, especially at the fork ends. If they are discolored or severely worn they are probably bent. If damage or wear is evident check the shift fork groove in the corresponding gear as well. Inspect the guide pins and the shaft bore for excessive wear or distortion and replace any defective parts with new ones (photo).

6 Check the shift fork shafts for evidence of wear, galling or other damage. Make sure the shift forks move smoothly on the shafts. If the shafts are worn or bent replace them with new ones.

#### Installation

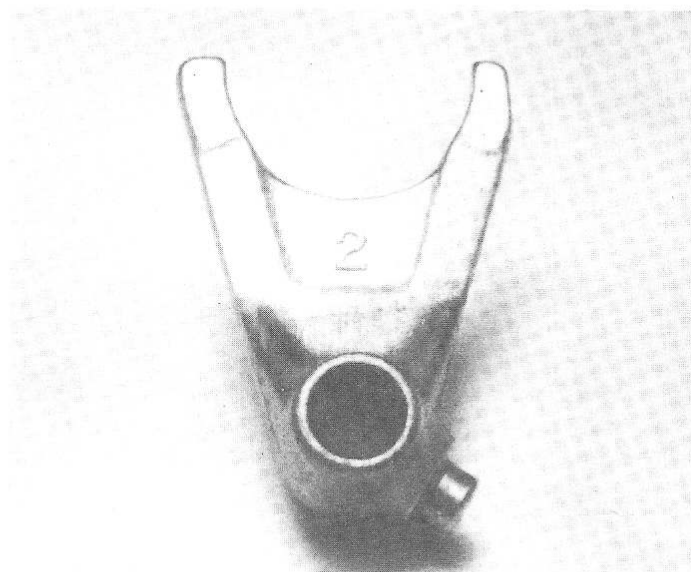
7 Lubricate the grooves in the shift drum (or the guide pins on the forks) with moly-base grease, then install the drum in the left crankcase half.

8 Each shift fork is marked with a number (photo) and must be installed with the number facing up.

9 Lubricate the fork ends, then engage shift fork number 2 in the mainshaft third gear groove and the center shift drum groove. Lubricate the shaft, then slide it through the shift fork bore and into the recess in the crankcase.

10 Lubricate the fork ends, then engage shift fork number 1 in the countershaft fifth gear groove and the lower shift drum groove. Engage shift fork number 3 in the countershaft fourth gear groove and the upper shift drum groove, then lubricate the remaining shaft and slide it through both shift fork bores and into the recess in the crankcase.

11 Turn the shift drum and transmission gears as necessary to place the transmission in the Neutral position. Make sure the gears turn freely before proceeding with the engine reassembly procedure.



22.8 Each shift fork is numbered (the number must face out when the fork is installed)

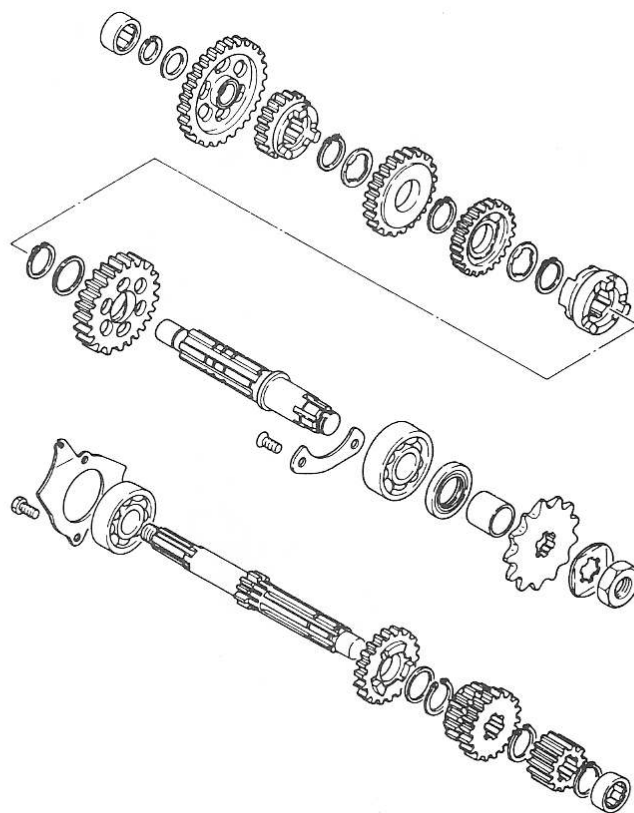


Fig. 2A.31 YT 125/175 transmission shaft components — exploded view (Sec 23)

#### 23 Transmission shafts — disassembly, inspection and reassembly

1 Carefully lift out the mainshaft and countershaft assemblies as a unit with all of the gears in place. Set them on a clean surface.

2 When disassembling the transmission shafts, do one at a time, then reassemble it to avoid mixing up parts. Use the accompanying illustrations as a guide.

3 Snap-ring pliers will be necessary to remove the snap-rings that keep the gears in place.

#### Disassembly

4 Carefully remove the snap-rings, the thrust washers and the gears from the mainshaft. Lay the parts out in the order of removal (make sure the gears and snap-rings are facing the same way they were on the shaft). Clean each part, one at a time, with solvent and dry them thoroughly.

5 Inspect the components then reassemble them before taking apart the countershaft. Use new parts where necessary.

#### Inspection

6 Check the gear teeth, the gear dogs and the shift fork grooves for cracks, heat discoloration and excessive wear (photo). If the gear dogs are rounded off, replace the gears with new ones and check the slots in the gears that mate with the dogs.

7 Check the splines on the shaft and the splines in the gears for wear or distortion. Make sure each gear slides freely on the shaft splines. Check the snap-ring grooves in the shaft for worn and rounded shoulders. If they are damaged, a new shaft will be required (photo). Have the shaft runout checked by an automotive machine shop or motorcycle repair shop.



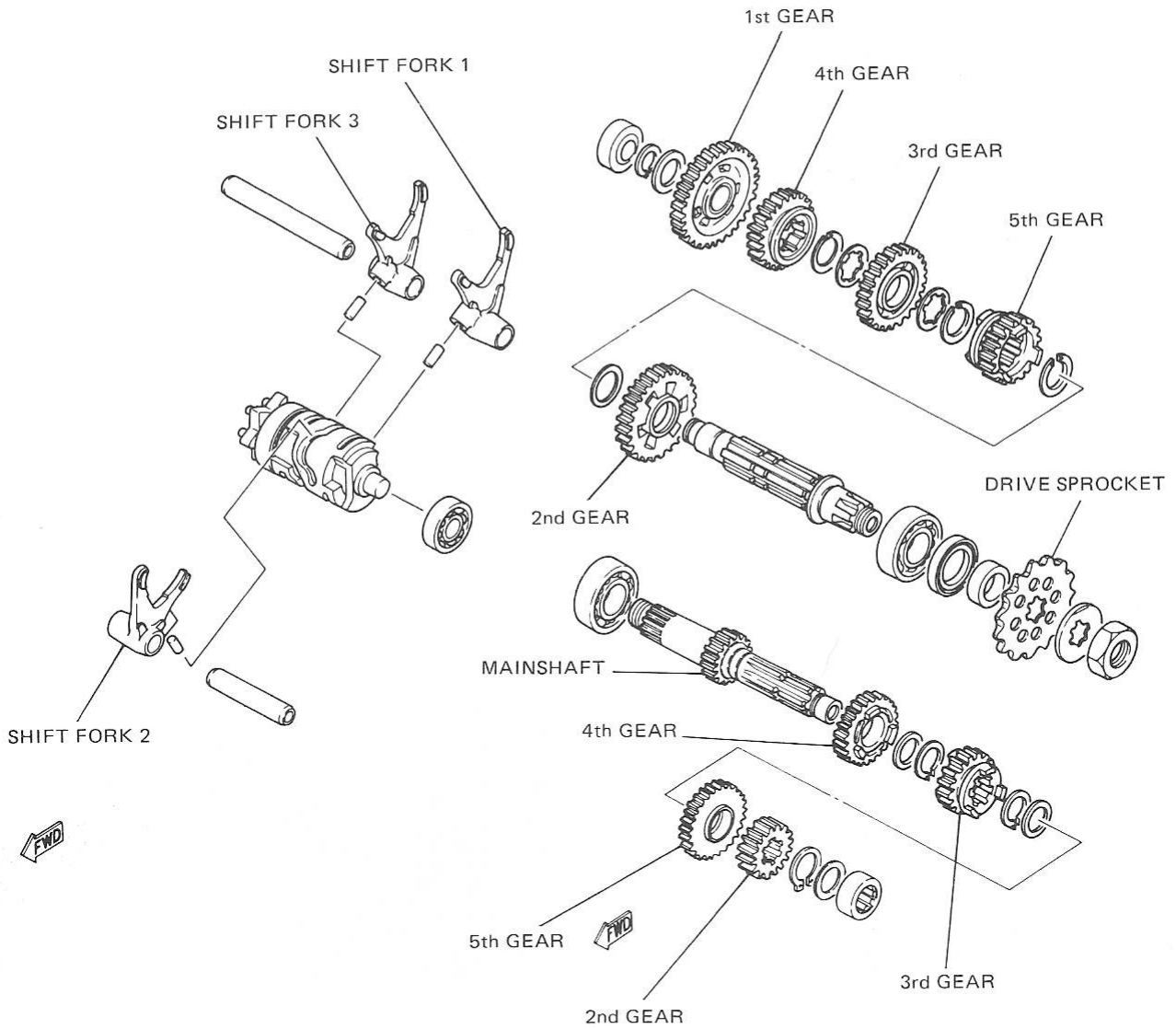
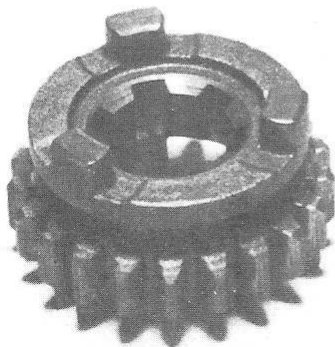
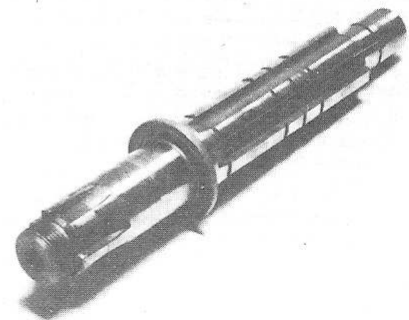


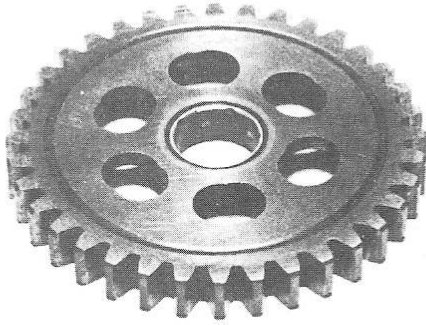
Fig. 2A.32 YTZ 250 transmission shaft components — exploded view (Sec 23)



23.6 Inspect the gear teeth, the splines, the shift grooves and the gear dogs for signs of wear and damage



23.7 Check the shaft splines, bearing areas and snap-ring grooves for wear and damage



23.8 Check the dog slots and the bearings for wear

8 Check the gear bushings (photo) and the corresponding shaft journals for wear, galling and heat discoloration. Make sure they rotate freely on the shaft without excessive play. If a gear requires replacement due to wear or damage, have the gear it mates against on the other shaft replaced as well.

9 Check the thrust washers and snap-rings for wear and distortion. Replace any worn or damaged parts. If in doubt as to the condition of the snap-rings, replace them with new ones — the cost is minimal and it may prevent severe damage that could occur if a snap-ring breaks or shifts during engine operation.

### Reassembly

10 Reassemble the components in the reverse order of disassembly. Use the exploded view as a guide. As the parts are assembled, lubricate the contact surfaces with moly-base grease. Make sure the snap-rings are securely seated in their grooves with the sharp edge on each snap-ring facing out.

## 24 Crankshaft — removal, inspection and installation

### Removal

1 The crankshaft can be removed from the left crankcase half with the same tool that was used to separate the crankcases (Section 20). Attach the puller to the crankcase in the same manner and carefully push the crankshaft out of the bearing.

2 Measure the connecting rod big end side clearance with a feeler gauge.

3 Measure the connecting rod small end free play.

4 Check the runout with a dial indicator by turning the crankshaft between centers on a lathe or on large V-blocks.

5 Measure the width of the crankshaft at the big end journal (across the outer faces of the flywheels).

6 Compare the results to the Specifications at the front of this Chapter. Replace the crankshaft and rod if they are beyond the specified limits. If the special equipment required to check crankshaft runout (a lathe or crankshaft truing jig) is not available, take it to a dealer service department or motorcycle repair shop for this check.

### Installation

7 Refer to Section 23 and check the main bearings as described there. Replace them if necessary. Install new crankshaft seals and apply moly-base grease to the seal lips.

8 Make sure the crankshaft journals are clean and free of burrs, then lubricate the left journal with grease and the left main bearing with two-stroke oil. Position the crankshaft in the left crankcase main bearing.

9 Pull the crankshaft into place in the bearing race by slipping spacers or large washers over the end and tightening the rotor nut (photo). The spacers should bear against the inner bearing race. Add more washers or spacers as the crankshaft moves into the bearing.

10 Keep the connecting rod at top dead center and continue carefully

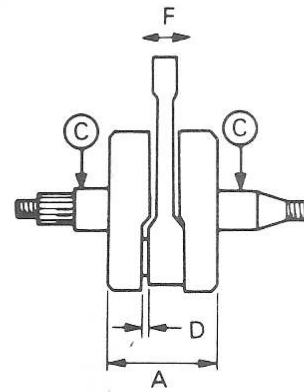
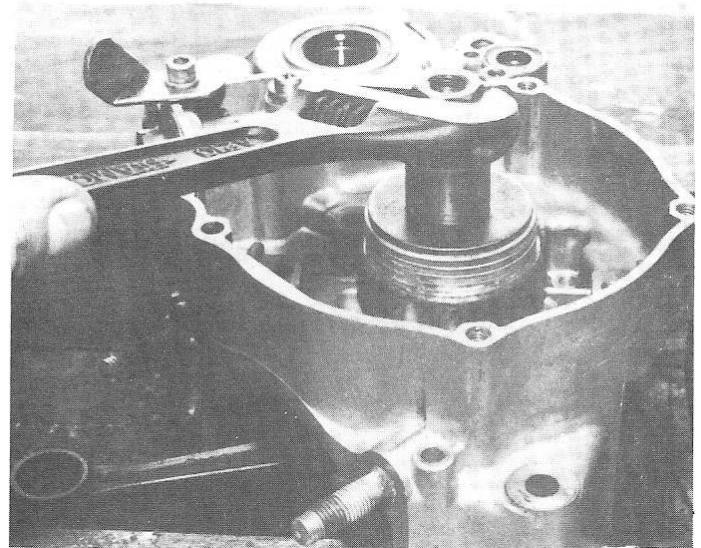


Fig. 2A.33 Crankshaft inspection details (Sec 24)

A Big end width  
C Runout

D Big end side clearance  
F Small end free play



24.9 Installing the crankshaft

tightening the rotor nut until the crankshaft bottoms against the bearing race on the inside.

11 Lubricate the connecting rod big end bearing with two-stroke oil.

## 25 Recommended break-in procedure

1 An engine which has had extensive work, such as new piston rings, new main and/or connecting rod bearings or new transmission parts, must be carefully broken-in to realize the maximum possible benefits from the repairs.

2 The break-in procedure allows the new parts to wear in under controlled conditions and conform to the surfaces which they bear against.

3 Generally, the break-in procedure requires that the engine be allowed to spin freely under light loads without over-revving or continuously running at a constant speed. Do not lug the engine by using large throttle openings at low speeds and do not allow it to idle for long periods of time. These guidelines should be followed for approximately ten operating hours, realizing that as mileage accumulates, gradually higher engine speeds and loads can be applied. After ten operating hours the engine can be considered satisfactorily broken in and the full performance potential can be utilized.

4 If the transmission has been overhauled and new parts installed, replace the transmission oil after five operating hours, then follow the recommended maintenance schedule.

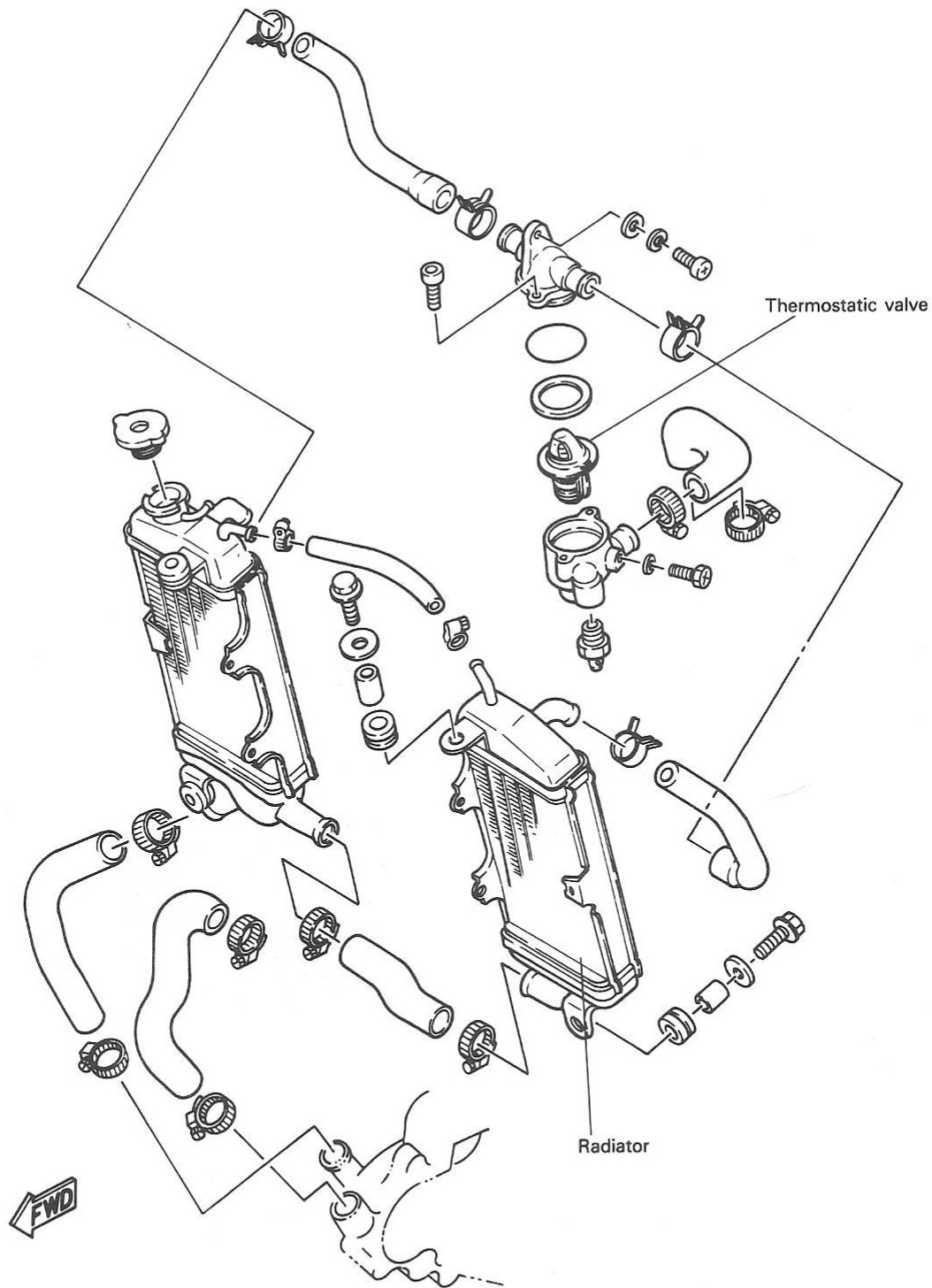


Fig. 2A.34 Cooling system components — exploded view (YTZ 250) (Sec 26)

## 26 Radiator — removal and installation

**Caution:** The engine must be completely cool before beginning this procedure.

- 1 Refer to Chapter 1 and drain the entire cooling system. If the coolant is in good condition, or relatively new, it can be reused.
- 2 Remove the screws and detach the radiator shrouds.
- 3 Loosen the hose clamp and separate the lower radiator hose from the right-side radiator. If it is difficult to remove, grasp the hose with water pump pliers and twist it around the radiator fitting until it can be pulled free.
- 4 Repeat the procedure and remove the upper hose from the left-side radiator.
- 5 Loosen the clamp and detach the upper radiator connecting hose from the right-side radiator, then remove the upper mounting bolt.
- 6 Loosen the right-side clamp on the lower radiator connecting hose, then remove the lower mounting bolt and detach the right-side radiator from the frame (pull it out of the lower hose).
- 7 Remove the bolts and detach the left-side radiator and connecting hoses from the frame.
- 8 Carefully examine the radiators for evidence of leaks and damage. It is recommended that any necessary repairs be performed by a reputable radiator repair shop.
- 9 If the radiators are clogged, or if large amounts of rust or scale have formed, the repair shop will also do a thorough cleaning job.
- 10 Make sure the spaces between the cooling tubes and fins are clear. If necessary, use compressed air or running water to remove anything



that may be clogging them. If the fins are bent or flattened, straighten them very carefully with a small screwdriver.

11 Installation is basically the reverse of removal. If the rubber hoses are damaged or deteriorated this would be a logical time to replace them with new ones. Replace the spring-type hose clamps with stainless steel, worm drive screw-type clamps.

12 After the installation is complete refill the cooling system (see Chapter 1), start the engine and check carefully for leaks.

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### 27 Thermostat — removal, check and installation

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**Caution:** *The engine must be completely cool before beginning this procedure.*

#### *Removal*

1 If the thermostat is functioning properly, the coolant temperature should rise to the normal operating temperature quickly and then stay there, only rising above normal occasionally when the engine gets unusually hot. If the engine does not reach normal operating temperature quickly, or if it overheats, the thermostat should be removed and checked or replaced with a new one.

2 Refer to Chapter 1 and drain the entire cooling system, then detach the radiator hoses from the thermostat cover. Remove the thermostat cover-to-frame bolt and the cover bolts, then separate the cover from

the housing.

3 Withdraw the thermostat and rubber gasket from the housing.

#### *Check*

4 Remove any coolant deposits, then visually check the thermostat for corrosion, cracks or other damage. If the thermostat is open when removed, it is defective. Check the rubber gasket for cracks or other damage.

5 To check thermostat operation, submerge it in a container of water along with a thermometer. The thermostat should be suspended so it does not touch the container.

6 Gradually heat the water in the container with a hotplate or stove and check the temperature when the thermostat first starts to open. It should be about 152 °F.

7 Continue heating the water and check the temperature when the thermostat is fully open. It should be about 176 °F.

8 Lift the fully open thermostat out of the water and make sure the valve has opened a distance of 0.280-inch (7 mm).

9 If the thermostat does not open while the water is heated, replace it with a new one.

#### *Installation*

10 Installation is the reverse of removal. Make sure the O-ring on the housing is in place and undamaged. Refill the cooling system (Chapter 1) and start the engine, then check carefully for leaks.

# Chapter 2 Part B Four-stroke engines

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## Specifications

### General

Bore	
200 .....	2.6 in (67.0 mm)
225 .....	2.76 in (70 mm)
Stroke	
200 .....	2.2 in (55.7 mm)
225 .....	2.28 in (58 mm)
Displacement	
200 .....	196.3 cc
225 .....	223.2 cc
Compression ratio	
200 .....	8.5:1
225 .....	8.8:1

**Camshaft**

Bearing oil clearance	0.0008 to 0.0024 in (0.020 to 0.061 mm)
Lobe height	
Intake	1.4385 to 1.4424 in (36.537 to 36.637 mm)
Exhaust	1.440 to 1.444 in (36.577 to 36.677 mm)
Runout limit	0.0012 in (0.03 mm)

**Valves, valve springs and cylinder head**

Valve face width	0.089 in (2.26 mm)
Valve seat width	0.0354 to 0.0433 in (0.9 to 1.1 mm)
Margin thickness limit	0.0315 to 0.0472 in (0.8 to 1.2 mm)
Valve stem diameter	
Intake	0.2352 to 0.2358 in (5.975 to 5.990 mm)
Exhaust	0.2346 to 0.2352 in (5.960 to 5.975 mm)
Valve guide diameter (intake and exhaust)	0.2362 to 0.2367 in (6.000 to 6.012 mm)
Valve stem-to-guide clearance	
Intake	0.0004 to 0.0015 in (0.010 to 0.037 mm)
Exhaust	0.001 to 0.002 in (0.025 to 0.052 mm)
Valve stem runout limit	0.0012 in (0.03 mm)
Valve spring free length (intake and exhaust)	
Inner spring	1.40 in (35.5 mm)
Outer spring	1.46 in (37.2 mm)
Valve spring installed height/pressure	
Inner spring	1.20 in (30.5 mm) @ 20.5 lbs
Outer spring	1.26 in (32.0 mm) @ 40.8 lbs
Valve spring out-of-square limit	2.5°/0.063 in (1.6 mm)
Rocker arm inside diameter	
Standard	0.4724 to 0.4731 in (12.00 to 12.018 mm)
Service limit	0.474 in (12.03 mm)
Rocker arm shaft outside diameter	
Standard	0.4718 to 0.4721 in (11.985 to 11.991 mm)
Service limit	0.470 in (11.94 mm)
Rocker arm-to-shaft clearance	0.0004 to 0.0015 in (0.009 to 0.037 mm)
Cylinder head warpage limit	0.0012 in (0.03 mm)

**Cylinders**

Bore size	
200	2.6388 to 2.6408 in (66.97 to 67.02 mm)
225	2.7547 to 2.7567 in (69.97 to 70.02 mm)
Taper limit	0.0002 in (0.005 mm)
Out-of-round limit	0.0004 in (0.01 mm)
Cylinder-to-piston clearance	0.001 to 0.0018 in (0.025 to 0.045 mm)

**Pistons and piston rings**

Piston ring-to-groove clearance limit	
Top ring	0.004 in (0.1 mm)
2nd ring	0.035 in (0.9 mm)
Oil ring	No measurable clearance
Piston ring end gap	
Top/2nd rings (limit)	0.0295 in (0.75 mm)
Oil ring side rails (standard)	0.0118 to 0.0354 in (0.3 to 0.9 mm)

**Crankshaft and bearings**

Connecting rod side clearance	0.0138 to 0.0256 in (0.35 to 0.65 mm)
Crankshaft runout limit (see illustration)	
C1	0.0008 in (0.02 mm)
C2	0.0024 in (0.06 mm)



**Crankshaft and bearings (continued)**

Crankshaft width . . . . .	2.2028 to 2.2047 in (55.95 to 56.00 mm)
Connecting rod small end free play limit . . . . .	0.080 in (2.0 mm)

**Clutch**

Friction plate thickness	
Standard . . . . .	0.120 in (3.0 mm)
Service limit . . . . .	0.110 in (2.8 mm)
Metal plate thickness . . . . .	0.060 in (1.6 mm)
Metal plate warpage limit . . . . .	0.008 in (0.2 mm)
Clutch spring free length . . . . .	1.37 in (34.9 mm)
Primary clutch shoe thickness	
Standard . . . . .	0.079 in (2.0 mm)
Service limit . . . . .	0.059 in (1.5 mm)

**Transmission**

Shaft runout limit . . . . .	0.0031 in (0.08 mm)
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**Oil pump**

Tip clearance . . . . .	0.0059 in (0.15 mm)
Side clearance . . . . .	0.0016 to 0.0035 in (0.04 to 0.09 mm)
Rotor thickness . . . . .	0.236 in (6.0 mm)

**Torque specifications**

	Ft-lbs	M-kg
Cylinder head flange bolt . . . . .	16	2.2
Cylinder head bolt . . . . .	14	2.0
Cylinder bolts . . . . .	7.2	1.0
Balancer shaft nut . . . . .	36	5.0
Recoil starter pulley bolt . . . . .	36	5.0
Camshaft sprocket bolt . . . . .	43	6.0
Camshaft bearing retainer plate bolts . . . . .	5.8	0.8
Chain tensioner nut . . . . .	22	3.0
Primary clutch nut . . . . .	56	7.8
Clutch hub nut . . . . .	36	5.0
Engine mount bolts/nuts . . . . .	24	3.3

**1 General information**

The four-stroke engine is a single cylinder, air-cooled overhead cam powerplant with a counterbalancer assembly to dampen out engine vibrations.

Two clutches are used — a primary clutch, which is centrifugally actuated, and a secondary clutch, which is a conventional motorcycle design. The primary clutch is mounted on the right end of the crankshaft and drives the secondary clutch, which is attached to the transmission mainshaft.

The transmission is a constant mesh 5-speed, with a reverse gearbox installed on some models.

The crankcase is made of aluminum and splits vertically. The crankshaft is a built-up assembly and rides in large ball bearings.

A recoil starter assembly is standard equipment on most models, with electric starting used on some. **Note:** *If service or repair of the output gearbox or reverse gear is required, it must be done by a Yamaha dealer service department.*

**2 Major engine repair — general note**

1 It is not always easy to determine when or if an engine should be completely overhauled, as a number of factors must be considered.

2 High mileage is not necessarily an indication that an overhaul is needed, while low mileage does not preclude the need for an overhaul. Frequency of servicing is the single most important consideration. An engine that has regular and frequent oil changes, as well as other required maintenance, will most likely give many miles of reliable service. Conversely, a neglected engine, or one which has not been broken in properly, may require an overhaul very early in its life.

3 Exhaust smoke and excessive oil consumption are both indications that piston rings and/or valve guides are in need of attention. Make sure that oil leaks are not responsible before deciding that the rings and guides are bad. Refer to Chapter 1 and perform a cylinder compression check to determine the nature and extent of the work required.

4 If the engine is making obvious knocking or rumbling noises, the connecting rod and/or main bearings are probably at fault.

5 Loss of power, rough running, excessive valve train noise and high fuel consumption rates may also point to the need for an overhaul, especially if they are all present at the same time. If a complete tuneup does not remedy the situation, major mechanical work is the only solution.

6 An engine overhaul involves restoring the internal parts to the specifications of a new engine. During an overhaul the piston rings are replaced and the cylinder walls are bored and/or honed. If a rebore is done a new piston is required. The main and connecting rod bearings are generally replaced with new ones and, if necessary, the crankshaft is also replaced. Generally the valves are serviced as well, since they

are usually in less than perfect condition at this point. While the engine is being overhauled, other components such as the carburetors and the starter motor can be rebuilt also. The end result should be a like-new engine that will give many troublefree miles.

7 Before beginning the engine overhaul read through all of the related procedures to familiarize yourself with the scope and requirements of the job. Overhauling an engine is not difficult, but it is time consuming. Plan on the machine being tied up for a minimum of two weeks. Check on the availability of parts and make sure that any necessary special tools, equipment and supplies are obtained in advance.

8 Most work can be done with typical hand tools, although a number of precision measuring tools are required for inspecting parts to determine if they must be replaced. Often a dealer service department or motorcycle repair shop will handle the inspection of parts and offer advice concerning reconditioning and replacement. As a general rule, time is the primary cost of an overhaul so it doesn't pay to install worn or substandard parts.

9 As a final note, to ensure maximum life and minimum trouble from a rebuilt engine, everything must be assembled with care in a spotlessly clean environment.

### 3 Repair operations requiring engine removal

1 Although many repair operations can be performed with the engine in place in the frame, others, especially those related to the lower end and the transmission, require that it be removed. Fortunately the removal procedure is not very difficult or time consuming.

2 Inspection and repair or replacement of the following components requires removal of the engine:

*Crankshaft and connecting rod*  
*Main and connecting rod bearings*  
*Balancer shaft*  
*Transmission shafts and gears*  
*Shift drum and shift forks*

3 Components and systems other than those listed are accessible for inspection and repair or replacement with the engine in the frame.

### 4 Engine — removal and installation

**Note:** *Engine removal and installation should be done with the aid of an assistant to prevent the engine from falling or being dropped.*

1 Refer to Chapter 1 and drain the engine oil.

#### Chain drive models

2 Remove the fuel tank cover. Turn the petcock to *Off*, disconnect the lines from the petcock and tank, remove the bolt and release the rubber strap, then detach the tank.

3 Remove the exhaust pipe flange bolts and the muffler mounting bolts, then detach the exhaust system.

4 Remove the bolt and separate the shift lever from the shaft on the engine.

5 Loosen the drive chain tensioner, remove the three bolts and separate the lock plate from the drive sprocket. Pull the sprocket and chain off of the shaft.

6 Refer to Chapter 3 and remove the carburetor.

7 Remove the spark plug lead and loop it around the frame. Disconnect the ignition and lighting coil wire connectors and free the wires from the frame so they don't get snagged when the engine is removed.

8 Disconnect the cable from the brake pedal and detach the cable housing from the engine.

9 Detach the decompression cable from the head and the vent pipe from the crankcase.

10 Remove the rear mounting bolts/nuts and the front brackets.

11 Remove the head-to-frame brackets and pull the engine out through the right side of the frame.

#### Shaft drive models

##### Four wheelers

12 Remove the rear brake cable adjusters at the caliper levers. Disconnect the cables from the holder.

13 Remove the left footrest.

14 Support the rear of the machine and detach the rear wheels.

Separate the hitch bracket from the frame.

15 Disconnect the breather hose from the final drive unit and remove the final drive mounting nuts/bolts.

16 Remove the rear hub bolts and separate the hub from the frame.

17 Disconnect the battery cables, negative first, then positive.

18 Remove the front and rear carrier bolts and pivot both carriers up.

19 Remove the front cover and fuel tank cover.

20 Turn the petcock to *Off* and disconnect the fuel line and release the rubber strap. Remove the bolts to detach the tank.

21 Remove the rear fender assembly.

22 Remove the exhaust pipe flange bolts and the muffler mounting bolts, then detach the exhaust system.

23 Refer to Chapter 3 and remove the carburetor.

24 Remove the spark plug lead and loop it around the frame. Disconnect the ignition and lighting coil wire connectors and free the wires from the frame so they don't get snagged when the engine is removed.

25 Detach the vent pipe from the crankcase.

26 Refer to Chapter 7 and remove the starter motor.

27 Remove the rear mounting bolts/nuts and the front bolt/nut.

28 Remove the head-to-frame brackets and pull the engine out through the left side of the frame.

##### Three wheelers

29 Loosen the rear brake cable adjusters at the caliper levers. Disconnect the cables from the lever, pedal, holder and cable guides.

30 Support the rear of the machine and detach the rear wheels. Separate the hitch bracket from the frame.

31 Disconnect the breather hose from the final drive unit and remove the final drive mounting nuts/bolts.

32 Remove the rear hub bolts and separate the hub from the frame.

33 Disconnect the battery cables, negative first, then positive.

34 Loosen the rear carrier mounting knob and pull the carrier to the rear.

35 Remove the seat and rear fender assembly and the fuel tank cover. Remove the tank mounting nut and strap. Turn the petcock to *Off*, then disconnect the fuel line and remove the tank.

36 Remove the cover bracket from the frame.

37 Remove the exhaust pipe flange bolts and the muffler mounting bolts, then detach the exhaust system.

38 Refer to Chapter 3 and remove the carburetor.

39 Remove the spark plug lead and loop it around the frame. Disconnect the ignition and lighting coil wire connectors and free the wires from the frame so they don't get snagged when the engine is removed.

40 Detach the vent pipe from the crankcase. Remove the bolt and separate the shift lever from the shaft in the engine.

41 Refer to Chapter 7 and remove the starter motor.

42 Remove the rear mounting bolts/nuts and the front brackets.

43 Remove the head-to-frame brackets and pull the engine out through the right side of the frame.

##### Installation

44 Installation is the reverse of removal.

### 5 Engine disassembly and reassembly — general note

1 Before disassembling the engine clean the exterior with a degreaser and rinse it with water. A clean engine will make the job easier and prevent the possibility of getting dirt into the internal areas of the engine.

2 In addition to the precision measuring tools mentioned earlier, you will need a torque wrench, a valve spring compressor, oil line brushes and a motorcycle piston ring removal and installation tool. Some new engine oil of the correct grade and type, some moly-base grease and a tube of Yamabond-4 sealant will also be required.

3 An engine support stand made from short lengths of 2 x 4's bolted together will facilitate the disassembly and reassembly procedures (see photos in Chapter 2, Part A).

4 When disassembling the engine, keep 'mated' parts together, such as gears, valves, etc. that have been in contact with each other during engine operation. These 'mated' parts must be reused or replaced as an assembly.

5 Engine and transmission disassembly should be done in the following general order with reference to the appropriate Sections.

*Remove the cylinder head*

*Remove the cylinder and piston*

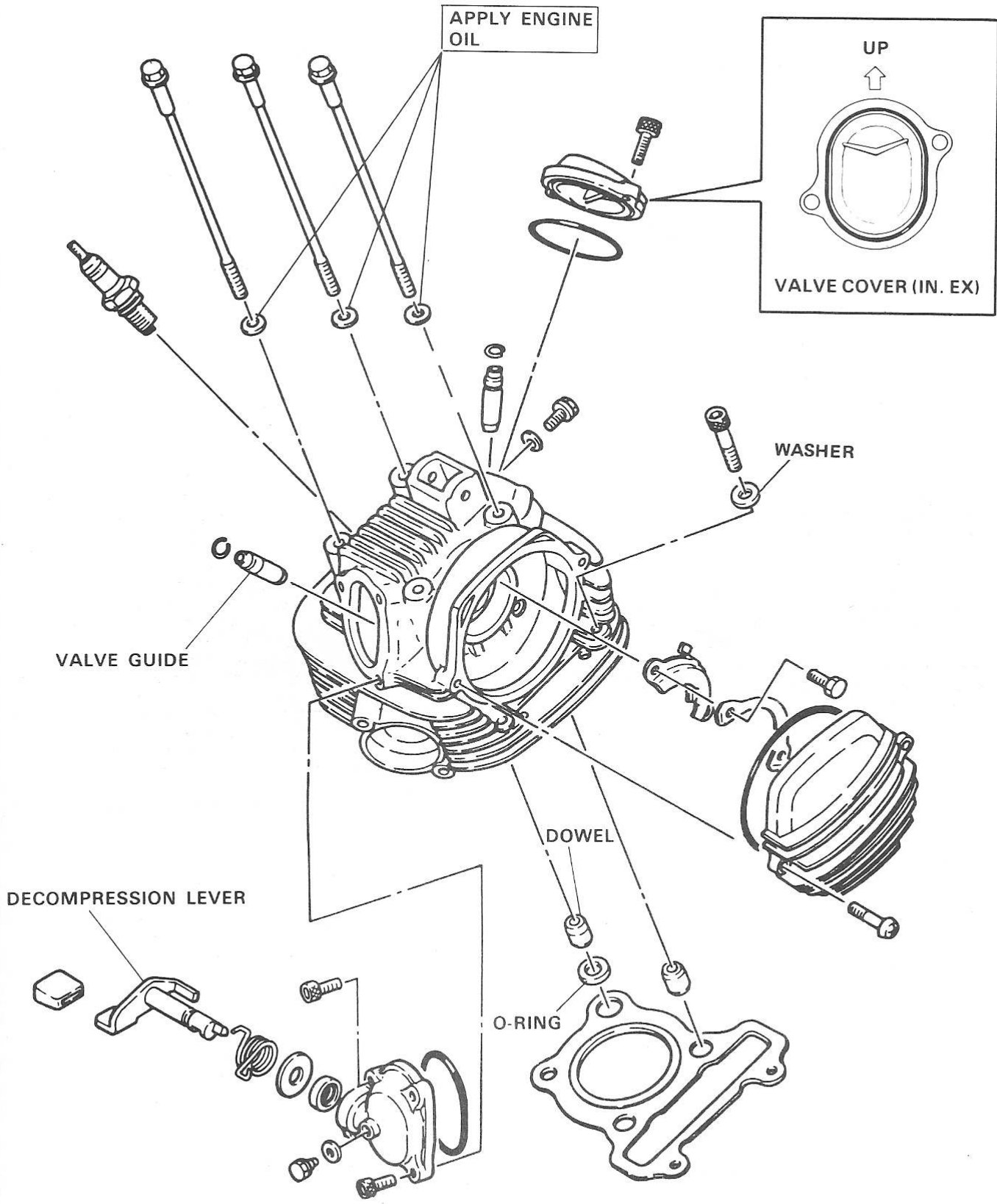
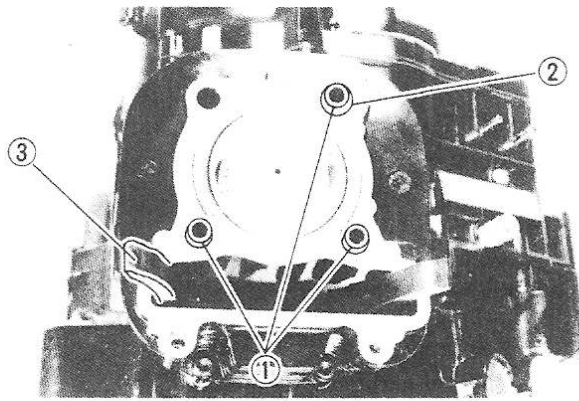


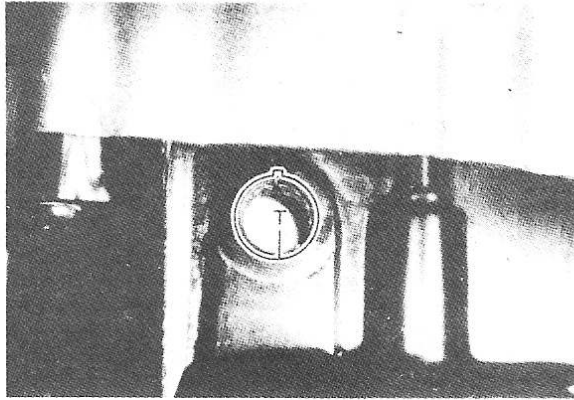
Fig. 2B.1 Cylinder head components — exploded view (Sec 6)



1. Dowel 2. O-ring 3. Cam chain guide #1

**Fig. 2B.2** Make sure the O-ring is in place and insert the cam chain guide into the recess in the case before installing the head (Sec 6)

- 1 Dowel pin 3 Front cam chain guide  
2 O-ring



**Fig. 2B.4** When installing the cam sprocket, the T mark on the rotor must be aligned with the notch in the timing window (Sec 6)

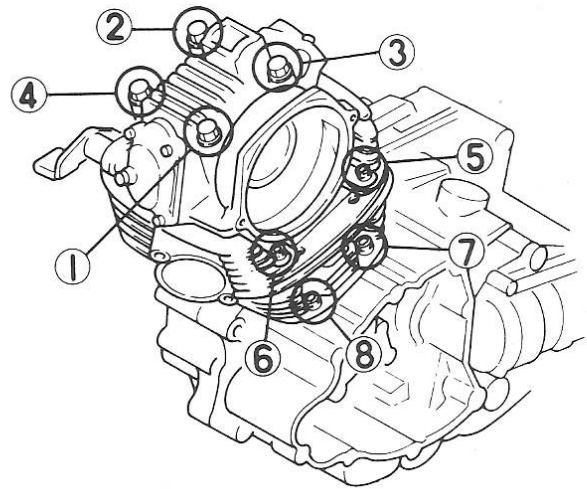
- Remove the AC generator
- Remove the cam drive mechanism
- Remove the right engine side cover and clutches
- Remove the right crankcase spacer
- Remove the oil pump
- Remove the gearshift mechanism
- Remove the balancer gears
- Separate the crankcase halves
- Remove the balancer shaft
- Remove the crankshaft and connecting rod
- Remove the shift drum and forks
- Remove the transmission shafts and gears

6 Reassembly is accomplished by reversing the general disassembly sequence.

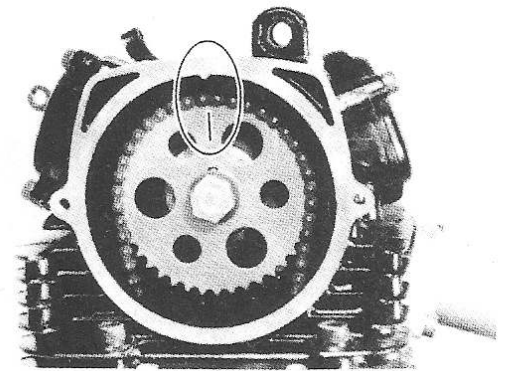
## 6 Cylinder head — removal and installation

### Removal

- 1 Remove the cam chain tensioner cap and loosen the locknut, then unscrew the tensioner assembly. Note the installed position of each part.
- 2 Remove the two screws and separate the camshaft sprocket cover from the head. Remove the recoil starter assembly and the spark plug.
- 3 Hold the recoil starter pulley to keep the crankshaft from turning and loosen the camshaft sprocket bolt with a socket and breaker bar. Remove the bolt, slip the sprocket out of the chain and hang the chain over the end of the camshaft.
- 4 Loosen the six cylinder head bolts and the two cylinder base bolts



**Fig. 2B.3** Cylinder head bolt tightening sequence (Sec 6)



**Fig. 2B.5** Align the sprocket mark with the mark on the head (the T mark must still be aligned in the window also) (Sec 6)

- 1/4-turn each at a time, in a criss-cross pattern, then remove them.
- 5 Carefully separate the head from the cylinder. You may have to tap lightly on the head with a soft-face hammer to break the gasket seal, but do not pry between the cylinder and head to separate them as damage to the gasket sealing surfaces will result.
- 6 Note how they are installed, then remove the dowel pins and the large O-ring. Peel up the old head gasket and discard it. A new one must be used during installation. Lift the front cam chain guide out of the cylinder.
- 7 Using a blunt gasket scraper or similar tool, remove all traces of old gasket material left on the head and cylinder gasket sealing surfaces. Clean them with a solvent such as lacquer thinner or acetone to ensure that the new gasket will adhere and seal properly.

### Installation

- 8 Install the dowel pins and a new O-ring then lay the new head gasket in place. Never reuse the old gasket and do not use any type of gasket sealer. Position the front cam chain guide in the cylinder cavity and make sure it engages in the recess.
- 9 Apply a small amount of engine oil to the copper washers installed with the head bolts.
- 10 Carefully set the cylinder head in place while directing the front cam chain guide into the slot and threading the cam chain up into the head and out the side. Hold the chain up with a piece of wire.
- 11 Install the head bolts and washers and tighten them gradually in four steps, following the sequence shown in the accompanying illustration, until the specified torque is reached. Don't forget to tighten the two small cylinder base bolts as well.
- 12 Remove the timing window plug from the left crankcase cover and rotate the crankshaft until the T mark is aligned with the notch in the



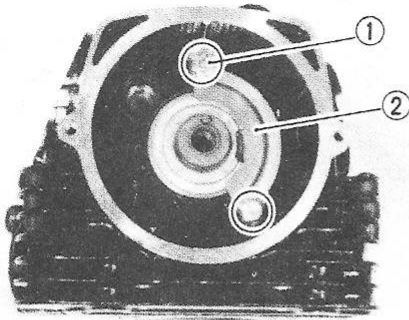


Fig. 2B.6 After flattening the tab, remove the bolts (1) and detach the retainer plate (2) to remove the camshaft (Sec 7)

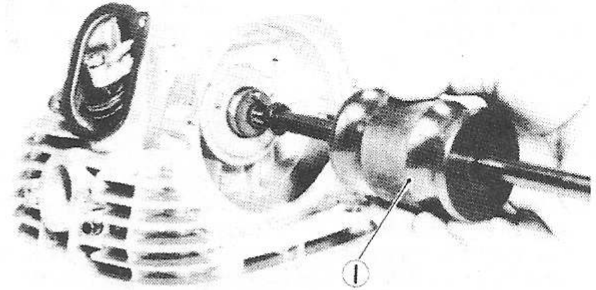


Fig. 2B.7 The camshaft must be removed with a slide hammer (1) — a large bolt may also work (Sec 7)

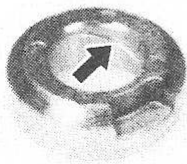


Fig. 2B.8 Check the outer camshaft bearing for wear and damage (Sec 7)

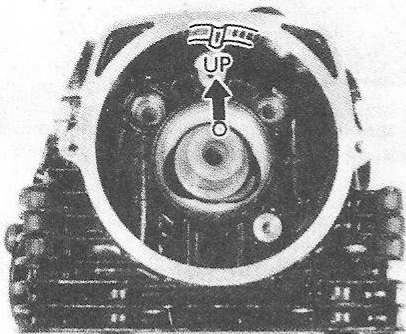
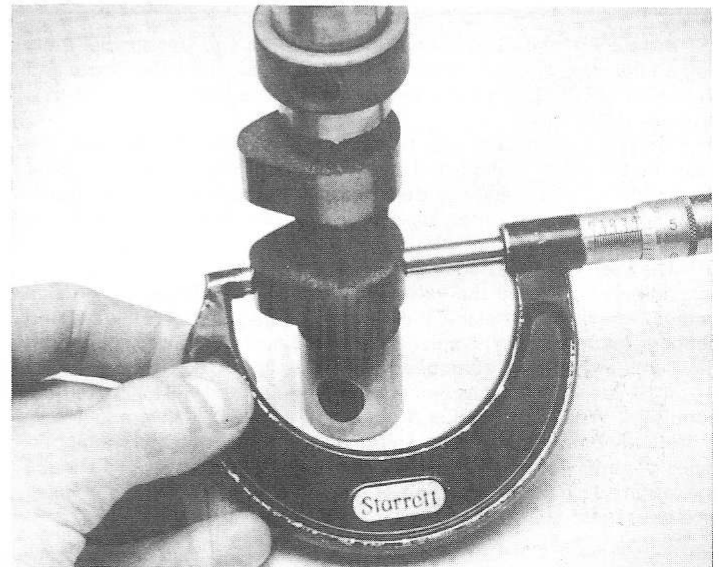


Fig. 2B.9 When installing the camshaft, the pin must face up and be aligned with the timing mark on the head (Sec 7)



7.6 Measuring camshaft lobe height with a micrometer

*prevent this hold it up with a piece of wire.*

- 2 Remove the bolts and separate the valve covers from the head, then loosen the locknuts and back out the valve adjuster in each valve.
- 3 Flatten the tabbed washer tabs and remove the bolts, then detach the camshaft bearing retaining plate. Be careful not to drop the bolts or plate down into the engine — you can stuff a clean rag in the cylinder cavity to prevent such an occurrence.
- 4 The camshaft and bearing are removed as an assembly with a slide hammer. Thread the slide hammer bolt into the hole in the end of the camshaft (10 mm threads) and gently tap the camshaft out. This will force the bearing out. Keep the rocker arms pivoted up and out of the way of the cam lobes.

### Inspection

- 5 Inspect the camshaft journals and the bearing surfaces. Look for rust, pits, score marks, deep scratches and evidence of galling.
- 6 Check the camshaft lobes for heat discoloration (blue appearance), score marks, chipped areas and flat spots. Measure the height of each lobe (photo) and compare the results to the specifications. Have the camshaft runout checked by a dealer service department or an automotive machine shop. If damage or excessive wear is evident, the camshaft must be replaced with a new one.
- 7 Check the camshaft bearing oil clearances. Clean the camshaft and the bearing surfaces in the cylinder head and bearing with a clean, lint-free cloth, then measure each bearing journal outside diameter in several places with a micrometer. Record the results. Measure the inside diameter of each bearing with a telescoping gauge, then measure the gauge with a micrometer to obtain the size. Record the results. Subtract the journal diameter from the bearing diameter to obtain the clearance. If it is excessive, new bearings and/or a camshaft will be required.
- 8 Check the sprocket for wear, cracks or other damage. **Note:** If the

window. **Note:** Work slowly and hold the cam chain up with the piece of wire so it doesn't jam in the drive sprocket on the crankshaft.

13 Engage the sprocket in the chain and attach it to the camshaft. The pin on the cam must fit into the hole in the sprocket. The timing mark on the sprocket must be aligned with the mark on the head. Pull all of the slack from the front side of the chain — the front run must be taut when the sprocket is installed.

14 Install the bolt and tighten it to the specified torque while holding the recoil starter pulley to keep the crankshaft from turning. Make sure the marks are aligned as described above.

15 Install the sprocket cover and tighten the screws securely. Make sure the bracket is attached under the rear screw.

16 Install the chain tensioner assembly and adjust it as described in Chapter 1.

## 7 Camshaft — removal, inspection and installation

### Removal

1 Refer to Section 6 and remove the sprocket from the camshaft. **Note:** Don't let the cam chain fall down into the cylinder cavity. To



sprocket is worn, the chain and drive sprocket are also worn and the chain guides should be checked as well. Replacement of these parts requires removal of the head and cylinder as well as the AC generator (see Section 23). Always replace the chain and both sprockets when any one or all of the parts are worn or damaged.

### Installation

9 Apply moly-base grease to the camshaft lobes and journals, then slip the cam into the head. The pin on the cam must be up, aligned with the timing mark on the cylinder head. Slip the outer bearing onto the camshaft and carefully tap it into place with a socket and hammer. **Caution:** Make sure the bearing is installed squarely until the cut out portion is flush with the head.

10 Position the retaining plate and install the bolts. Tighten the bolts to the specified torque and bend up the washer tabs to keep the bolts from loosening.

11 Refer to Section 6 and install the camshaft sprocket and chain.

## 8 Valves, valve seats and valve guides — servicing

1 Because of the complex nature of this job and the special tools and equipment required, servicing of the valves, the valve seats and the valve guides (commonly known as a valve job) is best left to a professional.

2 The home mechanic can, however, remove and disassemble the head, do the initial cleaning and inspection, then reassemble and deliver the head to a dealer service department or properly equipped repair shop for the actual valve servicing. Refer to Section 9 for those procedures.

3 The dealer service department will remove the valves and springs, recondition or replace the valves and valve seats, replace the valve guides, check and replace the valve springs, spring retainers and keepers (as necessary), replace the valve seals with new ones and reassemble the valve components.

4 After the valve job has been performed the head will be in like-new condition. When the head is returned be sure to clean it again very thoroughly before installation on the engine to remove any metal particles or abrasive grit that may still be present from the valve service operations. Use compressed air, if available, to blow out all the holes and passages.

## 9 Cylinder head and valves — disassembly, inspection and reassembly

1 As mentioned in the previous Section, valve servicing and valve guide replacement should be left to a dealer service department or motorcycle repair shop. However, disassembly, cleaning and inspection of the valves and related components can be done, if the necessary special tools are available, by the home mechanic. This way no expense is incurred if the inspection reveals that service work is not required at this time.

2 To properly disassemble the valve components a valve spring compressor is absolutely necessary. If the special tool is not available, have a dealer service department or motorcycle repair shop handle the entire process of disassembly, inspection, service or repair (if required) and reassembly of the valves.

### Disassembly

3 Thread a bolt into the end of each rocker arm shaft and pull the shafts out of the head, then lift out the rocker arms. Be sure to label the parts (intake and exhaust) to ensure reinstallation in their original locations. Refer to Section 7 and remove the camshaft.

4 Before the valves are removed scrape away any traces of gasket material from the head gasket sealing surface. Work slowly and do not nick or gouge the soft aluminum of the head. Gasket removing solvents, which work very well, are available at most motorcycle shops and auto parts stores.

5 Carefully scrape all carbon deposits out of the combustion chamber area. A hand-held wire brush or a piece of fine emery cloth can be used once the majority of deposits have been scraped away. Do not use a wire brush mounted in a drill motor, as the head material is soft and may be eroded away by the wire brush.

6 Before proceeding, arrange to label and store the valves along with

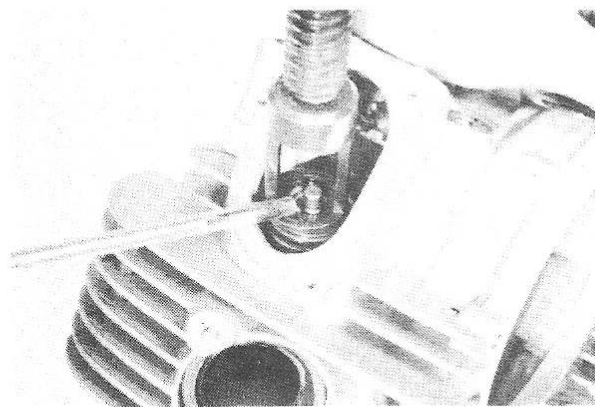


Fig. 2B.10 Compress the valve spring with the special tool and remove the keepers with a magnet or small needle-nose pliers (Sec 9)

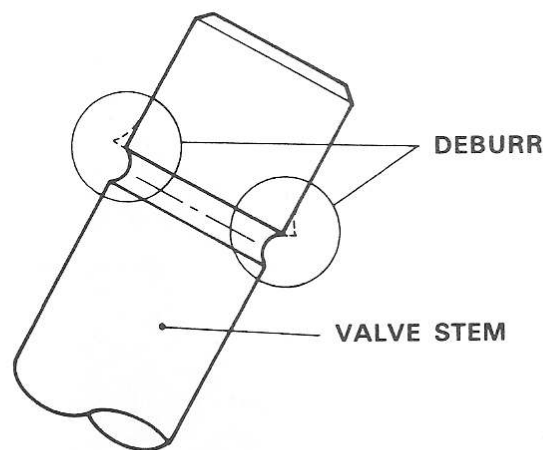


Fig. 2B.11 If the valve binds in the guide, deburr the area above the keeper groove (Sec 9)

their related components so they can be kept separate and reinstalled in the same valve guides they are removed from.

7 Compress the valve spring on the first valve with a spring compressor, then remove the keepers and the retainer from the valve assembly. Do not compress the springs any more than is absolutely necessary. Carefully release the valve spring compressor and remove the springs and the valve from the head. If the valve binds in the guide (won't pull through), push it back into the head and deburr the area around the keeper groove with a very fine file or whetstone.

8 Repeat the procedure for the remaining valves. Remember to keep the parts for each valve together so they can be reinstalled in the same locations.

9 Once the valves have been removed and labeled, pull off the valve stem seals with pliers and discard them. The old seals should never be reused.

10 Clean the cylinder head with solvent and dry it thoroughly. Compressed air will speed the drying process and ensure that all holes and recessed areas are clean.

11 Clean all of the valve springs, keepers, and retainers with solvent and dry them thoroughly. Do the parts from one valve at a time so that no mixing of parts between valves occurs.

12 Use a motorized wire brush to remove deposits from the valve heads and stems. Again, make sure the valves do not get mixed up.

### Inspection

13 Inspect the head very carefully for cracks or other damage. If cracks are found, a new head will be needed.

14 Using a straightedge and feeler gauge, check the head gasket mating surface for warpage. Lay the straightedge lengthwise across the head and diagonally (corner-to-corner), intersecting the head bolt holes, and try to slip a 0.0012-inch (0.03 mm) feeler gauge under it

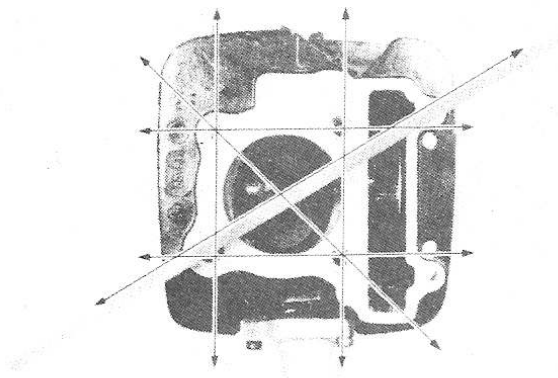


Fig. 2B.12 Lay the straightedge from corner-to-corner and diagonally when checking the head for warpage (Sec 9)

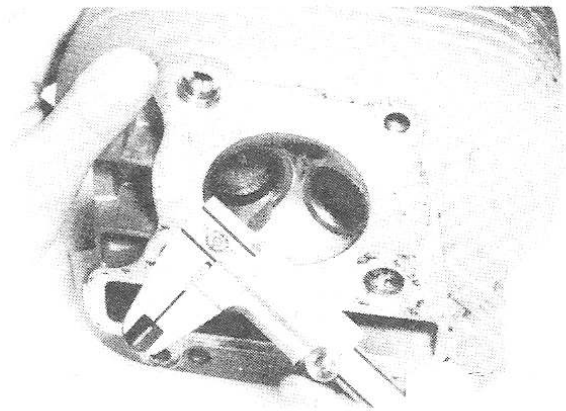
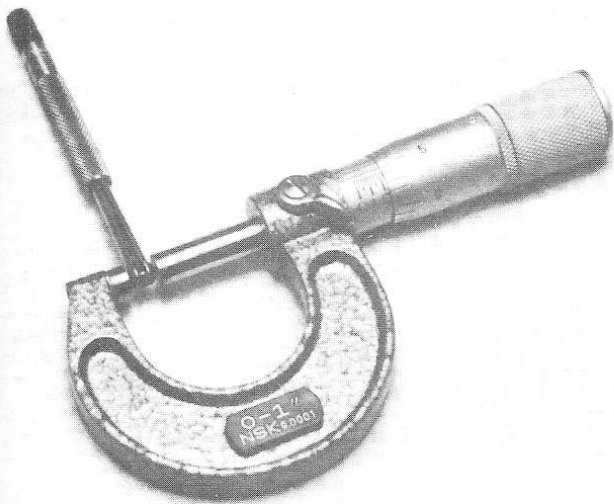


Fig. 2B.13 Measuring the width of the valve seat with a Vernier calipers (Sec 9)



9.16 Use the small hole gauge to determine the inside diameter of the valve guide, then measure the gauge with a micrometer to determine the size in inches

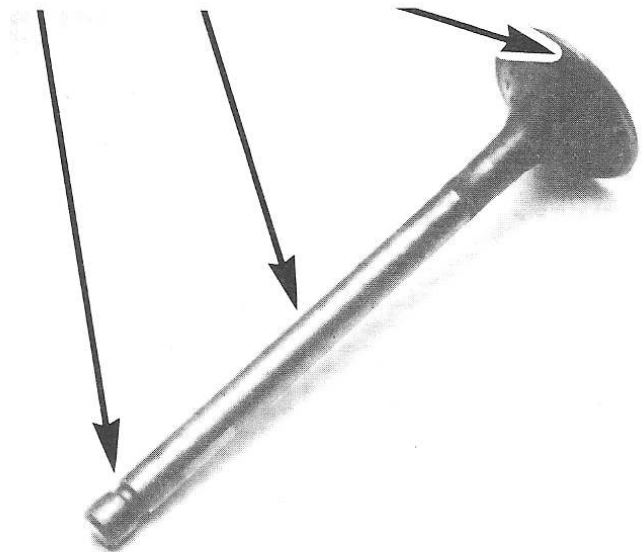
at each location. If the feeler gauge can be inserted between the head and the straightedge, the head is warped and must be replaced with a new one.

15 Examine the valve seats in the combustion chamber. If they are pitted, cracked or burned, the head will require valve service that is beyond the scope of the home mechanic. Measure the valve seat width and compare it to the Specifications. If it is not within the specified range, or if it varies around its circumference, valve service work is required.

16 Clean the valve guides to remove any carbon build-up, then measure the inside diameters of the guides (at both ends and at the center of the guide) with a small hole gauge and a 0-to-1 inch micrometer (photo). Record the measurements for future reference. These measurements, along with the valve stem diameter measurements, will enable you to compute the valve stem-to-guide clearance. This clearance, when compared to the Specifications, will be one factor that will determine the extent of the valve service work required. The guides are measured at the ends and at the center to determine if they are worn in a bell-mouth pattern (more wear at the ends). If they are, guide replacement is an absolute must.

17 Carefully inspect each valve face for cracks, pits or burned spots. Check the valve stem and the keeper groove area for cracks (photo). Rotate the valve and check for any obvious indication that it is bent. Check the end of the stem for pitting or excessive wear and make sure the end is slightly beveled. The presence of any of the above conditions indicates the need for valve servicing.

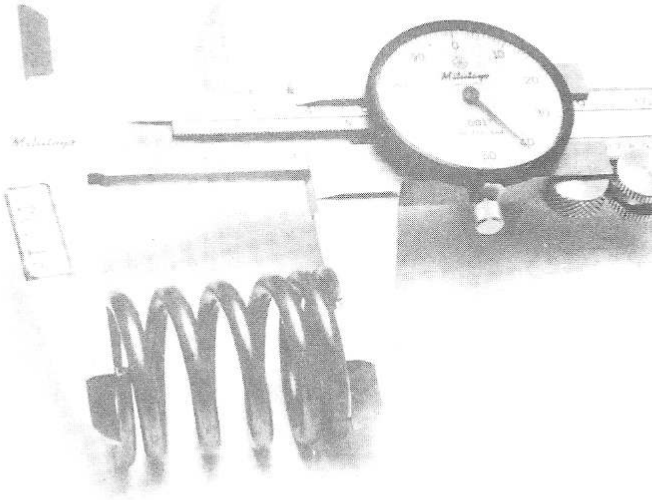
18 Measure the valve stem diameter (photo). By subtracting the stem diameter from the valve guide diameter, the valve stem-to-guide



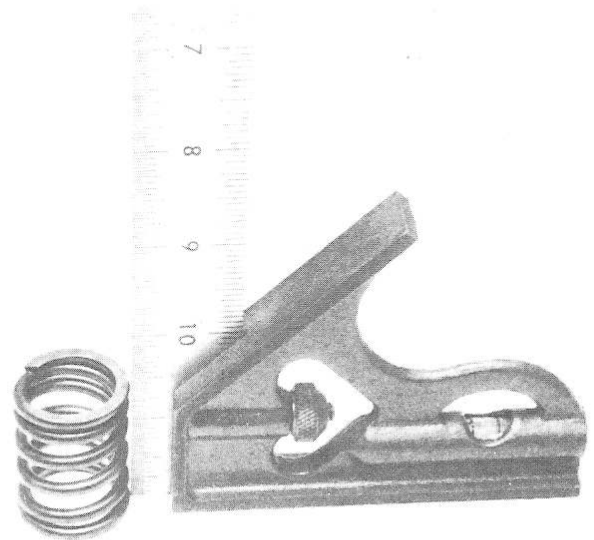
9.17 Check the valve face, stem and keeper groove for signs of wear and damage



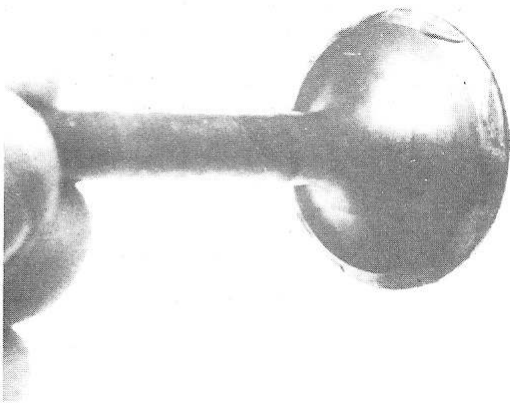
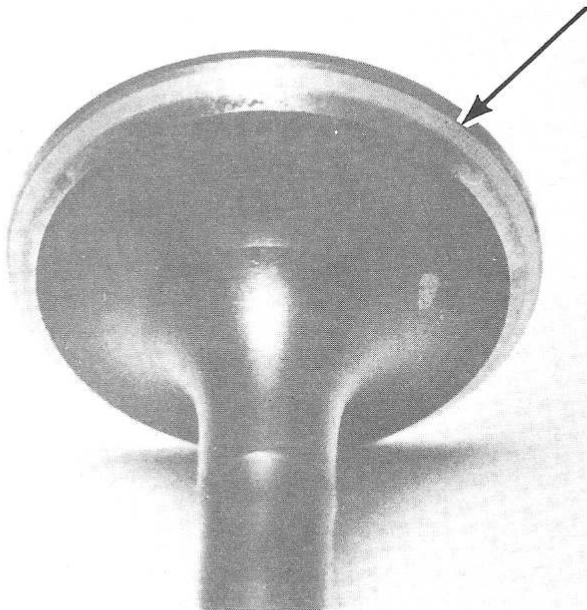
9.18 Measuring the valve stem diameter with a micrometer



9.19a Measuring the valve spring free length with a dial caliper



9.19b Checking a valve spring for squareness

9.27 Apply the lapping compound very sparingly, in small dabs, to the valve *face* only

9.28 After lapping, the valve face should exhibit a uniform, unbroken contact pattern

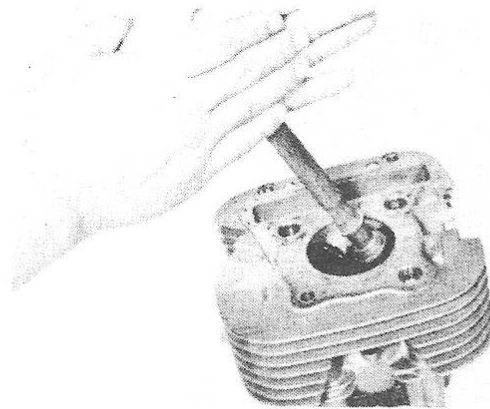


Fig. 2B.14 Rotate the valve lapping tool back-and-forth between the palms of your hands (Sec 9)

clearance is obtained. If the stem-to-guide clearance is greater than specified, the guides will have to be replaced.

19 Check the end of each valve spring for wear and pitting. Measure the free length and compare it to the Specifications (photo). Any springs that are shorter than specified have sagged and should not be reused. Stand the spring on a flat surface and check it for squareness (photo). 20 Check the spring retainers and keepers for obvious wear and cracks.

21 Check the cam lobe contact surfaces and the adjusting screw faces of the rocker arms for excessive wear, evidence of galling, flaking or cracks. Measure the rocker arm bore inside diameter and compare the results to the Specifications. If any damage or excessive wear is evident, replace the rocker arms with new ones and check the camshaft lobes for wear and damage.

22 Inspect each of the rocker arm shafts for wear and measure the outside diameter at both ends and the center. Compare the results to the Specifications. The rocker arm shafts are hardened and should not wear excessively. If galling or discoloration is evident, replace the shafts and check the lubrication system. Check the exhaust rocker arm shaft O-ring for damage and replace it if necessary.

23 Subtract the shaft diameter from the rocker arm bore diameter to obtain the shaft-to-arm clearance. If it is greater than specified, the shaft and/or rocker arm must be replaced.

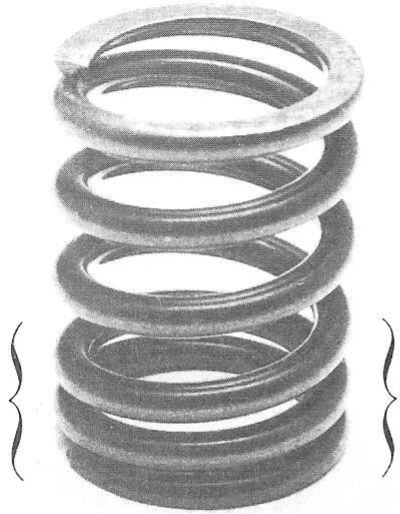
24 Any questionable parts should not be reused, as extensive damage will occur in the event of failure during engine operation.

25 If the inspection indicates that no service work is required the valve components can be reinstalled in the head.

### Reassembly

26 Before installing the valves in the head they should be lapped to ensure a positive seal between the valves and seats. This procedure





9.31a Install the springs with the closely spaced coils next to the cylinder head

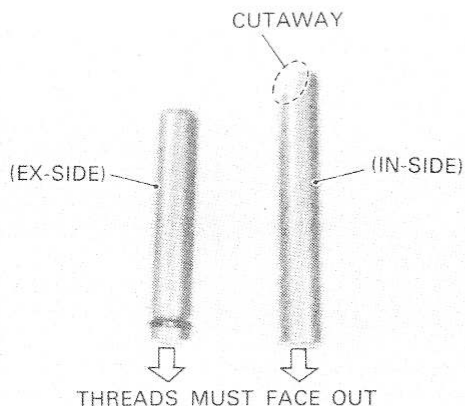


Fig. 2B.15 Rocker arm installation details (Sec 9)

requires a fine valve lapping compound (available at auto parts stores) and a valve lapping tool. If a lapping tool is not available a piece of rubber or plastic hose can be slipped over the valve stem (after the valve has been installed in the guide) and used to turn the valve.

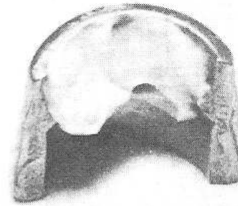
27 Apply a small amount of fine lapping compound to the valve face (photo), then slip the valve into the guide. **Note:** *Make sure the valve is installed in the correct guide and be careful not to get any lapping compound on the valve stem.*

28 Attach the lapping tool (or hose) to the valve and rotate the tool between the palms of your hands. Use a back-and-forth motion rather than a circular motion. Lift the valve off the seat at regular intervals to distribute the lapping compound properly. Continue the lapping procedure until the valve face and seat contact area is of uniform width and unbroken around the entire circumference of the valve face and seat (photo).

29 Carefully remove the valve from the guide and wipe off all traces of lapping compound. Use solvent to clean the valve and wipe the seat area thoroughly with a solvent soaked cloth. Repeat the procedure for the remaining valve.

30 Install new valve stems seals on each of the guides. Use an appropriate size deep socket to push the seals into place until they are properly seated. Do not twist or cock them or they will not seal properly against the valve stems.

31 Install the valves, taking care not to damage the new seals, the springs, the retainers and the keepers. Coat the valve stems with assembly lube or grease (preferably moly-base) before slipping them into the guides and install the springs with the tightly wound coils next to the cylinder head (photo). When compressing the springs with the valve spring compressor, depress them only as far as is absolutely necessary to slip the keepers into place. Apply a small amount of grease to the keepers to help hold them in place until the pressure is released



9.31b A small dab of grease will help hold the keepers in place on the valve while the spring is released

from the spring (photo). Make certain that the keepers are securely locked in their retaining grooves.

32 Support the cylinder head on blocks so the valves cannot contact the workbench top and very gently tap each of the valve stems with a soft-face hammer. This will help seat the keepers in their grooves.

33 Once the valves have been installed in the head, check for proper valve sealing by pouring a small amount of solvent into each of the valve ports. If the solvent leaks past the valves into the combustion chamber area, disassemble the valves and repeat the lapping procedure, then reinstall the valves and repeat the check. Repeat the procedure until a satisfactory seal is obtained.

34 Position the rocker arms, apply moly-base grease to the shafts and install them while directing the rocker arms into place on the shafts.

**Note:** *The shorter shaft (with the O-ring) is installed on the exhaust side and the longer shaft (with the cutaway) is installed on the intake side. Make sure the ends with the threaded holes face out or the shafts will be impossible to remove later. Make sure the cutaway on the longer shaft is positioned so the head bolt will slide by.*

35 Refer to Section 7 and install the camshaft.

## 10 Cylinder — removal, inspection and installation

1 Refer to the appropriate Section and remove the cylinder head.

### Removal

2 Remove the two small bolts from the base of the cylinder.

3 The cylinder will probably be stuck tightly to the crankcase, so tap around its entire circumference with a soft-face hammer to break the gasket seal.

4 Rotate the crankshaft until the piston is as far up in the bore as possible, then separate the cylinder from the crankcase.

5 Before the cylinder is lifted off the piston, stuff a clean shop towel into the crankcase opening to keep foreign objects out of the engine and to cushion the piston/connecting rod as the cylinder is removed.

6 Slide the cylinder up and off the piston.

7 Remove the O-ring and the dowel pins, then peel up the cylinder base gasket.

8 Using a blunt gasket scraper or similar tool, remove all traces of old gasket material left on the cylinder and crankcase, then clean the cylinder with solvent and dry it thoroughly.

### Inspection

9 Check the cylinder walls carefully for scratches and score marks.

10 Using the appropriate precision measuring tools, check the cylinder's diameter near the top, center and bottom of the cylinder bore, parallel to the crankshaft axis. Next, measure the cylinder's diameter at the same three locations across the crankshaft axis. Compare the results to the Specifications. If the cylinder walls are tapered, out-of-

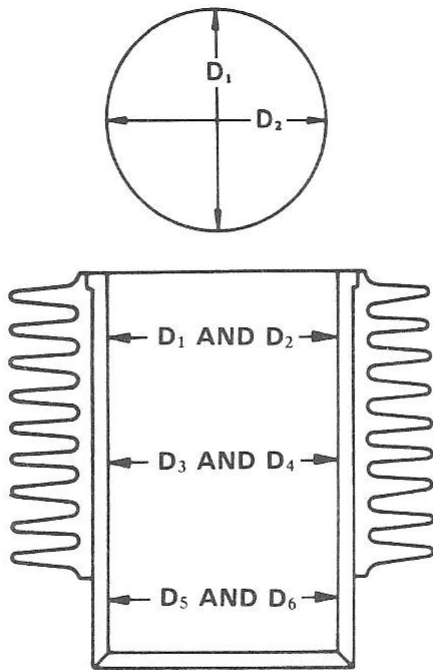


Fig. 2B.16 Cylinder bore measurement points (Sec 10)

round, worn beyond the specified limits, or badly scuffed or scored, have them rebored and honed by a dealer service department or a motorcycle repair shop. If a rebore is done, an oversize piston and rings will be required.

11 As an alternative, if the precision measuring tools are not available, a dealer service department or motorcycle repair shop will make the measurements and offer advice concerning servicing of the cylinder.

12 If the cylinder is in reasonably good condition and not worn to the outside of the limits, and if the piston-to-cylinder clearance can be maintained properly (Section 11), then the cylinder will not have to be rebored. Honing is all that is necessary.

13 To perform the honing operation you will need the proper size flexible hone with fine stones, plenty of light oil or honing oil, some shop towels and an electric drill motor. Hold the cylinder in a vise (cushioned with soft jaws or wood blocks) when performing the honing operation. Mount the hone in the drill motor, compress the stones and slip the hone into the cylinder. Lubricate the cylinder thoroughly, turn on the drill and move the hone up-and-down in the cylinder at a pace which will produce a fine crosshatch pattern on the cylinder wall with the crosshatch lines intersecting at a  $60^\circ$  angle. Be sure to use plenty of lubricant and do not take off any more material than is absolutely necessary to produce the desired effect. Do not withdraw the hone from the cylinder while it is running. Instead, shut off the drill and continue moving the hone up-and-down in the cylinder until it comes to a complete stop, then compress the stones and withdraw the hone. Wipe the oil out of the cylinder. If you do not have the tools, or do not desire to perform the honing operation, a dealer service department or motorcycle repair shop will generally do it for a reasonable fee.

14 The cylinder must be washed thoroughly with warm soapy water to remove all traces of the abrasive grit produced during the honing operation. Be sure to run a brush through the bolt holes and flush them with running water. After rinsing, dry the cylinder thoroughly and apply a coat of light, rust-preventative oil to all machined surfaces.

### Installation

15 Before installation, clean the gasket sealing surfaces of the crankcase and the cylinder with a solvent such as lacquer thinner or acetone.

16 Install the dowel pins and the O-ring in the crankcase recesses. Lay a new cylinder base gasket in place (no gasket sealer is necessary), then roll the camshaft drive chain up and position it in the cavity in front of the chain guide.

18 Apply a thin coat of clean engine oil to the cylinder bore.

19 Position the cylinder over the piston, hook the cam chain with a length of bent wire and pull it through the chain tunnel. Direct the chain

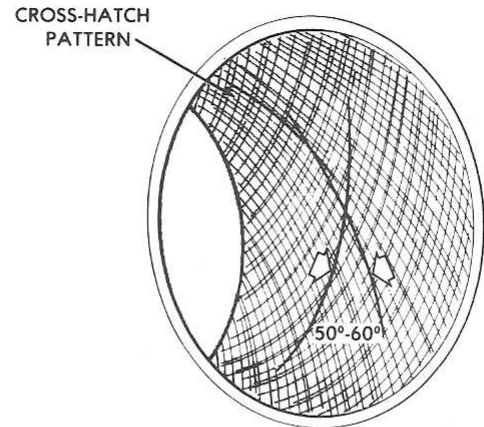


Fig. 2B.17 The cylinder hone should leave a crosshatch pattern with the lines intersecting at approximately a  $60^\circ$  degree angle (Sec 10)

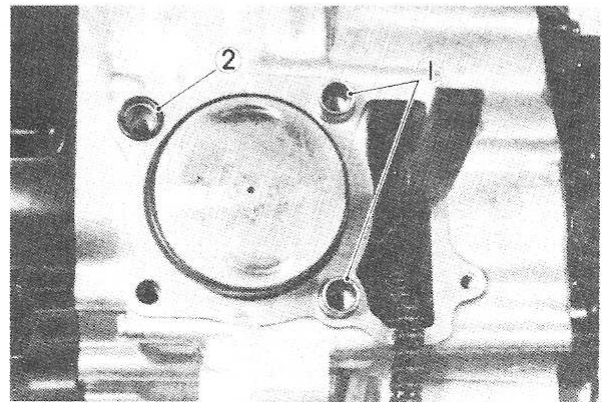


Fig. 2B.18 Make sure the dowel pins (1) and the O-ring (2) are in place before installing the cylinder on the cases (Sec 10)

tensioner slipper into the tunnel as well.

20 Carefully direct the piston into the cylinder bore. The long tapered portion at the bottom of the bore will serve to compress the rings as the piston enters the bore. Rock the piston slightly to help ease the rings into position. Install the two small Allen head bolts and tighten them finger tight.

21 Refer to the appropriate Section and install the cylinder head.

### 11 Piston — removal, inspection and installation

1 The piston is attached to the connecting rod with a piston pin that is a slip fit in the piston and rod.

2 Before removing the piston from the rod, stuff a clean shop towel into the crankcase hole, around the connecting rod. This will prevent the circlip from falling into the crankcase if it is inadvertently dropped.

#### Removal

3 Support the piston, grasp the circlip with needle-nose pliers and twist it out of the groove.

4 Push the piston pin out from the opposite end to free the piston from the rod. You may have to deburr the area around the groove to enable the pin to slide out. **Caution:** If the pin is difficult to remove, do not drive it out with a hammer. Use a piston pin puller.

#### Inspection

5 Before the inspection process can be carried out the piston must be cleaned and the old piston rings removed.

6 Using a piston ring installation tool, carefully remove the rings from the piston. Do not nick or gouge the piston in the process.

7 Scrape all traces of carbon from the top of the piston. A hand-

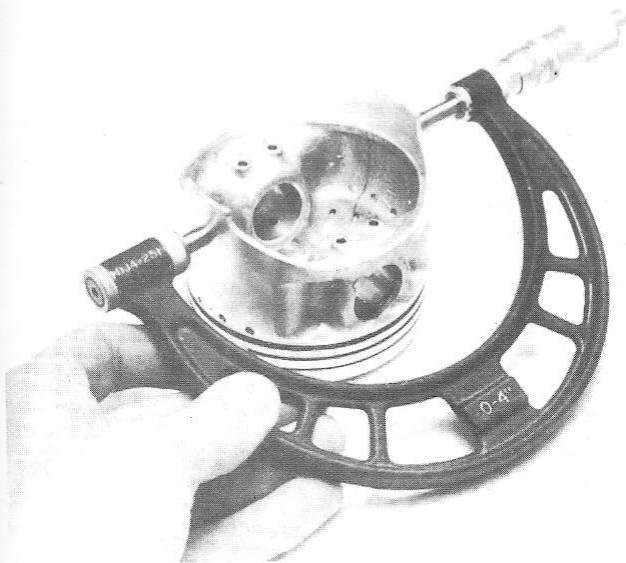




Fig. 2B.19 Removing the piston pin circlip (note the rag in the crankcase opening (Sec 11))



Fig. 2B.20 Checking the piston ring-to-groove clearance with a feeler gauge (Sec 11)



11.14 Measuring the piston diameter with a micrometer

held wire brush or a piece of fine emery cloth can be used once the majority of the deposits have been scraped away. Do not, under any circumstances, use a wire brush mounted in a drill motor to remove deposits from the pistons. The piston material is soft and will be eroded away by the wire brush.

8 Use a piston ring groove cleaning tool to remove any carbon deposits from the ring grooves. If a tool is not available, a piece broken off the old ring will do the job. Be very careful to remove only the carbon deposits. Do not remove any metal and do not nick or gouge the sides of the ring grooves.

9 Once the deposits have been removed clean the piston with solvent and dry it thoroughly. Make sure the oil return holes inside the oil ring groove are clear.

10 If the piston is not damaged or worn excessively and if the cylinder is not rebored, a new piston will not be needed. Normal piston wear appears as even, vertical marks on the thrust surfaces of the piston and slight looseness of the top ring in its groove. New piston rings should always be used when an engine is rebuilt.

11 Carefully inspect the piston for cracks around the skirt, at the pin bosses and at the ring lands.

12 Look for scoring and scuffing on the thrust faces of the skirt, holes in the piston crown and burned areas at the edge of the crown. If the skirt is scored or scuffed, the engine may have been suffering from overheating or abnormal combustion, which caused excessively high operating temperatures. The oil pump should be checked thoroughly. A hole in the piston crown is an indication that abnormal combustion (pre-ignition) was occurring. Burned areas at the edge of the piston crown are usually evidence of spark knock (detonation). If any of the above problems exist, the causes must be corrected or the damage will occur again.

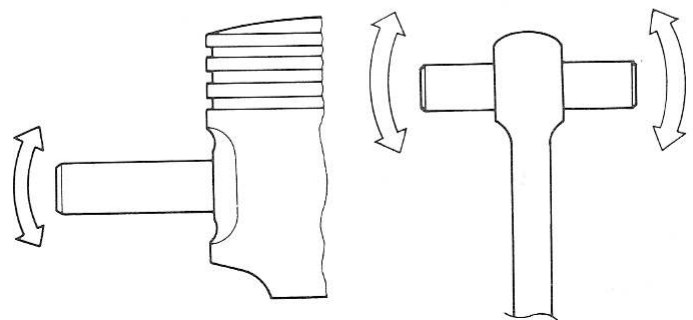


Fig. 2B.21 The piston pin should be inserted into the piston and connecting rod and checked for play (Sec 11)

13 Measure the piston ring-to-groove clearance by installing a new piston ring in each ring groove and slipping a feeler gauge in beside it. Check the clearance at three or four locations around the groove. Be sure to use the correct ring for each groove. If the clearance is greater than specified a new piston will have to be used when the engine is reassembled.

14 Check the piston-to-bore clearance by measuring the bore (see Section 10) and the piston diameter. Measure the piston across the skirt on the thrust faces at a  $90^\circ$  angle to the piston pin, about  $3/8$ -inch (9.5 mm) up from the bottom of the skirt (photo). Subtract the piston diameter from the bore diameter to obtain the clearance. If it is greater than specified, the cylinder will have to be rebored and an oversized piston and rings installed. If the appropriate precision measuring tools are not available, the piston-to-cylinder clearance can be obtained, though not quite as accurately, using feeler gauge stock. Feeler gauge stock comes in 12-inch lengths and various thicknesses and is generally available at auto parts stores. To check the clearance, select a 0.0015-inch feeler gauge and slip it into the cylinder along with the piston. The cylinder should be upside down and the piston must be positioned exactly as it normally would be. Place the feeler gauge between the piston and cylinder on one of the thrust faces ( $90^\circ$  to the piston pin bore). The piston should slip through the cylinder with the feeler gauge in place with moderate pressure. If it falls through, or slides through easily, the clearance is excessive and a new piston will be required. If the piston binds at the lower end of the cylinder and is loose toward the top, the cylinder is tapered, and if tight spots are encountered as the piston/feeler gauge is rotated in the cylinder, the cylinder is out-of-round. Be sure to have the cylinder and piston checked by a dealer service department or a motorcycle repair shop to confirm your findings before purchasing new parts.

15 Apply clean engine oil to the pin, insert it into the piston and check for free play by rocking the pin up-and-down. Repeat the check with the pin in the small end of the connecting rod. If the pin is loose, a new piston must be installed.

16 Refer to Section 12 and install the rings on the piston.

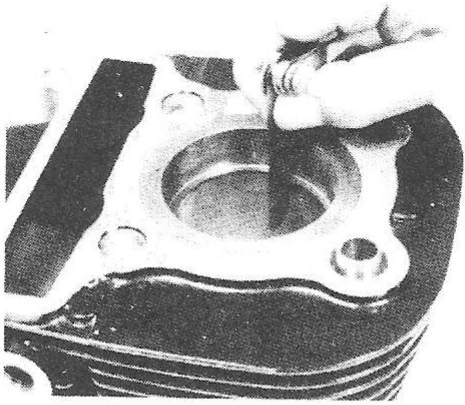


Fig. 2B.22 Checking the piston ring end gap with a feeler gauge (Sec 12)

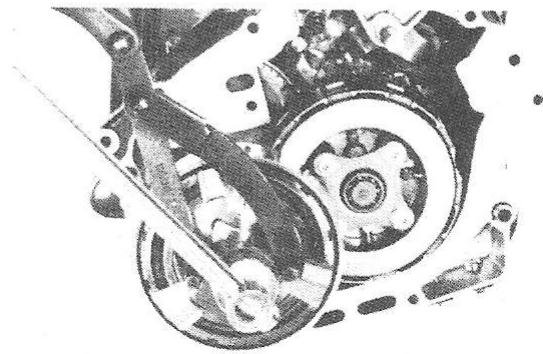


Fig. 2B.24 Loosening the primary clutch retaining nut (the shoe assembly must be kept from turning) (Sec 13)

### Installation

17 Install the piston with the arrow on the crown facing forward. Lubricate the pin and the rod bore with clean engine oil. Push the pin into position and install new circlips (do not reuse the old clips). Make sure the clips are properly seated in the grooves, then turn them so the gaps are up.

## 12 Piston rings — installation

- 1 Before installing the new piston rings the ring end gaps must be checked.
- 2 Insert the top (number 1) ring into the cylinder and square it up with the cylinder walls by pushing it in with the top of the piston. The ring should be about one inch below the top edge of the cylinder. To measure the end gap, slip a feeler gauge between the ends of the ring and compare the measurement to the Specifications.
- 3 If the gap is larger or smaller than specified, double check to make sure that you have the correct rings before proceeding.
- 4 If the gap is too small it must be enlarged or the ring ends may come in contact with each other during engine operation, which can cause serious damage. The end gap can be increased by filing the ring ends very carefully with a fine file. Mount the file in a vice and, holding the ring as close to the gap as possible, file only from the outside in.
- 5 Excess end gap is not critical unless it is greater than 0.040-inch (1 mm). Again, double check to make sure you have the correct rings for your engine.
- 6 Repeat the procedure for the remaining rings.
- 7 Once the ring end gaps have been checked and if necessary corrected, the rings can be installed on the piston.
- 8 The oil control ring (lowest on the piston) is installed first. It is composed of three separate components. Slip the spacer/expander into the groove, then install the lower side rail. Do not use a piston ring installation tool on the oil ring side rails. Instead, place one end of the side rail into the groove between the spacer expander and the ring land. Hold it firmly in place and slide a finger around the piston while pushing

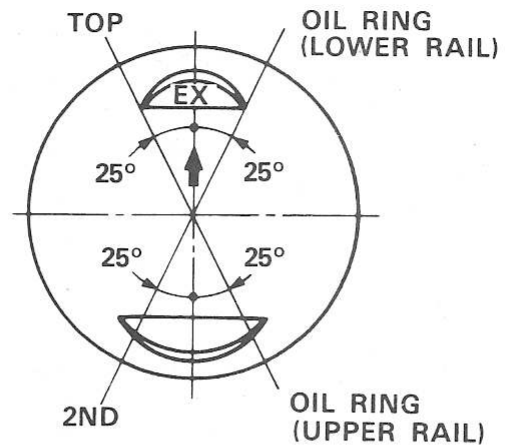


Fig. 2B.23 The piston ring end gaps should be positioned as shown (Sec 12)

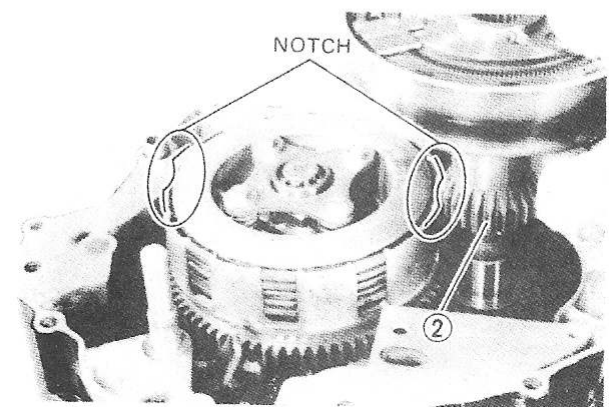


Fig. 2B.25 The secondary clutch housing has notches that allow the primary gear to clear it (Sec 13)

the rail into the groove. Next, install the upper side rail in the same manner.

9 After the three oil ring components have been installed, check to make sure that both the upper and lower side rails can be turned smoothly in the ring groove. **Note:** Make sure the ends of the spacer/expander are not overlapped.

10 The number 2 (middle) ring is installed next.

11 To avoid breaking the ring, use a piston ring installation tool. Make sure that the identification mark is facing up. Fit the ring into the middle groove on the piston. Do not expand the ring any more than is necessary to slide it into place.

12 Install the number 1 (top) ring in the same manner. Make sure the identifying mark is facing up.

13 Once the rings have been properly installed, turn them as required to position the end gaps as shown in the accompanying illustration.

## 13 Clutches — removal

- 1 It should be noted that the clutch assemblies can be removed with the engine in the frame. To do so, first drain the engine oil and remove the oil filter cover, filter and O-rings (Chapter 1).
- 2 Remove the right crankcase cover bolts. It may be helpful to make a holder from a piece of cardboard to ensure that the bolts are returned to their original locations when the cover is installed.
- 3 Tap the crankcase cover gently with a soft-face hammer to break the gasket seal, then pull it away from the engine. Do not pry between the gasket sealing surfaces, as damage and oil leaks can occur. Remove the two dowel pins from the cover or engine so they don't get lost. Remove the clutch release lever spring, shift guides and pawl holder by sliding them off the end of the shift shaft.
- 4 Flatten the tab on the primary (front) clutch tabbed washer and remove the large nut and washer. Hold the shoe assembly with a rotor holding tool to keep the crankshaft from turning as the nut is loosened.

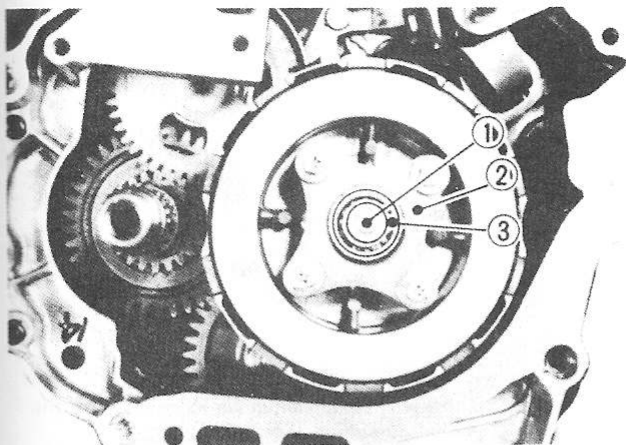


Fig. 2B.26 Remove the pushrod (1) and the bearing (3) before removing the spring plate (2) (Sec 13)

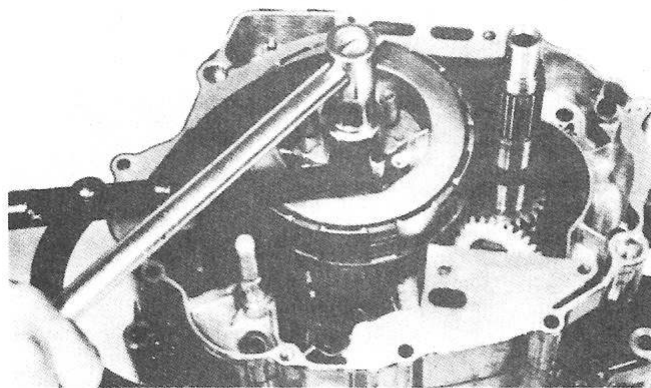


Fig. 2B.27 Removing the clutch hub retaining nut (Sec 13)

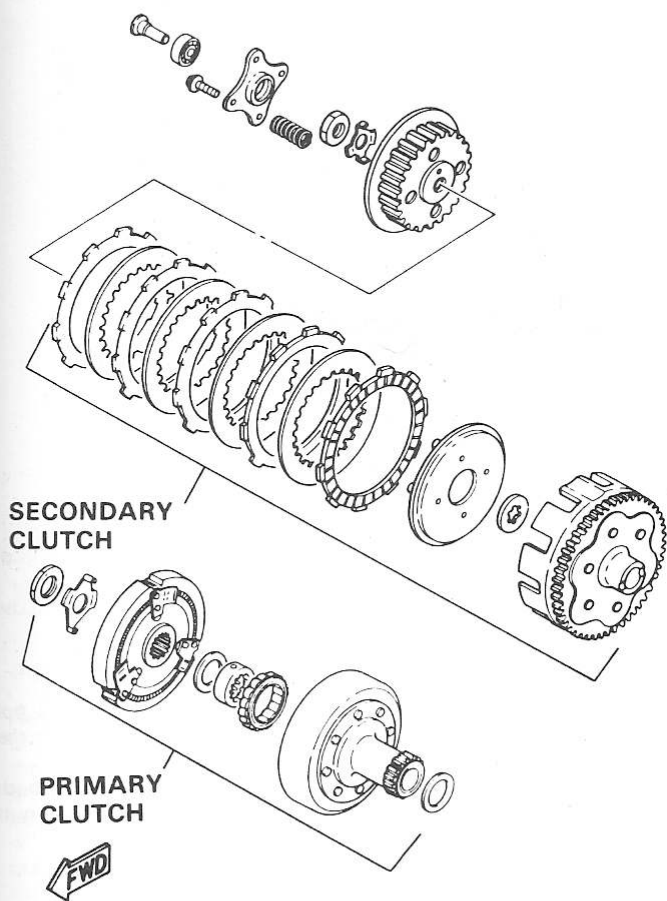


Fig. 2B.28 Clutch components — exploded view (Sec 14)

Turn the secondary clutch assembly until one of the large notches in the housing is aligned with the primary clutch gear, then slide the primary clutch off the crankshaft. The gear will not clear the clutch housing if the notch isn't positioned correctly. Remove the thrust washer from the crankshaft (it may stick to the back of the primary clutch gear).

5 Remove the ball bearing and the clutch pushrod from the secondary clutch spring plate. Remove the clutch spring plate by unscrewing the mounting bolts. Loosen them gradually, one turn at a time each, following a criss-cross pattern, until the spring pressure has been released. 6 Flatten the tab on the clutch hub nut tabbed washer, then loosen the nut. Hold the clutch hub with the special tool to keep the shaft from turning. Remove the nut and washer, then slide the entire clutch assembly off the transmission shaft. The clutch housing, clutch hub,

friction discs and metal plates should be kept together so they can be reinstalled in the exact same order.

7 Refer to Section 14 for clutch component inspection procedures. If the engine is being disassembled, remove the three screws and separate the spacer from the crankcase, then go on to the oil pump removal procedure.

#### 14 Clutches — inspection

##### Secondary clutch

1 **Note:** Refer to Chapter 2, Part A, for illustrations pertaining to the following inspection procedures. Remove the clutch plates and discs and clutch hub from the housing. Examine the splines on both the inside and the outside of the clutch hub. If any wear is evident, replace the clutch hub with a new one. Inspect the pressure plate as well.

2 Measure the free length of the clutch springs and compare the results to the Specifications. If the springs have sagged, or if cracks are noted, replace them with new ones as a set.

3 If the lining material of the friction plates smells burned or if it is glazed, new parts are required. If the metal clutch plates are scored or discolored they must be replaced with new ones. Measure the thickness of each friction plate and compare the results to the Specifications. Replace any friction plates that are near the wear limit.

4 Lay the metal plates, one at a time, on a flat surface, such as a piece of plate glass, and check for warpage by trying to slip a 0.008-inch feeler gauge between the flat surface and the plate. Do this at several places around the plate's circumference. If the feeler gauge can be slipped under the plate, it is warped and should be replaced with a new one.

5 Check the tabs on the friction plates for excessive wear and mushroomed edges. They can be cleaned up with a file if the deformation is not severe.

6 Check the edges of the slots in the clutch housing for indentations made by the friction disc tabs. If the indentations are deep they can prevent clutch release, and the housing should be replaced with a new one. If the indentations can be removed easily with a file, the life of the housing can be prolonged to an extent. Check the primary gear teeth for cracks, chips and excessive wear. If the gear is worn or damaged, the clutch housing must be replaced with a new one. Check the bearing for score marks, scratches and excessive wear.

7 Check the bearing journal on the transmission mainshaft for score marks, heat discoloration and evidence of excessive wear. Check the clutch spring plate, pushrod and bearing for wear and damage.

##### Primary clutch

8 Check the housing for wear, distortion and evidence of heat damage (blue color). Check the shoe assembly in the same manner.

9 Measure the shoe lining material and compare it to the Specifications. If it is thinner than specified, replace the shoe assembly.

10 Check the primary drive gear teeth for wear and damage.

11 Check the one-way clutch assembly inside the housing. Look for wear and damage and make sure it engages when turned only in one direction.

12 Refer to Section 15 for clutch installation procedures.



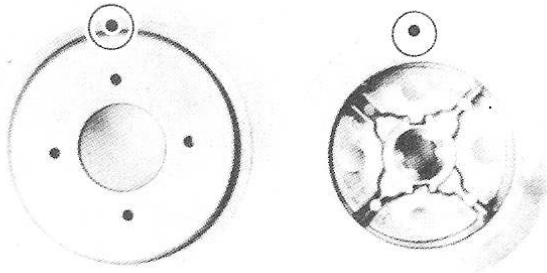


Fig. 2B.29 When installing the pressure plate, be sure to align the arrow mark with the one on the clutch hub (Sec 15)

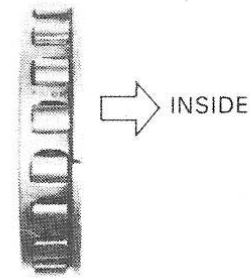


Fig. 2B.30 The one-way clutch must be installed with the flange side in (Sec 15)

### Release mechanism

- 13 Check the guide plates, spring and balls for wear and damage. Be alert for deep grooves in the guide plates made by the balls.
- 14 Check the lever pivot in the crankcase cover and the end of the lever that contacts the clutch pushrod for wear. Make sure everything moves freely.
- 15 Check the slot in shift guide number 1 for wear and inspect the crankcase post it rides on.
- 16 The clutch release mechanism is installed with the gearshift components (see Section 19).

### 15 Clutches — installation

- 1 Lubricate the thrust washer and the bearing journal on the transmission mainshaft with moly-base grease, then slide the clutch housing into place, followed by the thrust washer.
- 2 Install the clutch plates on the clutch hub. Begin with a friction plate and alternate friction and metal plates until all of them are in place. Install the pressure plate and one spring and bolt. Tighten the bolt finger tight. **Note:** *When installing the pressure plate make sure the arrows on the plate and clutch hub are aligned.*
- 3 Slip the clutch sub-assembly onto the transmission shaft, followed by a new tabbed washer. Make sure the tabs on the washer engage the slots in the hub. Install the large nut and tighten it to the specified torque, then bend the locking tab up against the flat of the nut.
- 4 Remove the one spring bolt, then install the remaining springs, the spring plate and the bolts. Tighten the bolts gradually, in a criss-cross pattern, until they are secure. Install the bearing and pushrod in the plate.
- 5 If the crankcase spacer was removed, install the dowel pins and a new gasket, then attach the spacer to the crankcase and tighten the bolts.
- 6 Lubricate the washer and slip it onto the crankshaft, followed by the primary clutch housing.
- 7 Install the one-way clutch into the housing with the flange side in. Install the washer and shoe assembly (the holes must face out).
- 8 Install a new tabbed washer and the nut. Tighten the nut to the specified torque, then bend up a lock tab to keep the nut from loosening.
- 9 Install the right crankcase cover, then adjust the clutch as described in Chapter 1.

### 16 Oil pump — removal and disassembly

- 1 The oil pump is located behind the right crankcase cover, below the primary clutch. It should be noted that it is accessible for repair or replacement with the engine in the frame. Preliminary disassembly includes draining the engine oil and removing the clutches and crankcase spacer.
- 2 Remove the right crankcase cover bolts and separate the cover from the engine. You may have to tap it gently with a soft-face hammer to break the gasket seal.
- 3 Refer to Section 13 and remove the clutches and crankcase spacer.

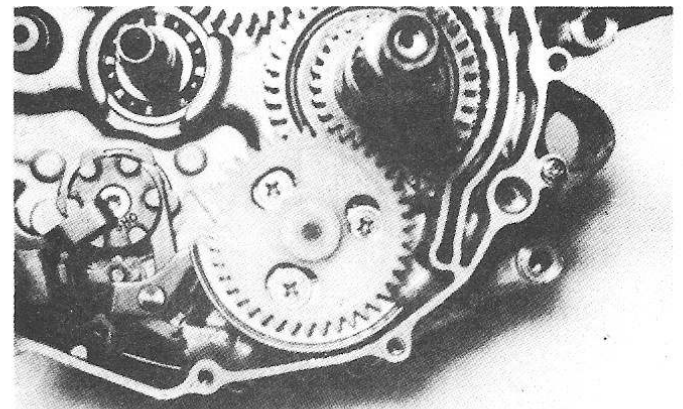


Fig. 2B.31 Rotate the gear to expose the oil pump mounting screws (Sec 16)

### Removal

- 4 Turn the pump gear until the mounting screws are visible in the holes.
- 5 Remove the screws that attach the pump to the crankcase. They are extremely tight, so an impact driver may be required.

### Disassembly

- Note:** *As the pump is disassembled, pay strict attention to how everything fits together to ensure that all mated parts stay in their original relationship when reassembled.*
- 6 Remove the drive and separate the pump cover from the body.
  - 7 Push the shaft and the inner rotor out of the pump body. The outer rotor will simply fall out, so be careful not to drop it.
  - 8 Refer to Section 17 for oil pump inspection procedures.

### 17 Oil pump — inspection

- 1 Clean the parts with solvent and dry them thoroughly. If available, use compressed air to blow out all the cavities.
- 2 Check the pump body and cover for cracks and evidence of wear. Look closely for a ridge where the rotors contact the body and cover. Check the drive and driven gears for obvious wear and damage.
- 3 Reassemble the rotors and the shaft in the pump body and check the inner rotor-to-outer rotor (tip) clearance and the outer rotor-to-pump body (side) clearance with feeler gauges. Measure the thickness of the rotors with a micrometer.
- 4 If the oil pump clearances are excessive, or if excessive wear is evident, replace the oil pump as a complete unit.
- 5 Refer to Section 18 for oil pump reassembly and installation procedures.



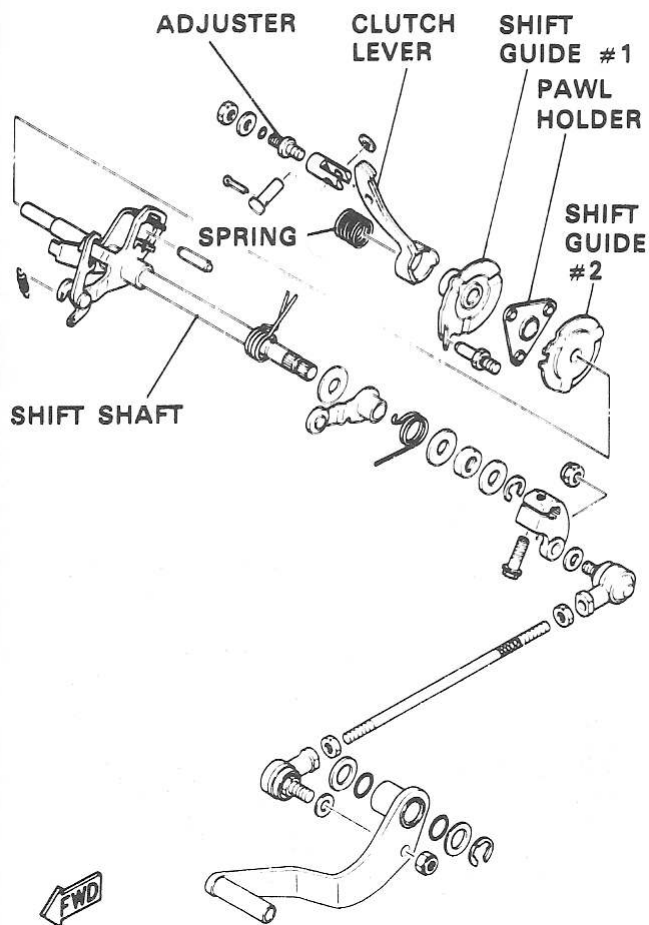


Fig. 2B.32 Gearshift and clutch release mechanism components — exploded view (Sec 19)

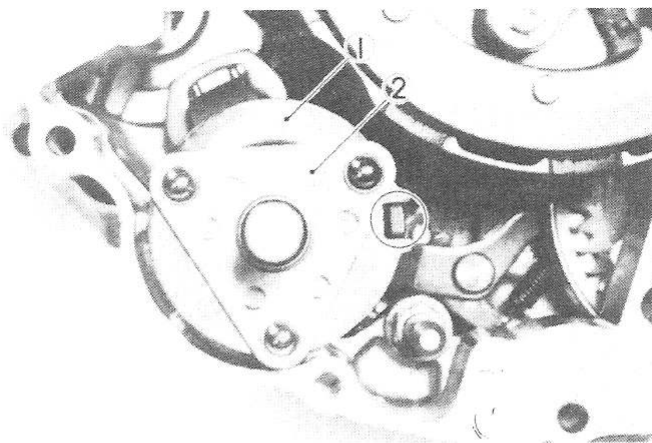


Fig. 2B.33 The number 2 shift guide (1) slot must fit over the tab on the shift shaft (circled) before the pawl (2) is installed (Sec 19)

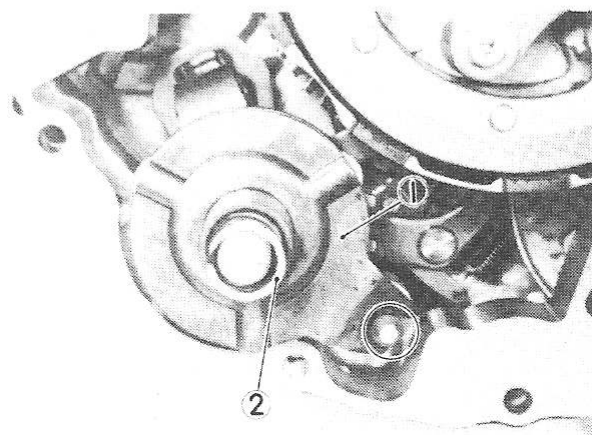


Fig. 2B.34 The number 1 shift guide must engage with the crankcase post (circled) before the spring (2) is installed (Sec 19)

## 18 Oil pump — reassembly and installation

1 As the parts are assembled lubricate them liberally with clean engine oil, a moly-base oil additive or moly-base grease.

### Reassembly

- 2 Install the outer rotor in the pump body. Slip the shaft and gear through the cover and attach the pin and inner rotor to the shaft.
- 3 Mesh the rotors, then make sure the cover and body are mated and install the screws.
- 4 Make sure the pump operates smoothly, then attach it to the crankcase. **Note:** Make sure the new gasket is in place before installing the pump.

### Installation

- 5 Hold the pump in place on the crankcase, then install and tighten the mounting screws evenly and securely. After the screws are tight, turn the pump shaft and check for binding.

## 19 Gearshift mechanism — removal, inspection and installation

- 1 The gearshift mechanism components are accessible for inspection and repair with the engine in the frame. To begin the disassembly procedure, refer to the appropriate Sections and remove the clutch release mechanism, the clutch and right-side crankcase spacer. Separate the E-clip from the left end of the shift shaft with a screwdriver.
- 2 Carefully apply pressure to the shift arm to disengage it from the shift drum, then pull the shaft out of the case. Do not lose the washer

on the left end of the shaft. As the shaft is being removed, disengage the stopper arm and spring from the shift drum and crankcase post and withdraw them with the shaft.

- 3 Clean all of the parts with solvent and dry them thoroughly.
- 4 Examine the gearshift mechanism for wear, particularly at the upper arm shift pawls. Make sure the shaft is not bent and check the springs for cracks and excessive stretch. The upper arm must be straight and free to move at its pivot point.
- 5 Check the stopper arm, the cam plate and the shift pins for excessive wear and replace any worn or damaged parts with new ones. The shift pins and cam plate are attached to the drum by a single Torx screw.
- 6 If the shift shaft oil seal has been leaking, refer to Section 26 and replace it with a new one. Wrap electrician's tape around the splines on the end of the shaft to avoid damaging the new seal as the shaft passes through it.
- 7 Installation is the reverse of removal. Use a thread-locking compound on the threads and be sure to lubricate the gearshift shaft before inserting it into the crankcase. Engage the return spring on the shift spindle tab and the crankcase post. Hook the stopper arm spring under the crankcase projection and be careful to engage the shift arm with the shift pins.
- 8 After the components have been reassembled check the shifter for proper operation.
- 9 Apply moly-base grease to the shift guides, the balls in the pawl holder and the end of the shift shaft. Install the number 2 shift guide, the pawl holder, the number 1 shift guide and the spring on the end of the shift shaft. **Note:** The slot in the number 2 shift guide must engage with the projection on the shaft and the slot in the number 1 shift guide must slip over the crankcase post.

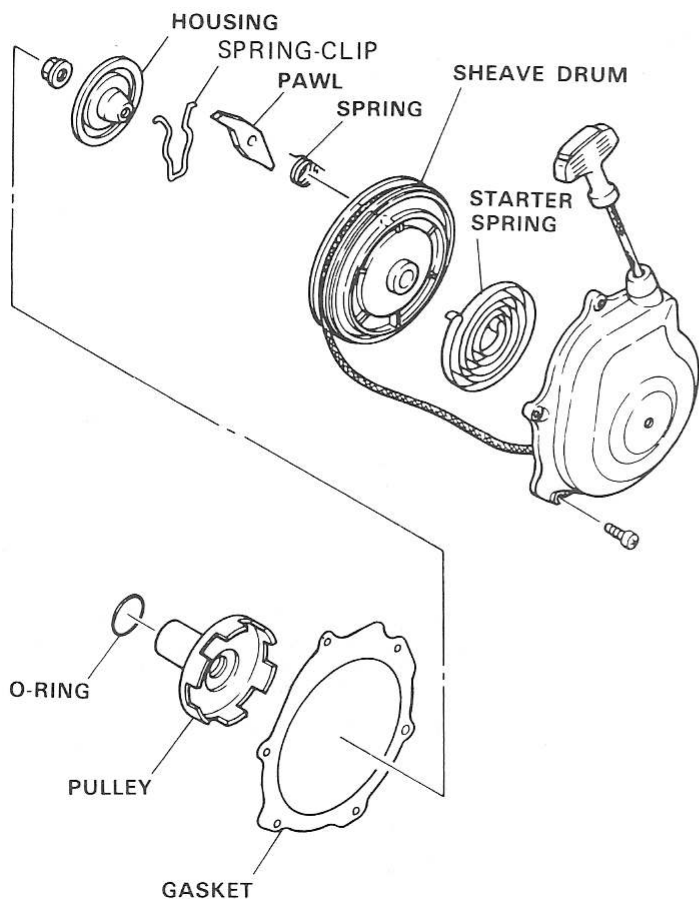


Fig. 2B.35 Recoil starter components — exploded view (Sec 21)

20 Recoil starter — removal and installation

- 1 The recoil starter is attached to the left side of the engine.
- 2 Removal is accomplished by removing the screws/bolts and separating the starter assembly from the crankcase mount.
- 3 The starter pulley is bolted to the end of the crankshaft. If it is damaged, remove the bolt to detach it.
- 4 Installation is the reverse of removal.

21 Recoil starter — disassembly, inspection and reassembly

**Note:** Refer to Chapter 2, Part A, for illustrations pertaining to the rope installation procedure.

- 1 To disassemble the starter when replacement of the rewind spring or rope is necessary, untie the knot in the outer end and detach the handle, then slowly release the drum so the spring winds itself back gradually. This won't be necessary if either the spring or rope is broken. Remove the nut from the shaft and lift out the components. Keep pressure on the rewind spring so it doesn't fly out and note its installed direction (which way it is wound). **Note:** Some models are equipped with a decompression device which is part of the recoil assembly. After the drum is lifted out, detach the circlip, washer and decompression linkage and disconnect the cable. Remove the gear circlip, then lift out the gear, spring retainer and stopper spring. Note how the parts are installed so reassembly can be accomplished without difficulty. Remove the starter spring guide and spring.
- 2 Clean the case, drum and drive pawl components and install the new spring after winding it up tightly. Hook the loop on the outer end of the spring over the tab in the starter case, then grease to the spring. Install the decompression device and spring guide (if so equipped).
- 3 Tie a knot in one end of the new rope and thread the other end into the drum through the rope hole and out the side. Wind the rope around the drum in a clockwise direction (viewed from the back side) about 15-1/2 inches remain (25-1/2 inches on YTM 200 models), then route it through the cutout in the upper edge of the drum.
- 4 Position the drum in the starter case and make sure the inner end of the spring engages with it. When first placed in the case, the drum

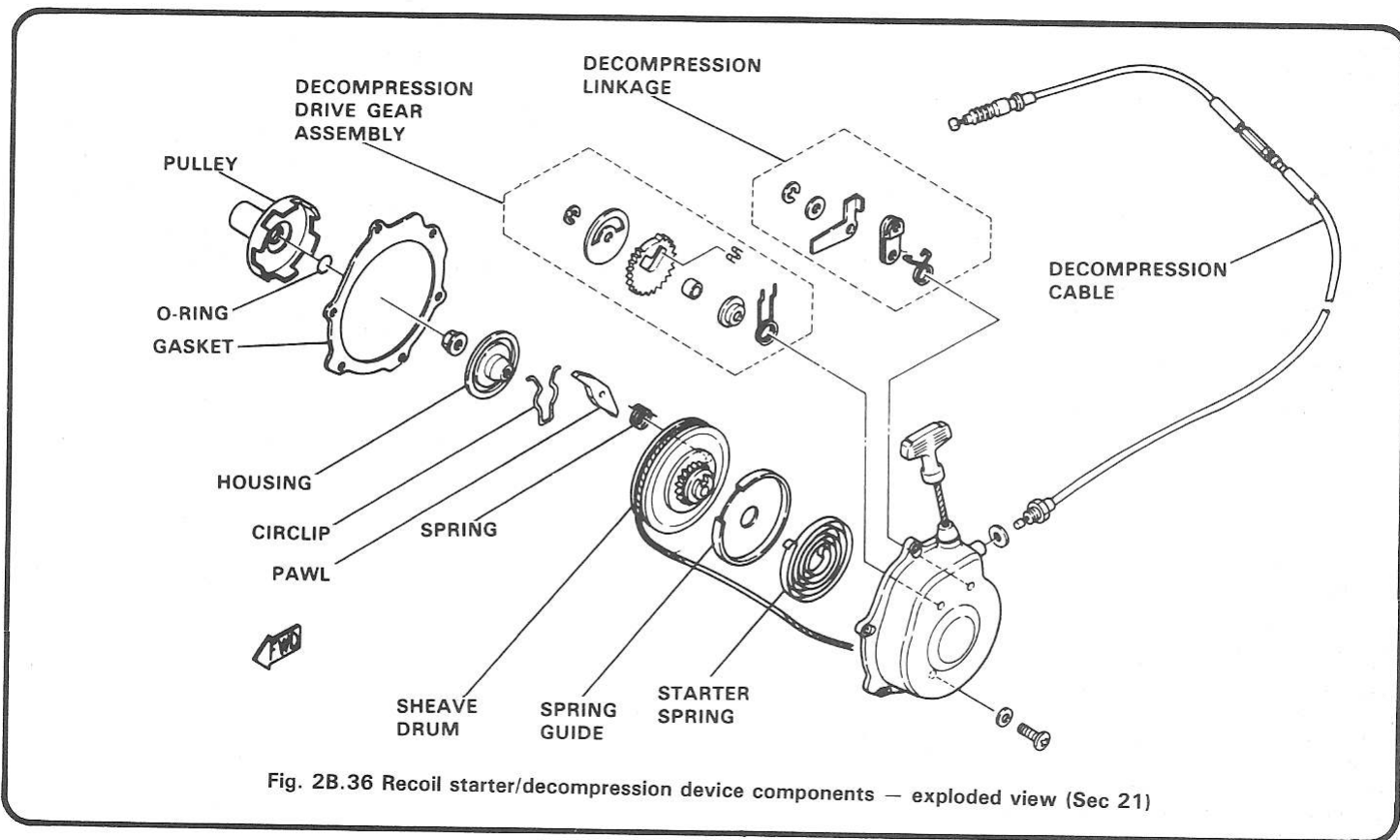


Fig. 2B.36 Recoil starter/decompression device components — exploded view (Sec 21)

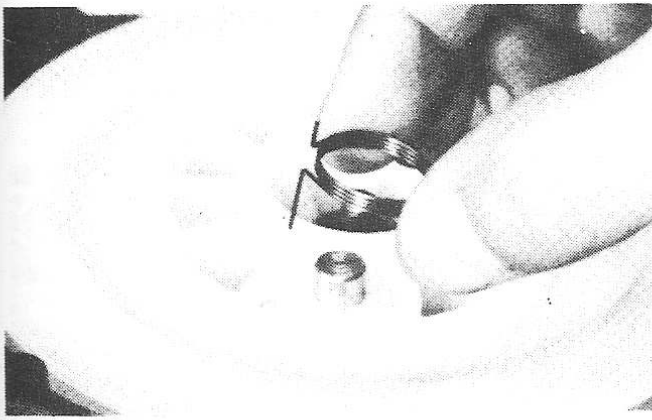


Fig. 2B.37 The long end of the drive pawl spring must fit into the drum hole (Sec 21)

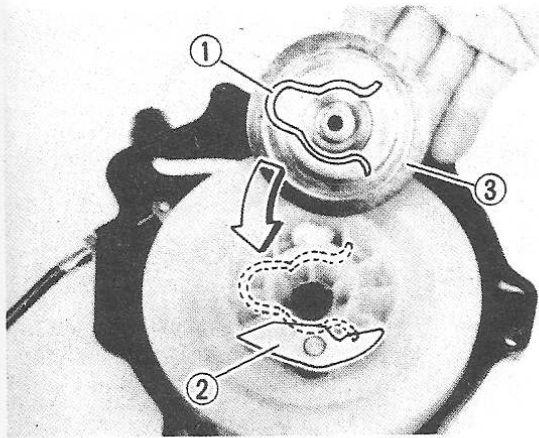


Fig. 2B.39 The spring clip (1) is attached to the drive housing (3) and fits against the pawl (2) when the housing is installed (Sec 21)

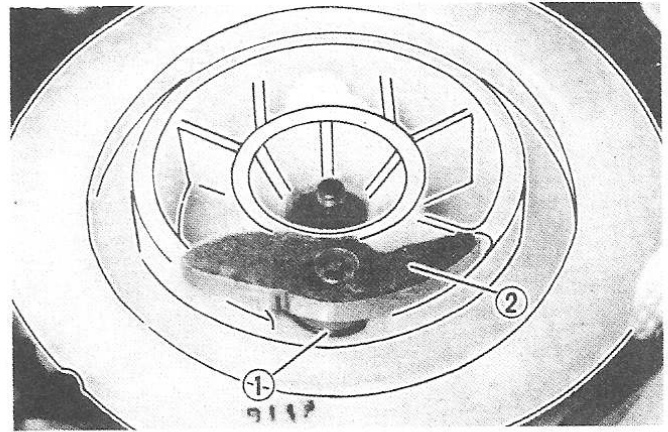


Fig. 2B.38 Correct installed position of spring (1) and pawl (2) (Sec 21)

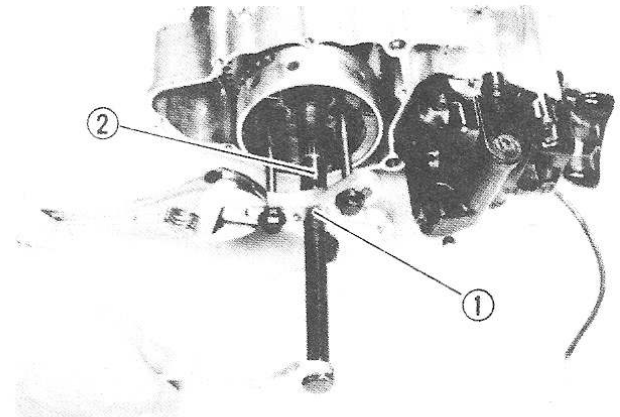


Fig. 2B.40 Tighten the puller screw (1) against the crankshaft (2) to remove the AC generator rotor (Sec 22)

will rest on the spring. Rotate the drum until it drops slightly, then turn it counterclockwise until spring tension is felt.

5 Keep downward pressure on the drum so the spring doesn't fly out, then pass the end of the rope through the case hole and starter handle. Tie a knot in the outer end of the rope so it will not pull back through the handle.

6 Install the drive pawl spring and the drive pawl. The longer end of the spring should be inserted into the hole in the drum and the other end should fit into one of the notches in the pawl.

7 Rotate the pawl one turn counterclockwise to preload the spring, then push the pawl into the drum cutout.

8 Attach the spring clip to the housing, then lay the housing in place and install the washer and nut. Use thread-locking compound on the nut and tighten it securely.

9 Turn the drum four turns in a counterclockwise direction to preload the spring. Keep slight pressure on the drum and let the spring rewind the rope until the handle stops it. Check the starter for smooth operation. When the rope has been pulled out three to five inches the drive pawl should move out. When the rope is retracted, the drive pawl should move in.

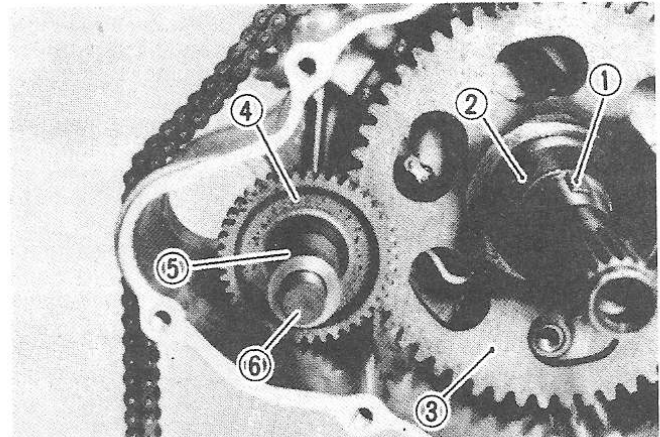


Fig. 2B.41 Electric starter idler gear components (Sec 22)

- |                    |                    |
|--------------------|--------------------|
| 1 Woodruff key     | 4 Small idler gear |
| 2 Washer           | 5 Collar           |
| 3 Large idler gear | 6 Shaft            |

## 22 AC generator — removal and installation

1 The AC generator components (rotor and stator) can be removed with the engine in place in the frame, but be sure to disconnect the stator wire connectors and drain the oil first. Remove the recoil starter assembly and the pulley. On models with a reverse gear, remove the bolts and detach the reverse gear selector lever.

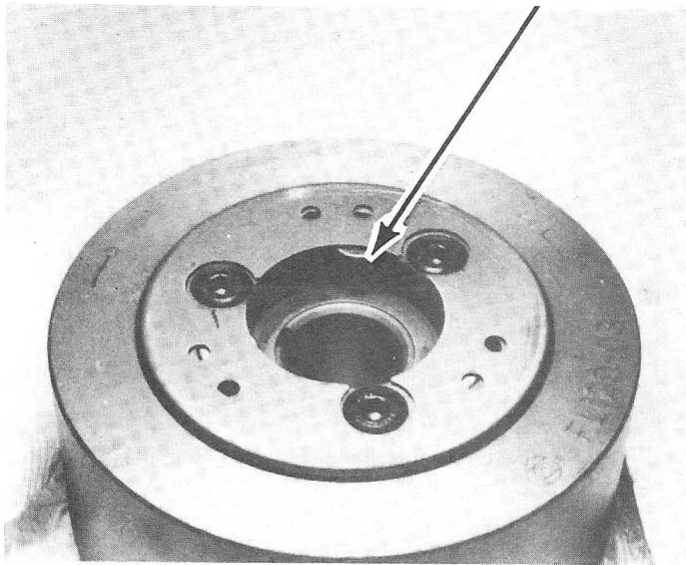
2 Remove the screws and separate the left crankcase spacer from the engine. It may be a good idea to make a holder from a piece of cardboard to ensure that the screws and dowel pins are returned to their original locations when the spacer is reinstalled. The stator assembly is bolted to the inside of the spacer.

3 Attach the puller to the rotor. Do not tighten the three puller bolts with a wrench. Tighten them an equal amount *by hand* until they bottom lightly. **Caution:** Do not use a gear puller to try to remove the rotor as damage will result.

4 Hold the puller and tighten the center bolt until the rotor separates from the end of the crankshaft. It may be necessary to strike the end of the center puller bolt with a large hammer to dislodge the rotor. If so, one heavy blow is preferred to a series of light ones.

5 If the engine is being disassembled completely, carefully pry the Woodruff key out of the keyway in the crankshaft. If no further disassembly is planned, the key can remain in place.





22.7 Check the starter clutch rollers for wear and free movement

6 On electric-start models carefully remove the collar, the small starter idler gear and the shaft from the crankcase. Remove the large starter idler gear from the crankshaft.

7 Before installing the AC generator, make sure the cam chain and guides are in place. Check the starter clutch (attached to the back of the rotor) rollers for wear and flat spots and make sure they move in and out smoothly (photo). Check the hex (Allen) head bolts to make sure they are tight. Do not disassemble the starter clutch unless wear or damage is evident. Check the large idler gear teeth and the bearing and roller contact surfaces for wear and damage. If it is worn or damaged, replace it with a new one.

8 Lubricate the larger starter idler gear bearing and slip it onto the crankshaft, then install the Woodruff key in the keyway (if it was removed).

9 Make sure the tapered portion of the crankshaft and the inside of the rotor are perfectly clean, then carefully slide the rotor over the end of the crankshaft while lining up the key and slot. Rotate the large starter idler gear clockwise while sliding the rotor into place. This will engage the idler gear and starter clutch rollers properly.

10 Apply moly-base grease to the shaft, then install the shaft, small idler gear and collar.

11 Reattach the left-side crankcase spacer and tighten the screws evenly and securely. Use a new gasket and make sure the dowel pins are in place.

12 Insert a new O-ring into the starter pulley and lubricate it with grease. Lubricate the seal in the crankcase spacer as well. Slip the pulley onto the crankshaft, then apply thread-locking compound to the threads and install the bolt in the end of the crankshaft. Hold the pulley and tighten the bolt to the specified torque.

13 The remainder of the installation procedure is the reverse of removal.

### 23 Camshaft drive mechanism — removal, inspection and installation

#### Removal

- 1 Refer to the appropriate Sections and remove the cylinder head, the cylinder and the AC generator rotor.
- 2 Once the cylinder head is detached, the front chain guide can be lifted out of the crankcase.
- 3 Remove the two bolts and separate the cam chain tensioner slipper (rear guide) from the crankcase.
- 4 Slip the chain off the drive sprocket on the crankshaft and remove it.

#### Inspection

- 5 Clean the parts with solvent and dry them thoroughly, then check the sprocket teeth for wear and damage.

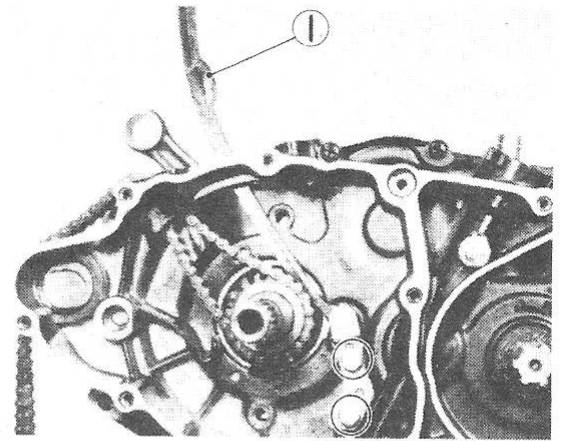


Fig. 2B.42 The camshaft chain tensioner (guide) (1) is attached to the case with two bolts (circled) (Sec 23)

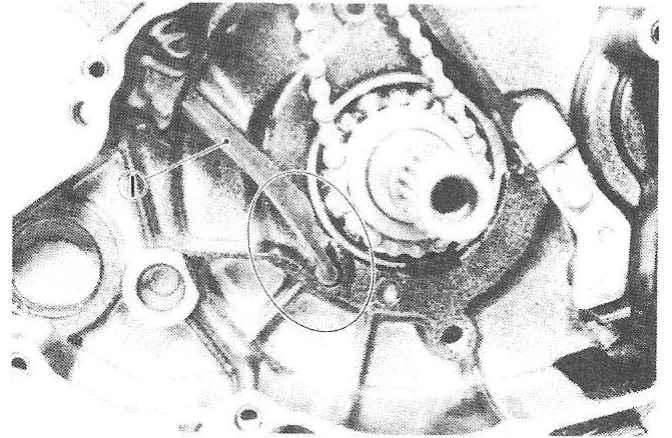


Fig. 2B.43 Make sure the front cam chain guide is engaged in the recess in the case (Sec 23)

6 Check the cam chain guide and tensioner slipper surfaces for wear. If the rubber is worn or separating from the metal backing plates, replace the parts with new ones.

7 Check the chain rollers for wear and evidence of galling. If the sprockets are worn, the chain is worn as well. Never replace just the chain or just the sprockets and never replace just one sprocket.

#### Installation

8 Install the tensioner slipper and tighten the bolts securely. Use thread locking compound on the bolt threads.

9 Mesh the chain with the drive sprocket, then route it up through the crankcase opening and hold it up with a piece of wire.

10 Insert the lower end of the front chain guide into the cavity in the crankcase.

11 Install the AC generator, the cylinder and the cylinder head.

### 24 Balancer gears — removal, inspection and installation

- 1 The balancer gears are accessible after removing the clutches (Section 13).
- 2 Remove the snap-ring, oil pump drive gear and large plate washer from the crankshaft.
- 3 Flatten the tab on the balancer shaft tabbed washer, then wedge a rag in the balancer gears and loosen and remove the large nut on the end of the balancer shaft.
- 4 Remove the rag and slide the gears off the shafts. Remove the square key from the balancer shaft. **Note:** As the outer portion of the



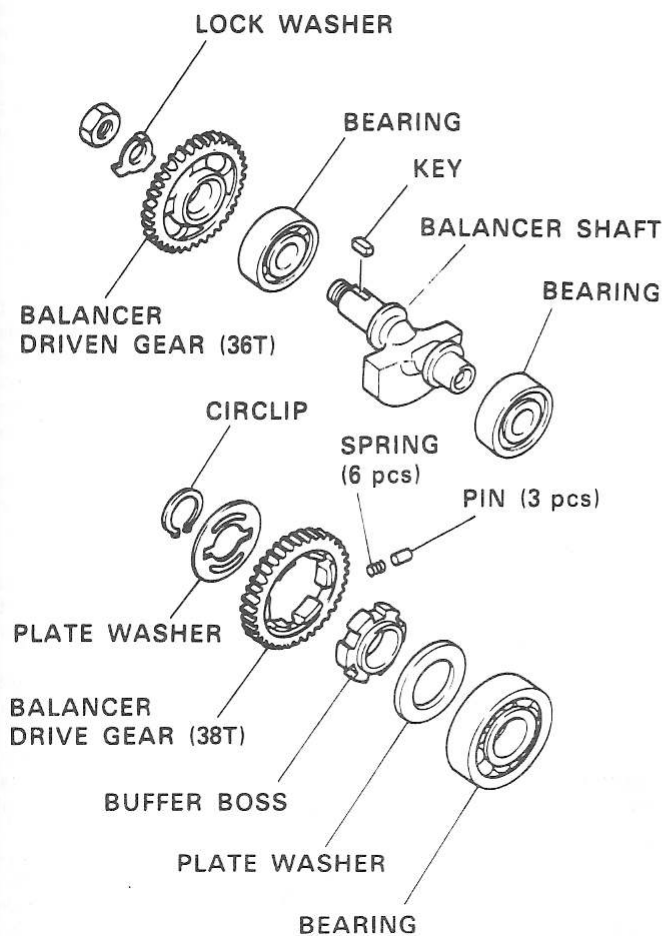


Fig. 2B.44 Balancer shaft/gear components — exploded view (Sec 24)

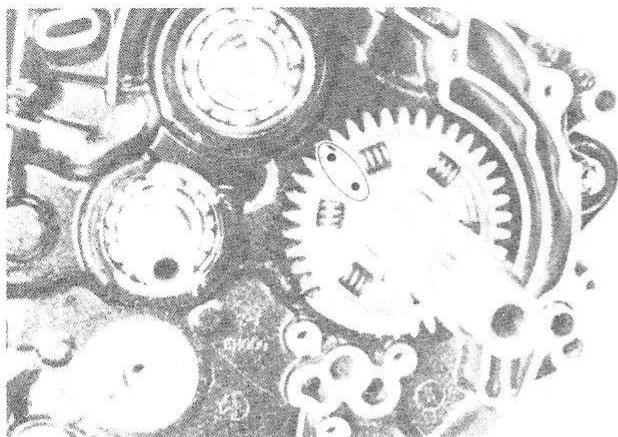


Fig. 2B.47 The punch marks (circled) on the gear and hub must be aligned (Sec 24)

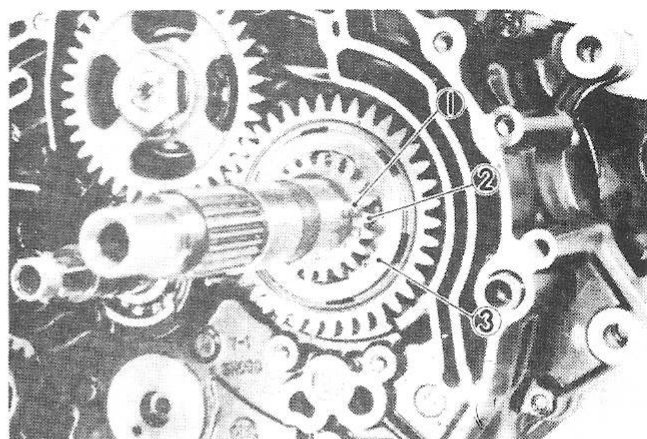


Fig. 2B.45 Remove the snap-ring (1), the oil pump drive gear (2) and the large washer (3) to gain access to the balancer drive gear (Sec 24)

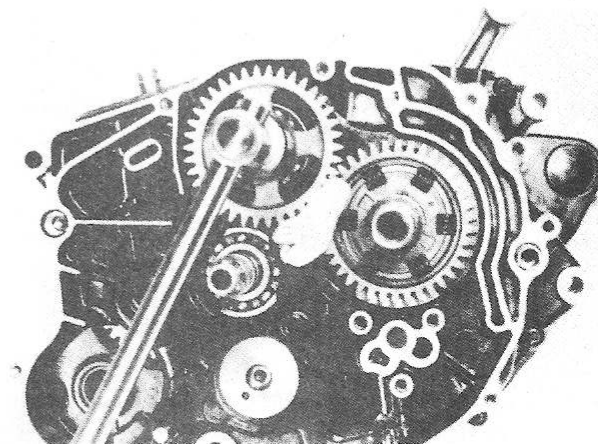


Fig. 2B.46 Removing the balancer shaft driven gear (note the rag wedged in the gear teeth to keep the shaft from turning) (Sec 24)

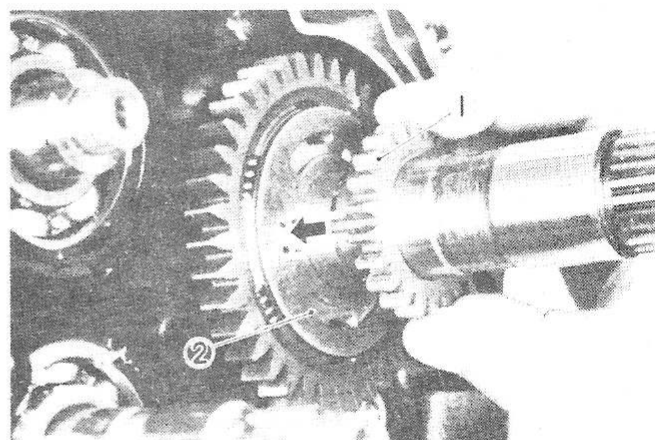


Fig. 2B.48 Make sure the tabs on the oil pump drive gear (1) fit into the slots in the washer (2) and gear (Sec 24)

*drive gear is separated from the hub, don't lose the springs and pins.* Be sure to align the punch marks when the gear and hub are reassembled.

5 Check the gear teeth for wear and damage and inspect the keyways in the gear and balancer shaft for distortion. If the springs in the drive gear appear to have sagged or if they are broken or cracked, replace the springs and pins with new parts. The pins are used only in every other spring. If all tabs on the tabbed washer have been bent, replace the washer with a new one when reinstalling the gear.

6 Begin installation by slipping the springs and springs/pins into the hub grooves. A pin is installed in every other spring. Align the drive

gear and hub and carefully slide the drive gear into position with the punch marks aligned.

7 Install the outer washer and the oil pump drive gear. Make sure the tabs on the oil pump gear engage in the slots in the plate washer and balancer gear. Position the snap-ring in the groove and make sure it is seated.

8 Slide the driven gear onto the balancer shaft and mesh the gears

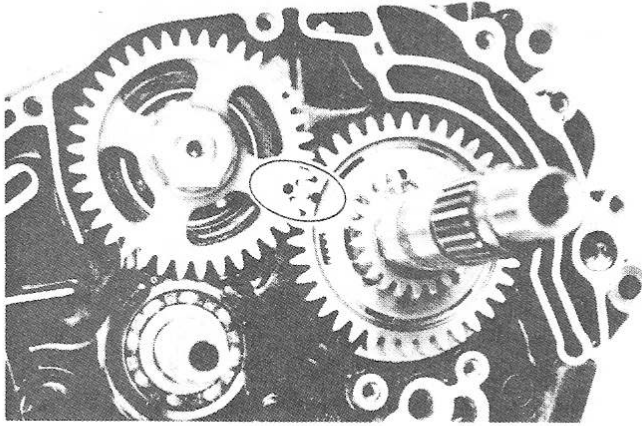


Fig. 2B.49 Align the punch marks on the gears before inserting the key in the balancer shaft (Sec 24)

with the punch marks in the outer edges aligned.

9 Rotate the shaft and slip the square key into the keyway, then install the tabbed washer and nut. Note that the tab on the washer must engage with the keyway in the shaft and the nut must be installed with the relieved side facing in.

10 The nut can be tightened to the specified torque only after wedging a rolled up rag between the gears.

11 After the nut has been tightened, bend up the tab on the washer to keep it from loosening.

## 25 Crankcase — disassembly and reassembly

1 To examine and repair or replace the crankshaft, connecting rod, bearings, transmission components and balancer shaft, the crankcase must be split into two parts.

2 Before this can be done, the clutches (Section 13), the oil pump (Section 16), the gearshift mechanism (Section 19), the AC generator (Section 22), the cam drive components (Section 23), and the balancer shaft gears (Section 24) must be removed. **Note:** *On models with a reverse gear, the output gear case cover must be removed to gain access to the crankcase screw behind it. To do this, remove the screws, tap on the cover gently with a soft-face hammer and separate it from the crankcase. Do not disassemble the gear case components.*

### Disassembly

3 If not already done, remove the Torx screw and detach the cam plate and pins from the shift drum (see Section 19). On chain drive models remove the drive sprocket from the countershaft (if not already done).

4 Remove the one or two screws from the front of the *right side* of the crankcase. Support the engine on blocks of wood or a homemade engine stand with the *left side* facing up and remove the crankcase screws. Don't miss the ones obscured by the output gearbox on shaft drive models. To prevent distortion of the cases, loosen the screws in three steps, following a criss-cross pattern. It may be helpful to make a holder from a piece of cardboard to ensure that the screws are returned to their original locations when the crankcase is reassembled.

5 On chain drive models position the engine with the left side up. Gently tap the upper (left) case with a soft-face hammer to break the seal, then carefully lift it away from the lower (right) case half. The crankshaft, balancer shaft, shift drum and transmission shafts will stay in the lower case. **Caution:** *Do not pry between the case sealing surfaces to separate them or damage to the surfaces will result.* If resistance is encountered, double check to make sure that all of the screws have been removed. Once the crankcase has been separated remove the dowel pins.

6 On shaft drive models a special tool is needed to push the crankshaft out of the *left* main bearing and separate the crankcases. However, the transmission components must remain in the *left* case section, which means that the engine should be upright (resting on the bottom) as the cases are separated. Refer to Chapter 2, Part A, and follow the procedure there, but note that on four-stroke engines the tool is installed on the *left side*, rather than the right side, and the

balancer shaft must be rotated to clear the crankshaft as the cases separate. Slowly tighten the tool center screw and push the transmission shafts, the balancer shaft and the shift drum into the left case section as the right case moves away from the left one. The balancer shaft, shift drum and transmission shafts will remain in place in the left crankcase half, while the crankshaft will still be in the right main bearing and case.

7 Lift out the balancer shaft. Refer to Sections 26 through 30 for transmission removal and servicing procedures for crankcase mounted components (bearings, seals, etc.).

### Reassembly

8 Before rejoining the cases the transmission components, the crankshaft and connecting rod and the balancer shaft must be in place in the right crankcase section on chain drive models. On shaft drive models the crankshaft must be in the right case half and the other components must be in the left case. The crankcase half with the transmission components and balancer shaft should be supported on wood blocks or a homemade engine stand.

9 Clean the mating surfaces with lacquer thinner or acetone, then apply a thin coat of Yamabond-4 semi-drying liquid gasket to both crankcase mating surfaces.

10 Install the dowel pins in the crankcase.

11 Make sure the transmission is in Neutral, then slowly and carefully lower the remaining crankcase section into position. Tap gently on the upper case around the main bearing boss and direct the transmission and balancer shafts into the bearings.

12 Make sure the cases are seated, then install the left side screws. Turn the engine over and install the right side screws. Tighten the screws gradually, in a criss-cross pattern, until they are tight.

13 Rotate the crankshaft and transmission shafts several times by hand to check for any obvious binding or rough spots. Do not proceed with the engine reassembly if the crankshaft and transmission shafts do not rotate freely.

14 The remaining steps are the reverse of disassembly. **Note:** *On models with a reverse gear, reattach the output gear case cover to the engine. Make sure the stopper rod lever is touching the case and engage the shift fork in the dog clutch groove. Tighten the bolts in a criss-cross pattern and make sure the driveshaft turns smoothly.*

## 26 Crankcase components — inspection and servicing

1 After the crankcases have been separated and the crankshaft, balancer shaft, shift drum and forks and transmission components removed, the crankcases should be cleaned thoroughly with solvent and dried with compressed air. **Note:** *Do not submerge the left crankcase section in solvent as the lubricant in the output gear assembly will be washed out.*

2 Refer to Chapter 2, Part A, and follow the procedure described there. Note that four-stroke engines do not have a clutch shaft, so ignore all references to it in Part A.

3 If the left crankcase half must be replaced on shaft drive models, the output gear assembly should be removed and replaced by a Yamaha dealer service department.

## 27 Crankshaft — removal and installation

1 Crankshaft removal is a simple matter of pulling or gently tapping it out of the right main bearing once the crankcase has been separated.

2 When installing the crankshaft it must be pulled into place in the right bearing. Refer to Chapter 2, Part A, and adapt the procedure there to this engine.

3 Be sure to install the crankshaft correctly. The end with the camshaft sprocket and the taper belong on the left side of the engine.

## 28 Crankshaft and main bearings — inspection

1 Measure the connecting rod big end side clearance with a feeler gauge.

2 Measure the connecting rod small end free play.

3 Check the runout with a dial indicator by turning the crankshaft

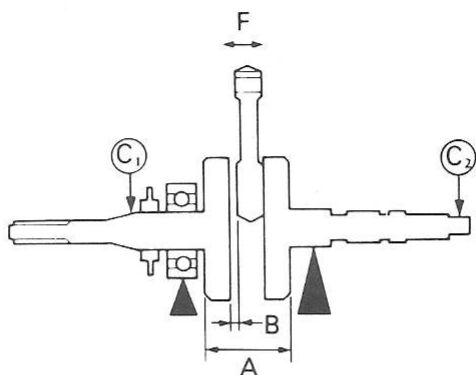


Fig. 2B.50 Crankshaft inspection details (Sec 28)

- |                          |                                      |
|--------------------------|--------------------------------------|
| A Crankshaft width       | C Runout                             |
| B Big end side clearance | F Connecting rod small end free play |

between centers on a lathe or on large V-blocks.

4 Measure the width of the crankshaft at the big end journal (across the outer faces of the flywheels).

5 Compare the results to the specifications at the front of this Chapter. Replace the crankshaft and rod if they are beyond the limits. If the special equipment required to check crankshaft runout (a lathe or crankshaft truing jig) is not available, take it to a dealer service department or motorcycle repair shop for this check.

6 Rotate the main bearings and check for roughness and binding as well as excess free play (remember the bearing in the crankcase). Clean them with solvent, dry them thoroughly and check for pitting, rust spots and chatter marks.

7 If the bearings must be replaced, take the crankshaft to a dealer service department or an automotive machine shop to have the one on the crankshaft replaced. Refer to Section 26 to replace the one in the crankcase.

8 Oil the bearings immediately after this check to prevent rust.

### 29 Shift drum and shift forks — removal, inspection and installation

**Note:** Refer to Chapter 2, Part A, for illustrations pertaining to the following procedure.

#### Removal

1 **Caution:** Note the position of each shift fork and its number before removing them. Make a simple sketch indicating the positions to ensure correct reinstallation. Support the shift forks and pull straight up on the shift fork shafts, then separate the forks from the gears.

2 Pull straight up on the shift drum to remove it from the crankcase.

#### Inspection

3 Check the edges of the grooves in the drum for signs of excessive wear. Inspect the end plate, the shift pins and the cam plate for wear. If wear is evident, new parts will be required.

4 Check the bearing for smooth operation. If noise or binding is evident, the bearing must be replaced with a new one. The numbers on the bearing should face out when it is installed.

5 Check the shift forks for distortion and wear, especially at the fork ends. If they are discolored or severely worn they are probably bent. If damage or wear is evident, check the shift fork groove in the corresponding gear as well. Inspect the guide pins and the shaft bore for excessive wear and distortion and replace any defective parts with new ones.

6 Check the shift fork shafts for evidence of wear, galling and other damage. Make sure the shift forks move smoothly on the shafts. If the shafts are worn or bent, replace them with new ones.

#### Installation

7 Lubricate the grooves in the shift drum or the guide pins on the forks with moly-base grease, then install the drum in the crankcase.

8 Each shift fork is marked with a number and must be installed with the number toward the left crankcase section.

9 Lubricate the fork ends, then engage the shift forks in the shift

drum grooves. Apply moly-base grease to the shafts and install them through the shift fork bores and into the recesses in the crankcase.

10 Turn the shift drum and transmission gears as necessary to place the transmission in the Neutral position, then make sure the gears turn freely before proceeding with the engine reassembly procedures.

### 30 Transmission shafts — disassembly, inspection and reassembly

1 In order to disassemble the countershaft gears, snap-ring pliers are an absolute necessity. **Note:** The mainshaft cannot be disassembled and reassembled without a hydraulic press. As a result, if the gears on the mainshaft or the mainshaft itself requires replacement, we recommend that it be done by a Yamaha dealer service department.

#### Disassembly

##### Shaft drive models

2 Remove the snap-ring from the end of the countershaft, then lift off the thrust washer and the countershaft first (1st) gear.

3 Slide off the countershaft fourth (4th) gear, then remove the next snap-ring. Remove the thrust washer, then slide off the countershaft third (3rd) gear while lifting out the mainshaft assembly.

4 Slide off the countershaft fifth (5th) gear, then remove the remaining snap-ring and thrust washer and slide off the countershaft second (2nd) gear. **Note:** On shaft drive models, the countershaft cannot be removed without disassembling the shaft drive output gearbox, a procedure that must be done by a Yamaha dealer service department.

5 Lay the parts out in the order of disassembly, then clean each part, one at a time, with solvent and dry them thoroughly. Make sure the oil holes are clear.

##### Chain drive models

6 The transmission shafts can be lifted out of the case as an assembly. You may have to tap on the end of the countershaft with a soft-face hammer to remove it from the bearing. Refer to Chapter 2, Part A, for the disassembly procedure, but remember that the mainshaft cannot be disassembled.

#### Inspection

##### Countershaft

7 Check the gear teeth, the gear dogs and the shift fork grooves for cracks, heat discoloration and excessive wear. If the gear dogs are rounded off, replace the gears with new ones and check the slots in the gears that mate with the dogs.

8 Check the splines on the shaft and the splines in the gears for wear and distortion. Make sure each of the countershaft gears slides freely on the shaft splines.

9 Check the gear bushings and the corresponding shaft journals for wear, galling and heat discoloration. Make sure they rotate freely on the shaft without excessive play. If a gear requires replacement due to wear or damage, have the gear it mates against on the mainshaft replaced as well.

10 Check the thrust washers and snap-rings for wear and distortion. Replace any worn or damaged parts with new ones. If in doubt as to the condition of the snap-rings, replace them with new ones — the cost is minimal and it may prevent severe damage that could occur if a snap-ring breaks or shifts during engine operation.

##### Mainshaft

11 Check the mainshaft gears and shaft in the same manner as the countershaft components. Note that if mainshaft components require replacement, it should be done by a Yamaha dealer service department. If a gear requires replacement due to wear or damage, replace the gear that it mates against on the countershaft as well.

#### Reassembly

12 Reassemble and install the components in the reverse order of disassembly. Use the exploded view as a guide. As the parts are assembled, lubricate the contact surfaces with moly-base grease. Make sure the snap-rings are securely seated in their grooves with the sharp edge on each snap-ring facing out.

13 Before installing the mainshaft, measure the width of the gear cluster with a dial or vernier caliper. If it is not 3.59-inches (91 mm), have the mainshaft second gear position changed by a Yamaha dealer service department. A hydraulic press is required to move it.



## 31 Initial start-up after major repair

**Note:** Refer to Chapter 1 to check and adjust the valve clearances and cam chain tension before starting the engine.

1 Make sure the engine oil level is correct (Chapter 1), then remove the spark plug from the engine. Place the engine *Stop* switch in the *Off* position.

2 Turn on the main switch and crank the engine over with the electric starter (if equipped) for 15 seconds, no longer. If the machine is not equipped with an electric starter, operate the recoil starter as vigorously as possible for the same amount of time. Replace the spark plug, hook up the wire and turn the switch to *Run*.

3 Make sure there is fuel in the tank, then turn the petcock to the *On* or *Reserve* position and operate the starter valve.

4 Start the engine and allow it to run at a moderately fast idle until

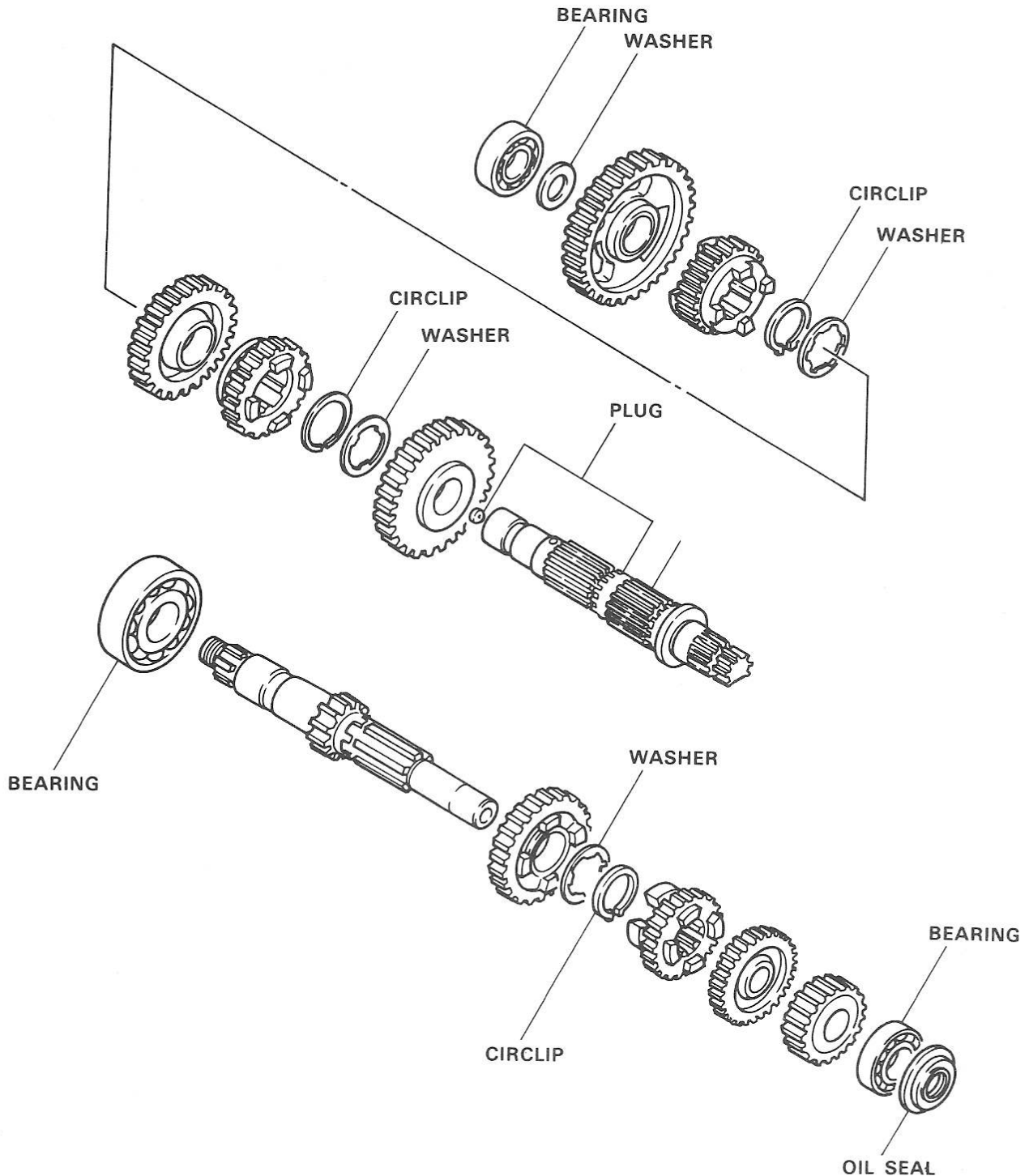
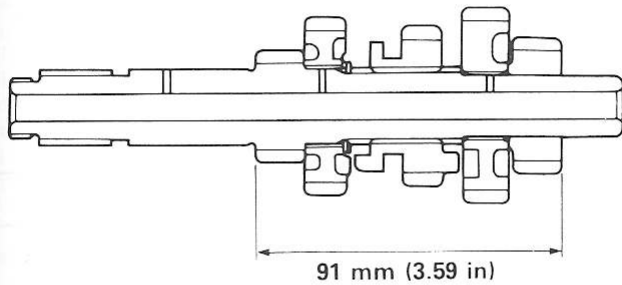


Fig. 2B.51 Typical transmission shaft components — exploded view (shaft drive model shown) (Sec 32)



it reaches operating temperature.

5 Check carefully for oil leaks and make sure the transmission and controls, especially the brakes, function properly before riding the machine. Refer to Section 32 for recommended break-in procedures.



**Fig. 2B.52** Make sure the mainshaft is the specified width before installing it (Sec 32)

### 32 Recommended break-in procedure

- 1 An engine that has had extensive work such as new piston rings, new main or connecting rod bearings or new transmission parts must be carefully broken in to realize the maximum possible benefits from the repairs.
- 2 The break-in procedure allows the new parts to wear in under controlled conditions and conform to the surfaces which they bear against.
- 3 Generally, the break-in procedure requires that the engine be allowed to spin freely under light loads without over-revving it or continuously running it at a constant speed. Do not lug the engine by applying large throttle openings at low speeds and do not allow it to idle for long periods of time. These guidelines should be followed for approximately 20 hours, realizing that as mileage accumulates, gradually higher engine speeds and loads can be applied. After 20 hours the engine can be considered completely broken in and its full performance potential can be utilized.
- 4 During the break-in period, keep a very close eye on the engine oil level. Change the engine oil after the first few hours and again at 20 hours to ensure that the minute metal particles normally generated during break-in are removed.

# Chapter 3 Fuel system

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## Specifications

### YT 60

Carburetor type .....	Mikuni VM12SC
Identification mark .....	36R00
Main jet .....	92.5
Jet needle/clip position .....	3X1/3
Needle jet .....	E8
Cutaway .....	4.0
Pilot jet .....	40
Pilot air screw .....	2 turns out
Valve seat size .....	1.2
Starter jet .....	40
Float height .....	16.5 ± 1 mm (0.65 ± 0.04 in)
Fuel level .....	3 ± 1 mm (0.12 ± 0.04 in)
Idle speed .....	See Chapter 1

### YT 125G

Carburetor type .....	Mikuni VM20SS
Identification mark .....	3X300
Main jet .....	110
Air jet .....	2.0
Jet needle/clip position .....	4E16/3
Needle jet .....	06
Cutaway .....	1.5
Pilot jet .....	20
Pilot air screw .....	1 1/2 turns out
Starter jet .....	50
Fuel level .....	21 mm (0.83 in)
Idle speed .....	See Chapter 1

### YT 125J

Carburetor type .....	Mikuni VM20SS
Identification mark .....	5V600
Main jet .....	200
Air jet .....	2.5
Jet needle/clip position .....	4E16/3
Needle jet .....	00
Cutaway .....	1.5
Pilot jet .....	25
Pilot outlet .....	0.6
Pilot air screw .....	1 1/2 turns out
Starter jet .....	50
Bypass size .....	1.4
Fuel level .....	21 ± 1 mm (0.83 ± 0.04 in)
Idle speed .....	See Chapter 1

**YT 175J**

Carburetor type	Mikuni VM24SS
Identification mark	5V700
Main jet	165
Air jet	2.5
Jet needle/clip position	4K4/3
Needle jet	N8
Cutaway	2.5
Pilot jet	40
Pilot outlet	0.6
Pilot air screw	1 1/4 turns out
Valve seat size	1.0
Starter jet	20
Bypass size	1.4
Float height	25 ± 1 mm (0.98 ± 0.04 in)
Idle speed	See Chapter 1

**YT 175K**

Carburetor type	Mikuni VM24SS
Identification mark	20E00
Main jet	170
Air jet	2.5
Jet needle/clip position	4I4/3
Needle jet	N8
Cutaway	2.5
Pilot jet	35
Pilot outlet	0.6
Pilot air screw	1 turn out
Valve seat size	1.0
Starter jet	20
Float height	25 ± 1 mm (0.98 ± 0.04 in)
Idle speed	See Chapter 1

**YTM 200K**

Carburetor type	Mikuni VM22
Identification mark	21V00
Main jet	102.5
Air jet	1.5
Jet needle/clip position	4L25/3
Needle jet	N8
Cutaway	3.5
Pilot jet	35
Pilot air jet	1.3
Pilot air screw	2 1/4 ± 1/2 turns out
Valve seat size	2.0
Starter jet	65
Float height	21.5 ± 0.5 mm (0.85 ± 0.02 in)
Fuel level	3.0 ± 1.0 mm (0.12 ± 0.04 in)
Idle speed	See Chapter 1

**YTM 200EK**

Carburetor type	Mikuni VM22
Identification mark	24W00
Main jet	112.5
Air jet	1.7
Jet needle/clip position	4H23/3
Needle jet	N6
Cutaway	4.0
Pilot jet	25
Pilot air jet	130
Pilot air screw	2 ± 1/2 turns out
Valve seat size	1.8
Starter jet	65
Float height	21.5 ± 0.5 mm (0.85 ± 0.02 in)
Fuel level	3.0 ± 1.0 mm (0.12 ± 0.04 in)
Idle speed	See Chapter 1

**YTM 200ERN**

Carburetor type	Mikuni VM22SH
Identification mark	24W01
Main jet	112.5
Air jet	1.7
Jet needle/clip position	4H23/3
Needle jet	N6
Cutaway	4.0
Pilot jet	25
Pilot air jet	130
Pilot air screw	2 ± 1/2 turns out
Valve seat size	1.8
Starter jet	85
Float height	21.5 ± 0.5 mm (0.85 ± 0.02 in)
Fuel level	3.0 ± 1.0 mm (0.12 ± 0.04 in)
Idle speed	See Chapter 1

**YTM 225DXK**

Carburetor type	Mikuni VM22
Identification mark	29U00
Main jet	112.5
Air jet	1.6
Jet needle/clip position	5L10/3
Needle jet	N8
Cutaway	3.5
Pilot jet	20
Pilot air jet	60
Pilot air screw	1 1/2 ± 1/2 turns out
Valve seat size	1.8
Starter jet	65
Float height	21.5 ± 0.5 mm (0.85 ± 0.02 in)
Fuel level	3.0 ± 1.0 mm (0.12 ± 0.04 in)
Idle speed	See Chapter 1

**YFM 200N**

Carburetor type	Mikuni VM22SH
Identification mark	52H00
Main jet	115
Air jet	1.7
Jet needle/clip position	4DH1/3
Needle jet	N6
Cutaway	4.0
Pilot jet	27.5
Pilot air jet	130
Pilot air screw	1 to 2 turns out
Valve seat size	1.8
Starter jet	85
Float height	21.5 ± 0.5 mm (0.85 ± 0.02 in)
Fuel level	3.0 ± 1.0 mm (0.12 ± 0.04 in)
Idle speed	See Chapter 1

**YTZ 250N**

Carburetor type	Mikuni VM32SS
Identification mark	38W00
Main jet	470
Air jet	2.5
Jet needle/clip position	6H3/3
Needle jet	P2
Cutaway	2.0
Pilot jet	45
Pilot air screw	1 turn out
Valve seat size	3.3
Starter jet	1.3
Float height	31.3 ± 1.0 mm (1.23 ± 0.04 in)
Idle speed	See Chapter 1

**Torque specifications**

Carburetor mounting nuts	Ft-lbs	mKg
	5.8	0.8



## 1 General information

The fuel system components include the gas tank, the carburetor and the air cleaner assembly. Some models are also equipped with a fuel pump.

Fuel is fed by gravity, except on models equipped with a fuel pump, through a single rubber line from the fuel tank to the carburetor. On most models the tank is equipped with a three-position petcock (*On — Off — Reserve*) to which a tubular nylon fuel filter is attached. YTZ 250 models are equipped with two petcocks — one for turning fuel flow off and on and the other for routing fuel from the main or reserve tank to the fuel pump. A screen-type filter is integral with the petcock attached to the pump. The carburetor is manufactured by Mikuni and has a cable-operated throttle valve and a manually-operated starter (choke) valve. The air cleaner is contained in a plastic box to the rear of the carburetor and is equipped with a removable, oil-soaked, polyurethane foam element.

Many of the fuel system service procedures are considered routine maintenance and for that reason are included in Chapter 1.

## 2 Fuel tank — removal and installation

1 Due to the number of models covered by this manual, specific instructions for removal and installation of the fuel tank cannot be given. Note that in most cases removal usually involves disconnecting the fuel hose from the petcock, removing the mounting bolts and/or straps, and sliding the tank out of position.

2 The YTZ 250N does not have the tank mounted in the conventional location. Instead, it is attached to the frame under the seat. The removal procedure is similar to other models, but note that additional hoses are attached to the tank.

3 When replacing the tank, reverse the removal procedure. Make sure the tank seats properly and does not pinch any control cables or wires. If you encounter difficulty when trying to slide the tank mounts into place, a small amount of liquid soap solution or saliva should be used to lubricate them (do not use oil).

## 3 Carburetor overhaul — general information

1 Poor engine performance, hesitation and little or no response to idle fuel/air mixture adjustments are all signs that major carburetor maintenance is required.

2 Many apparent carburetor problems are actually internal engine problems or ignition system faults. Be sure the carburetor needs work

before proceeding. For example, fuel starvation is often mistaken for a carburetor problem. Make sure the fuel filter, the fuel line and the gas tank cap vent hole are not plugged before blaming the carburetor for this relatively common malfunction.

3 Most carburetor problems are caused by dirt particles, varnish and other deposits which build up in and block the fuel and air passages. Also, gaskets and O-rings shrink and cause fuel and air leaks which lead to poor performance.

4 A carburetor overhaul requires complete disassembly of the carburetor. All metal components are soaked in carburetor cleaner, rinsed with solvent, then dried with compressed air. Compressed air is also used to blow out fuel and air passages. Once the cleaning process is complete, the carburetor is reassembled using new gaskets, O-rings and a new inlet needle and seat.

5 Before dismantling the carburetor, make sure you have a rebuild kit. This will include all necessary O-rings, gaskets and other parts. Also have some fresh carburetor cleaner, solvent, a supply of rags, some means of blowing out the carburetor passages and a clean place to work. **Note:** *Frequency of carburetor overhaul depends largely on the type of use. Since ATV's are designed for off-road use, some conditions, such as desert riding, may promote more frequent problems than those involved in less dusty conditions. To get the best performance from your carburetor, keep the air and fuel filters clean and stay alert for fuel system problems. There is no set rule for frequency of carburetor overhaul.*

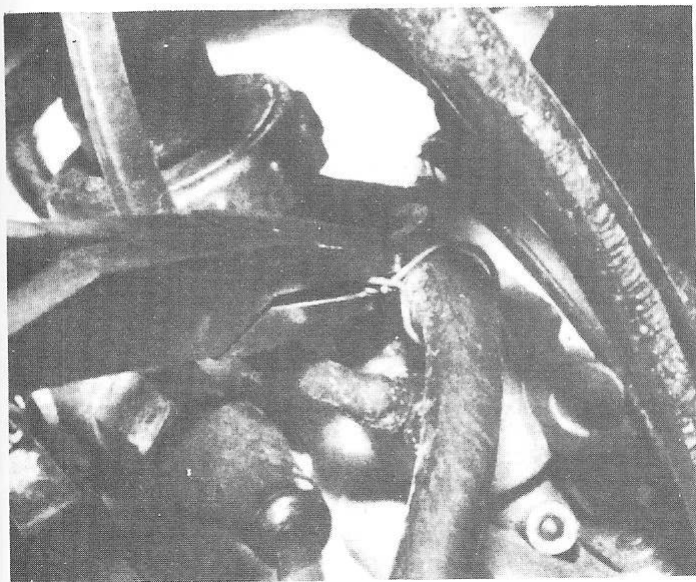
## 4 Carburetor — removal and installation

1 Remove the seat and rear mudguard assembly.

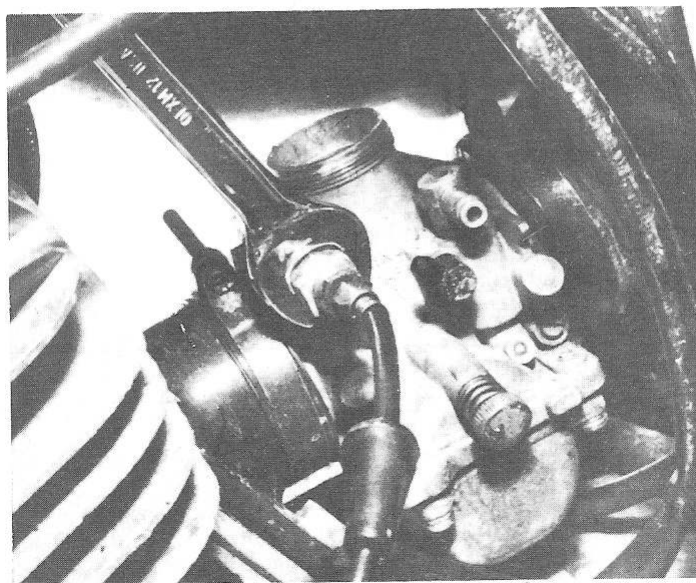
2 Because of the limited space between the rear of the cylinder and the airbox, remove the carburetor with care, following the correct removal sequence. It may help to remove the fuel tank, although this is not necessary. Whether or not the fuel tank is removed, turn the fuel petcock to the *Off* position. Carefully spread the spring clip on the fuel hose and pull the hose off the male fitting on the carburetor (photo). Detach the vent hose(s) as well. **Note:** *YT60 models also have an oil delivery hose attached to the carburetor.*

3 Remove the throttle slide assembly by turning the carburetor top counterclockwise and pulling the assembly out of the top of the carburetor. **Note:** *On YT60 models, the carburetor top is held in place with a screw.* On models with a cable-operated starter (choke) valve, remove the valve from the carburetor (photo) and leave it attached to the cable.

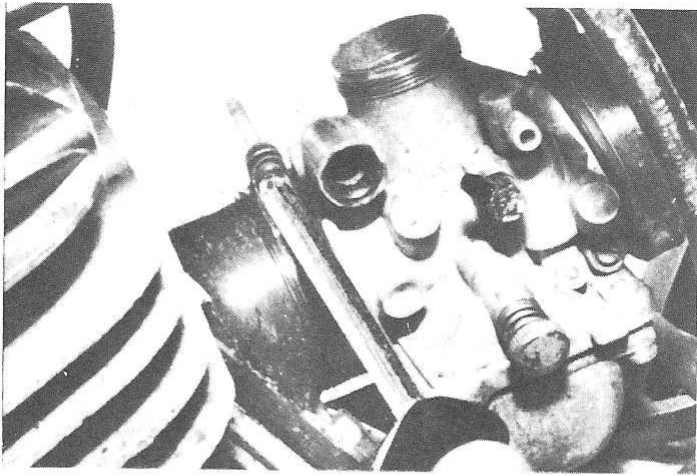
4 In most cases the carburetor is held in place at each end by a rubber boot, one from the airbox and one from the intake manifold on the cylinder head. Loosen the screws on each of the retaining clamps on the boots (photo) and pull the rear of the carburetor out of the airbox



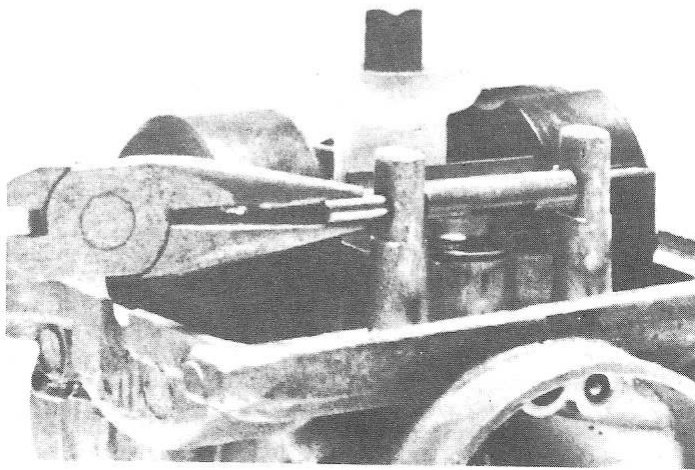
4.2 Pliers with a wide jaw work best when removing the fuel hose spring clip



4.3 The starter (choke) valve is threaded into the side of the carburetor



4.4 Loosen the clamps on both boots and detach the carburetor



5.5 Remove the float pivot pin with needle-nose pliers (if it is stuck, a small punch and hammer can be used)

boot. Now pull the front of the carburetor out of the intake boot and detach the carburetor from the engine. On some models the carburetor is attached to the manifold with two nuts, which must be removed to separate it from the manifold.

5 Installation is the reverse of removal. Where applicable, align the lug on the carburetor with the recess in the boot. If the carburetor is attached to the manifold with nuts, make sure a new O-ring is installed and do not over-tighten the nuts. Make sure that the vent/drain hoses are routed properly and that the rubber boots are securely fastened and not distorted in any way.

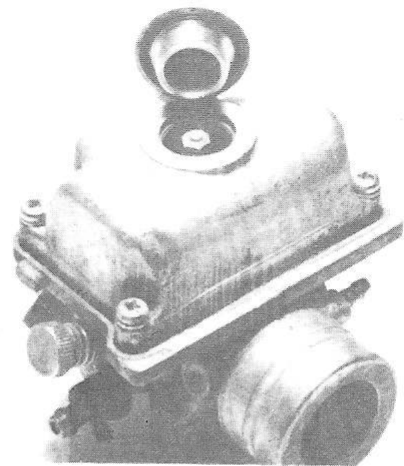
6 Insert the throttle slide into the carburetor body, being sure to align the groove in the slide with the throttle stop screw or tab in the carburetor body. Hand-tighten the carburetor top. If excessive force is applied, the carburetor could be distorted and the slide could stick open. Where applicable, install and tighten the starter valve.

7 After installation, adjust the carburetor following the idle speed/mixture adjustment procedure in Chapter 1.

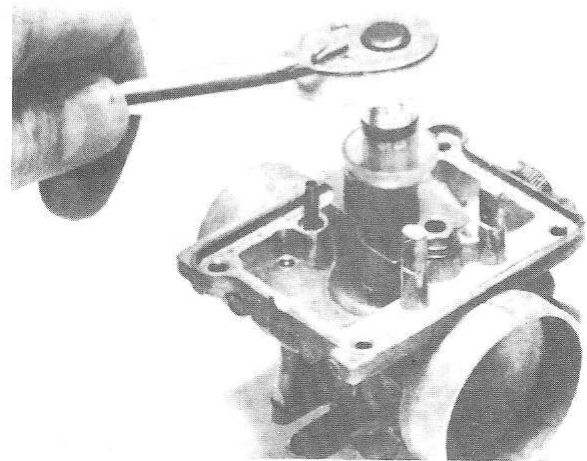
## 5 Carburetor — disassembly, inspection and reassembly

### Disassembly

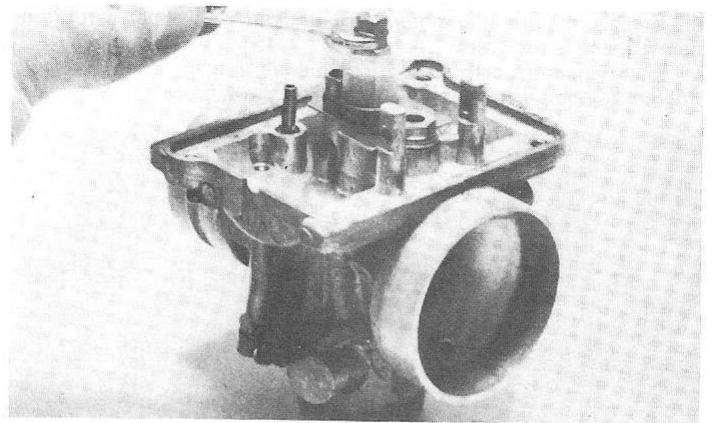
- 1 Compress the throttle slide return spring and unhook the throttle cable.
- 2 Remove the vent hose and the drain hose (if equipped).
- 3 Remove the large main jet access plug from the bottom of the float chamber (not all models) and note that there is a rubber O-ring on it which must be replaced before reassembly (photo).
- 4 Remove the retaining screws from the float chamber and separate the chamber from the carburetor body. Note that there is a gasket used



5.3 The large plug on the bottom of the carburetor is equipped with an O-ring that must be checked and replaced if damaged or deteriorated



5.7a Removing the main jet (this one requires a wrench — others may require a screwdriver)



5.7b Removing the needle jet

between the float chamber and carburetor body. The gasket must be replaced during reassembly.

5 Remove the float pivot pin by pulling it out with needle-nose pliers (photo). Be careful not to drop the float or the inlet needle valve, which may come out with the float assembly. Lay these items to the side for inspection later in the procedure.

6 If not already done, remove the starter valve. It is threaded into the carburetor body and may be covered with a rubber boot. Place it to the side for inspection.

7 Invert the carburetor body so the jets are exposed. Using a small screwdriver or wrench, depending on the type of jet, remove the main jet and the pilot jet (photo). The jet needle on some carburetors is held

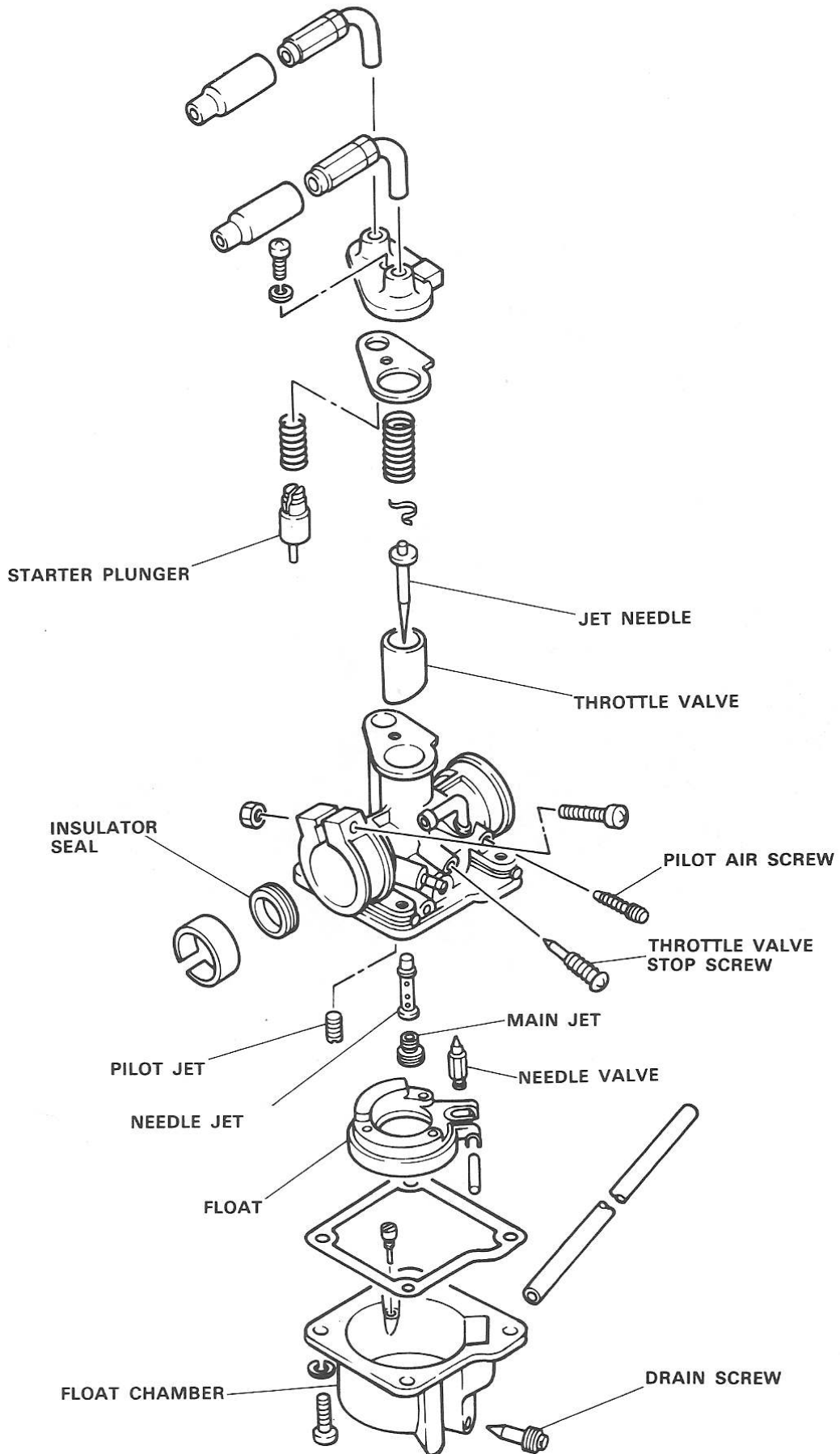


Fig. 3.1 YT 60 carburetor components — exploded view (Sec 5)

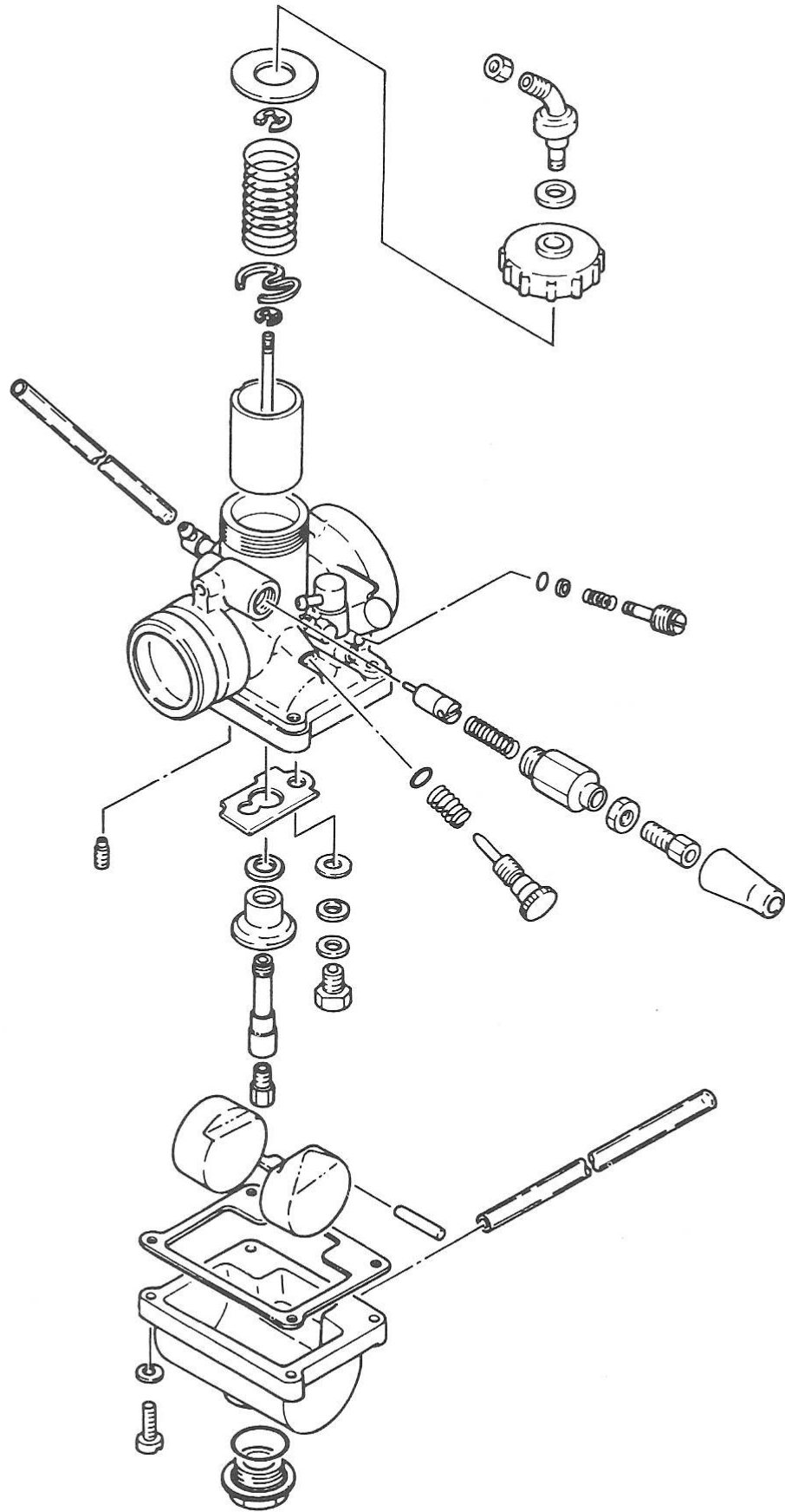


Fig. 3.2 YT 125 carburetor components — exploded view (Sec 5)



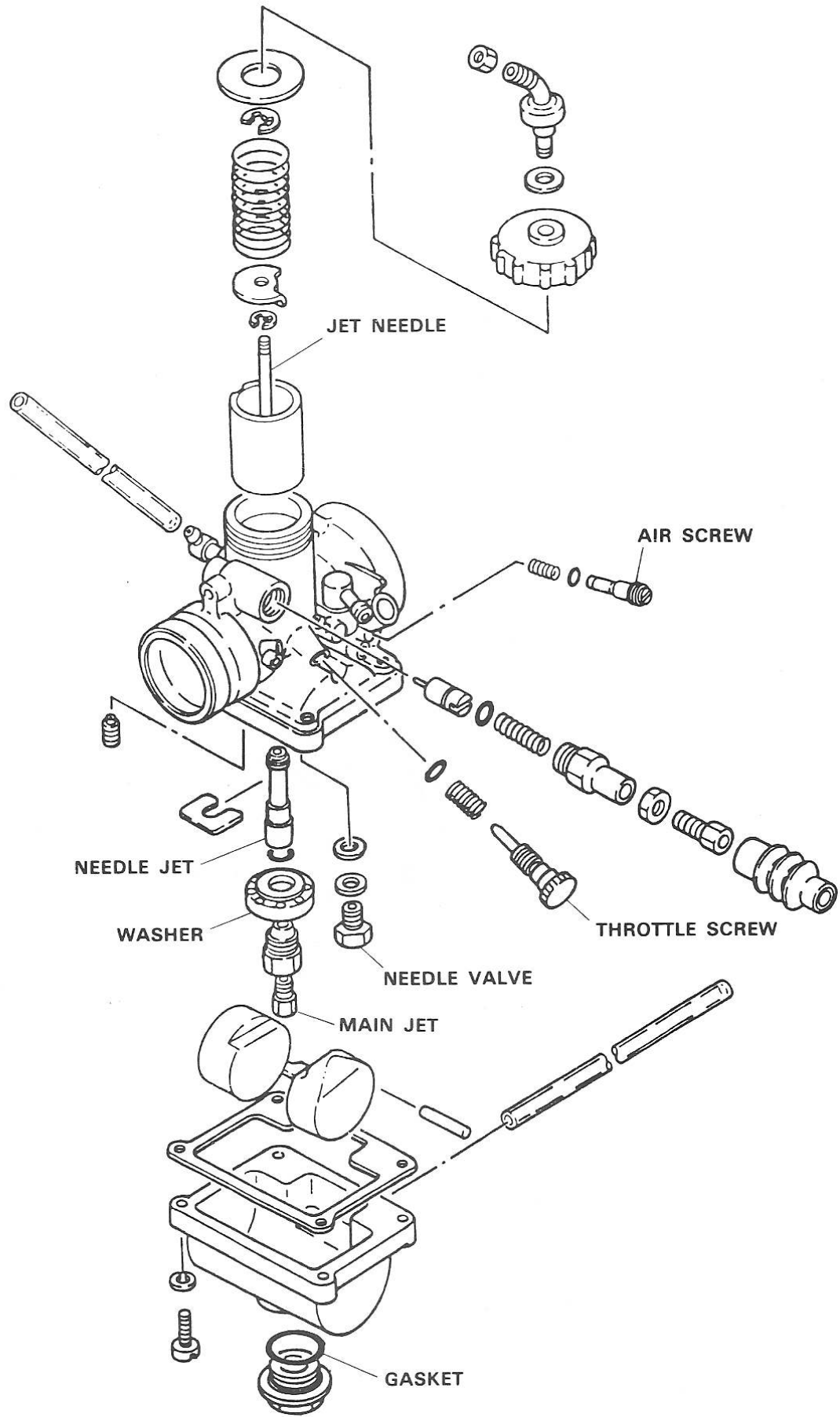


Fig. 3.3 YT 175 carburetor components — exploded view (Sec 5)

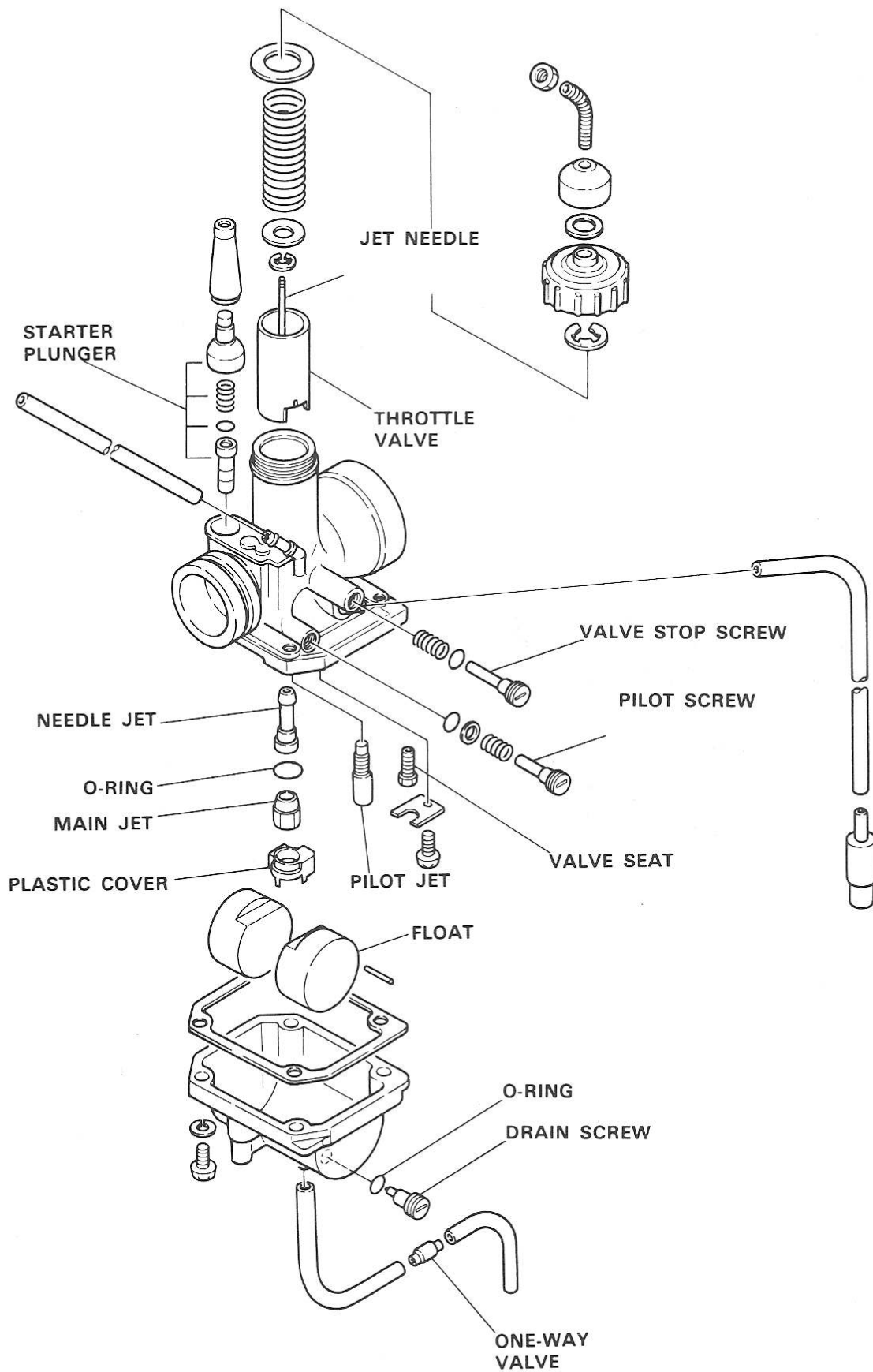


Fig. 3.4 YTM 200K carburetor components — exploded view (Sec 5)

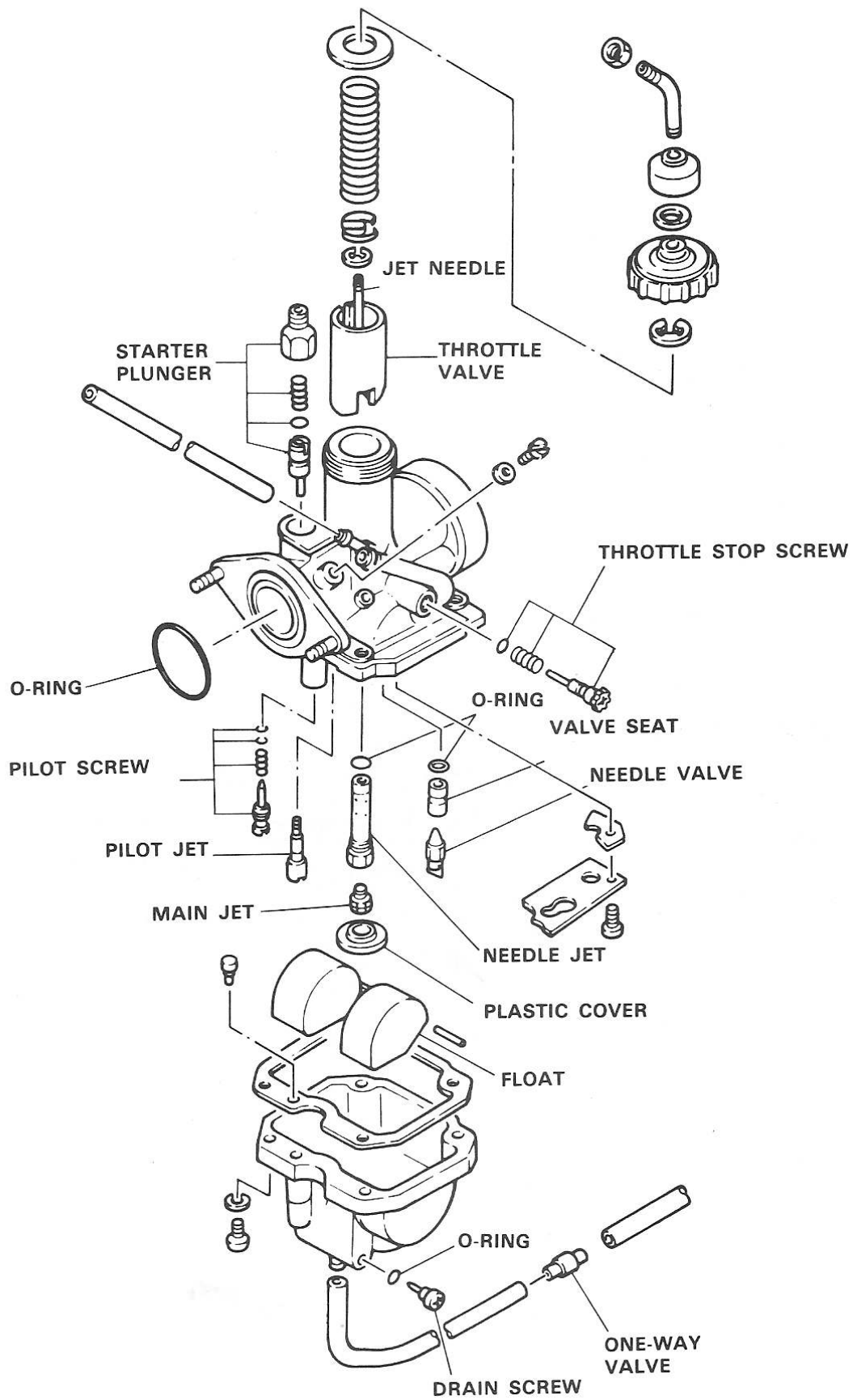


Fig. 3.5 YTM 200 EK/EL/ERN, YTM 225 DXK/DXL, YFM 200 N carburetor components — exploded view (Sec 5)

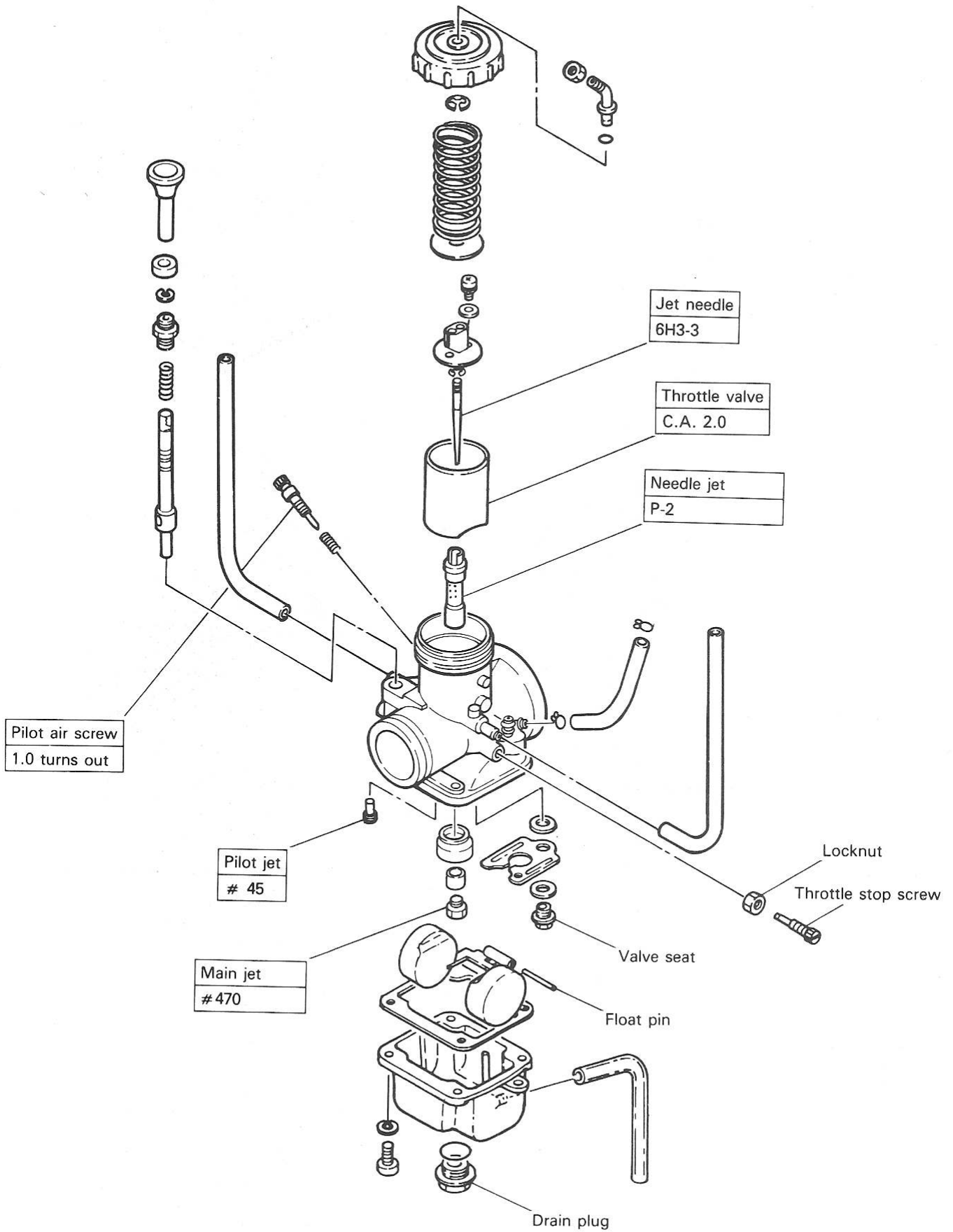
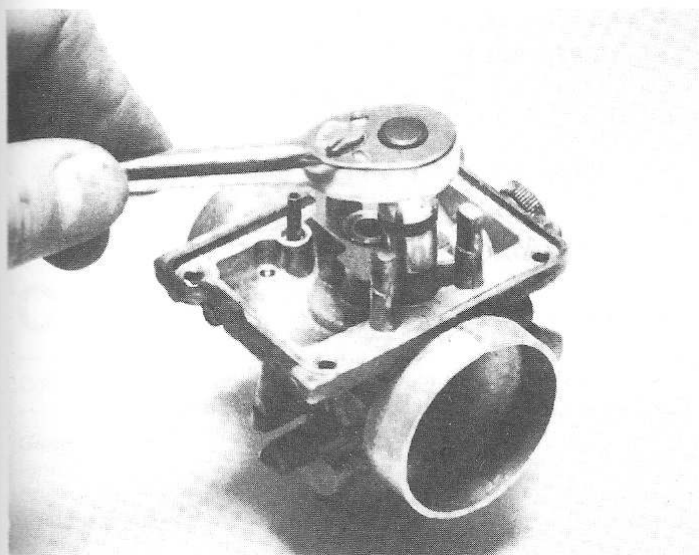


Fig. 3.6 YTZ 250 carburetor components — exploded view (Sec 5)





5.8 Removing the inlet needle seat (this one is threaded into the carburetor body)

in place by the main jet and will slide out when the carburetor is turned over. On others, the main jet is threaded into the end of the needle jet and the needle jet must be unscrewed (photo). Note the locations of any O-rings, plastic covers, washers or clamps.

8 Remove the inlet needle valve seat. On some carburetors it is held in place with a small plate and screw, while on others it is threaded into the carburetor body (photo). Note the locations of any washers or O-rings.

9 Turn the pilot air screw in until it is lightly seated and count and record the number of turns it took (for reassembly). Remove the air screw and the spring.

10 Remove the throttle stop screw (photo).

### Inspection

11 Submerge the metal components of the carburetor in solvent and allow them to soak for 30 minutes. Do not place any plastic or rubber parts in the solvent, as they may be damaged or dissolved.

12 After the carburetor has soaked long enough for the solvent to loosen and dissolve varnish and other deposits, rinse it thoroughly and blow it dry with compressed air. Blow out all the air passages in the float chamber and carburetor body with compressed air. **Note:** *Never clean the jets or passages with a piece of wire or a drill bit, as they will be enlarged, causing the fuel and air metering rates to be changed. A broom straw or nylon bristle works well for this type of cleaning.*

13 Inspect the carburetor slide and the bore for evidence of excessive wear, nicks or scratches. Make sure the slide moves freely up and down in the bore. If wear is excessive, a new carburetor will be required. If the slide binds in the bore, it may be loosened by sanding it lightly with a very fine piece of emery cloth or 600 grit wet/dry sandpaper.

14 Inspect the jet needle, the needle jet and the carburetor body for wear and make sure the needle is not bent or nicked. If the machine has a lot of miles on it, the needle and jet may be worn enough to require replacement with new parts. It is not necessary to remove the needle from the carburetor slide unless a new needle is required.

15 Check the fuel inlet needle and the seat for nicks and a pronounced groove or ridge on the sealing surface of the needle (photo). If there is evidence of wear, the needle and seat can be replaced with new parts.

16 Check the float pivot pin and bores for wear. If the pin is a sloppy fit in the bores, excessive amounts of fuel will be allowed to enter the carburetor and flooding will occur.

17 Check the air screw for nicks and evidence of wear. Replace it with a new one if it is damaged.

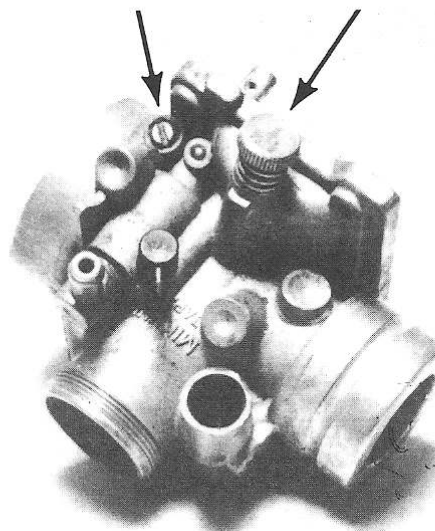
18 Check the float for dents and other damage.

19 Check the starter valve for wear and damage.

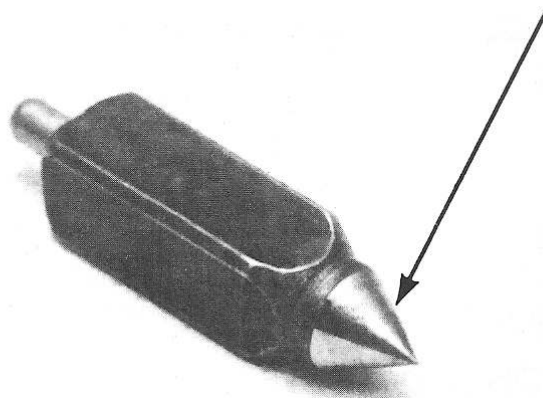
### Reassembly

20 When reassembling the carburetor, be sure to use the new O-rings, gaskets and other parts supplied in the rebuild kit.

21 Install the pilot jet, the needle jet and the main jet. Refer to the



5.10 Pilot air screw and throttle stop screw locations



5.15 Check the inlet needle valve for the presence of a groove in the tapered seat area

exploded view drawing for your particular model to ensure correct installation of the jets, O-rings, washers, plastic covers, etc. When installing the jets, do not overtighten them as the threads in the carburetor body are easily damaged.

22 Install the inlet needle valve seat. Make very sure the O-ring or gasket — if used — is correctly positioned.

23 Install the pilot air screw by turning it in until it is lightly seated and then unscrew it the number of turns recorded during disassembly. Install the throttle stop screw.

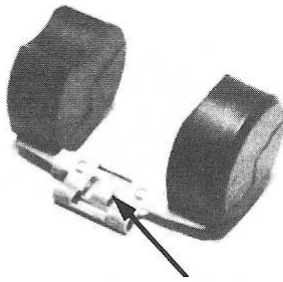
24 Install the starter valve.

25 Install the inlet needle in the seat. Hold the float in position on the carburetor and slip the pivot pin into place. Check the float for proper operation. It must move freely without binding or sticking.

### Float adjustment

**Note:** *On YTM 200, 225 and YFM 200N models, the float level is determined by checking the fuel level in the carburetor and must be done with the carburetor installed and the engine running. Refer to Section 6 for the procedure to follow. YT 60 models also require a fuel level check, but a static float height measurement is also required and can be done while the carburetor is apart for service.*

26 Turn the carburetor body so that the float is suspended by its own weight. The float should be just resting on, but not depressing, the spring-loaded inlet needle. The sealing gasket must be removed from the float chamber before the float level measurement is taken. Make the float level measurement with a vernier or dial caliper. The float level is correct when the distance between the upper edge of the float and the carburetor body flange is as specified at the beginning of the Chapter. **Note:** *If the float level is incorrect, check the inlet needle and*



5.26 If the float level is incorrect, *carefully* bend the tang to change it

*seat for wear and damage before attempting adjustment.* Adjust the float height by bending the float arm tang (photo) very carefully.

27 Install the main jet access plug and a new rubber O-ring (not all models). Position a new float chamber gasket and install the float chamber and the screws. Do not overtighten the screws.

28 Reassemble the throttle slide and cable by first installing the jet needle in the slide. Be sure the clip on the needle is in the proper groove.

29 Compress the spring and insert the throttle cable into the slide. Insert the retaining plate (if used) into the recess in the slide and secure it with the W-shaped clip.

30 Install the carburetor by referring to Section 4.

## 6 Float level — check and adjustment

1 If conditions of flooding or lean fuel mixtures have been occurring, or if you have been experiencing difficulty in adjusting the carburetor, check the float level and, if necessary, adjust it. On YT60, YT200, YT225 and YFM 200N models the float level is determined by checking the level of the gasoline in the float chamber. This is accomplished with the carburetor in place and the engine running. On all other models the float level is checked with the carburetor disassembled.

### YT60, 200, 225 and YFM 200 models

2 Place the machine on a level surface and raise the front end with a jack until the float chamber gasket surface is horizontal.

3 Disconnect the float chamber drain hose from the fitting and install a section of clear hose in its place. Hold the clear hose in a vertical position and loosen the drain screw (do not remove it, just loosen it).

4 Turn the fuel petcock lever to the *On* position, start the engine, let it run for a few minutes, then shut it off.

5 Check the fuel level in the clear hose. On YT 60 models it should be 0.040 to 0.120 in (1 to 3 mm) from the upper gasket surface of the float chamber. On YT 200 and 225 models it should be measured from the bottom of the lip on the carburetor body (see the accompanying illustrations for details).

6 If the fuel level is not as specified, the carburetor must be removed and the inlet needle and seat must be checked for damage and wear. If no damage is found, adjust the float level slightly by carefully bending the tang on the float, then recheck the fuel level.

7 When the check is complete, tighten the drain screw, remove the clear hose and reinstall the drain hose.

### All other models

8 The float level on these models is checked with the carburetor disassembled. Refer to Section 6, Paragraph 26, for the proper procedure.

## 7 Fuel pump — check

1 A fuel pump is used on YT 175K and YTZ 250N models. On YTZ 250 models the pump is directly above and part of the fuel petcock. On YT 175 models it is mounted just to the rear of the fuel petcock.

2 Check the vacuum hose mounted between the engine crankcase and the fuel pump. Look for cracks, kinks or other damage and make sure it is securely attached to the fittings. Check the fuel hoses in the same manner.

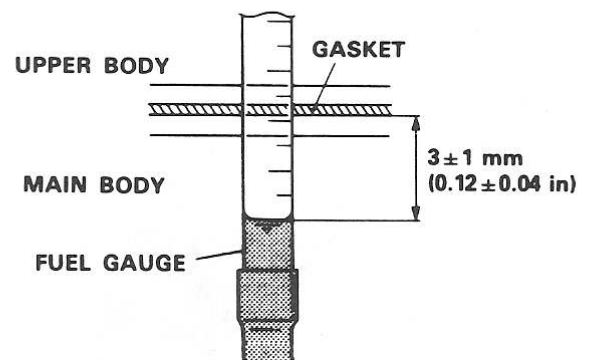


Fig. 3.7 On YT 60 models, the fuel level in the clear fuel hose must be the specified distance below the gasket surface of the float chamber (Sec 6)

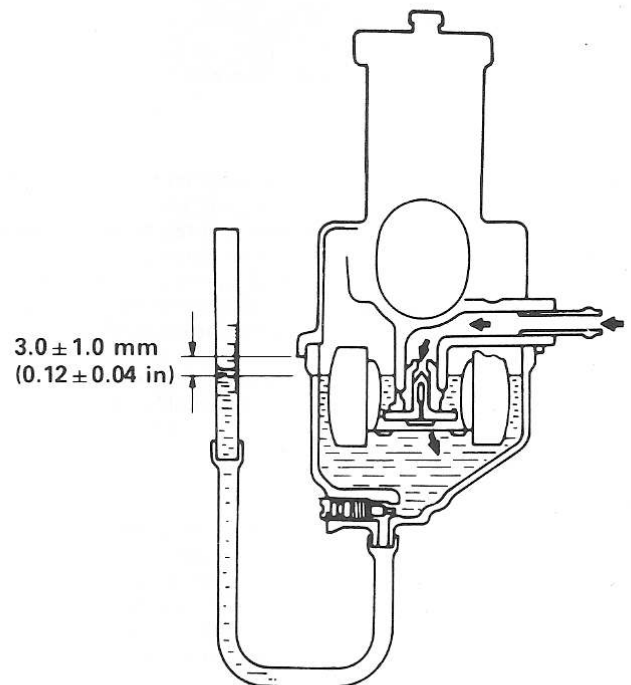


Fig. 3.8 On YT 200/225 and YFM 200 models, the fuel level in the clear fuel hose must be the specified distance below the lower edge of the lip on the carburetor body (Sec 6)

3 Make sure there is fuel in the tank and that the petcock is in the *On* or *Reserve* position.

4 To check pump operation, disconnect the fuel hose from the carburetor fitting and place it in a metal container. **Note:** On YTZ 250 models, make sure the front petcock is in the *On* position. Start the engine and see if fuel spurts out of the hose into the can. If it doesn't, the pump is defective and should be rebuilt or replaced. The pump on YT 175K models cannot be rebuilt — if it malfunctions, replace it with a new one.

5 Reattach the hose to the carburetor fitting.

## 8 Fuel pump — removal and installation

1 To remove the pump, turn the fuel petcock lever to the *Off* position, disconnect the hoses from the fittings on the pump and remove the mounting bolts. On YTZ 250 models, clamp the fuel lines running from the tank to prevent gasoline spillage. It may also be a good idea to mark the hoses and fittings to ensure correct installation. Use needle-nose pliers to release the hose clips and slide them away from the hose ends.

2 Installation is the reverse of removal.

# Chapter 4 Ignition system

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Ignition timing — check . . . . .	See Chapter 1	Pickup coil — check . . . . .	9
Ignition coil — check . . . . .	3	Engine speed control unit — check . . . . .	10
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CDI unit — removal and installation . . . . .	5		

## Specifications

### YT 60

Pickup coil resistance . . . . .	20 ohms $\pm$ 10% at 68°F
Ignition charge coil resistance . . . . .	33 ohms $\pm$ 10% at 68°F
Ignition coil	
Minimum spark gap . . . . .	0.240 in (6 mm)
Primary winding resistance . . . . .	1.6 ohms $\pm$ 10% at 68°F
Secondary winding resistance . . . . .	6.6 K ohms $\pm$ 10% at 68°F

### YT 125

Pickup coil resistance . . . . .	10 ohms $\pm$ 10% at 68°F
Ignition charge coil resistance . . . . .	300 ohms $\pm$ 10% at 68°F
Ignition coil	
Minimum spark gap . . . . .	0.280 in (7 mm)
Primary winding resistance . . . . .	1.0 ohm $\pm$ 10% at 68°F
Secondary winding resistance . . . . .	5.9 K ohms $\pm$ 10% at 68°F

### YT 175

Pickup coil resistance . . . . .	10 ohms $\pm$ 10% at 68°F
Ignition charge coil resistance . . . . .	300 ohms $\pm$ 10% at 68°F
Ignition coil	
Minimum spark gap . . . . .	0.350 in (9 mm)
Primary winding resistance . . . . .	1.0 ohm $\pm$ 10% at 68°F
Secondary winding resistance . . . . .	5.9 K ohms $\pm$ 10% at 68°F

### YFM 200

Pickup coil resistance . . . . .	196 ohms $\pm$ 10% at 68°F
Ignition charge coil resistance . . . . .	381 ohms $\pm$ 10% at 68°F
Ignition coil	
Minimum spark gap . . . . .	0.240 in (6 mm)
Primary winding resistance . . . . .	0.85 ohm $\pm$ 15% at 68°F
Secondary winding resistance . . . . .	5.9 K ohms $\pm$ 15% at 68°F

### YTM 200/225

Pickup coil resistance . . . . .	196 ohms $\pm$ 10% at 68°F
Ignition charge coil resistance . . . . .	381 ohms $\pm$ 10% at 68°F
Ignition coil	
Minimum spark gap . . . . .	0.240 in (6 mm)
Primary winding resistance . . . . .	0.85 ohm $\pm$ 15% at 68°F
Secondary winding resistance . . . . .	5.9 K ohms $\pm$ 15% at 68°F

### YTZ 250

Pickup coil resistance . . . . .	10.7 ohms $\pm$ 10% at 68°F
Ignition charge coil resistance . . . . .	315 ohms $\pm$ 10% at 68°F
Ignition coil	
Minimum spark gap . . . . .	0.240 in (6 mm)
Primary winding resistance . . . . .	0.79 ohm $\pm$ 15% at 68°F
Secondary winding resistance . . . . .	5.9 K ohms $\pm$ 15% at 68°F

### 1 General information

All Yamaha ATVs are equipped with a capacitive discharge ignition system (CDI). This system is composed primarily of solid-state electronic components which work in conjunction with the AC generator. Ignition system components include the CDI unit, spark plug, ignition coil and the pickup coil and ignition charging (exciter) coil, which are contained within the AC generator/magneto. The conventional mechanical advance system with contact breaker points has been

replaced by electronic components, which virtually eliminate ignition system adjustment and maintenance.

The components are easily checked, but they cannot be repaired. Once a faulty component is isolated the part must be replaced with a new one. Keep in mind that most electrical parts cannot be returned, so be absolutely certain that the part you buy is the part you need.

Due to the fact that special tools, training and experience are required to check the CDI system components, the job should be left to a dealer service department or a reputable motorcycle repair shop.

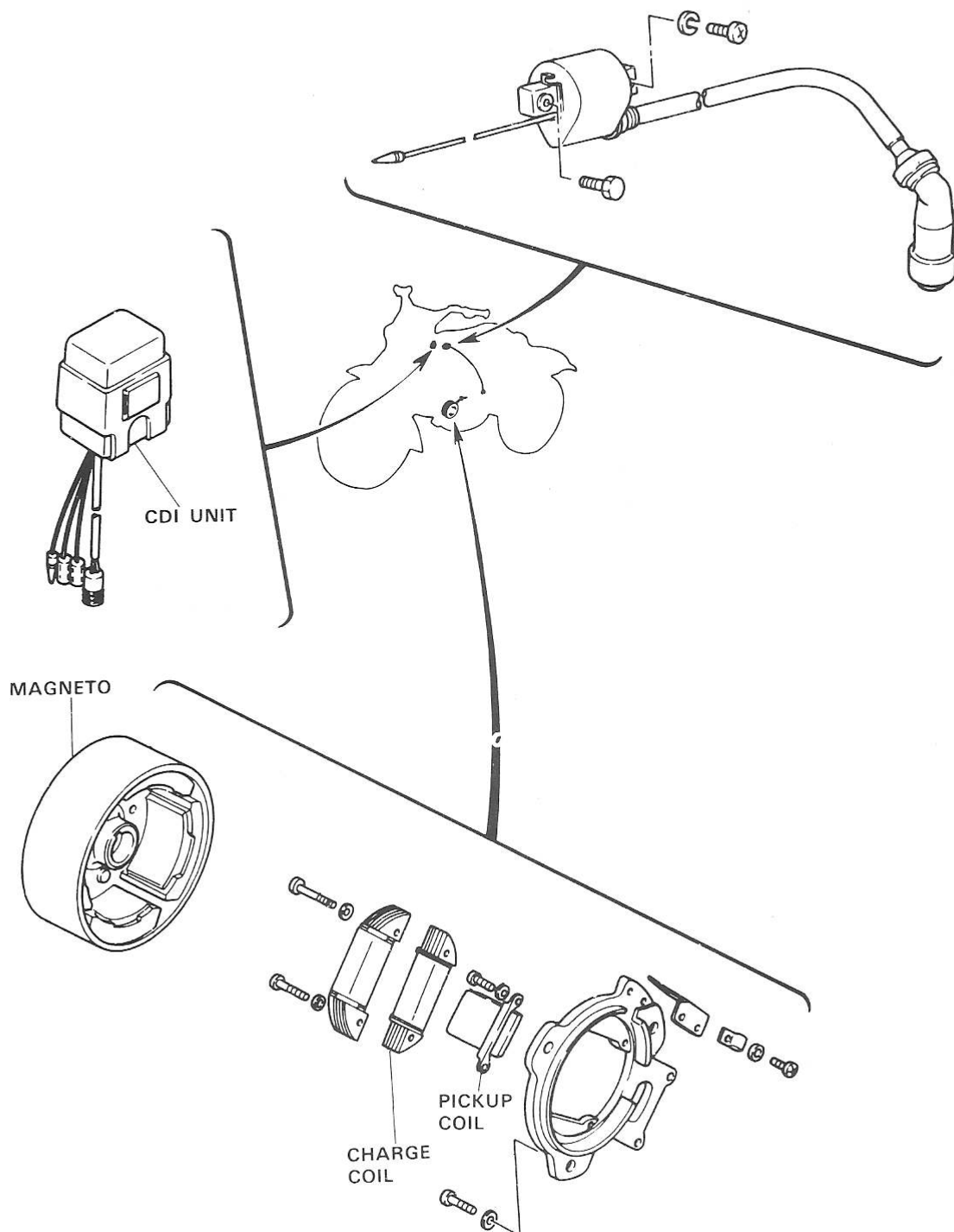


Fig. 4.1 Typical ignition system components (YTM 200K shown) (Sec 1)



## 2 Ignition system — general check

1 If the ignition system is the suspected cause of poor engine performance or failure to start, a number of checks can be made to isolate the problem.

2 Make sure the ignition kill switch is in the *Run* position.

### Engine will not start

3 Remove the spark plug, hook up the plug lead and lay the plug on the engine with the threads contacting the cylinder cooling fins (photo). Crank the engine over and make sure a well-defined, blue spark occurs between the spark plug electrodes.

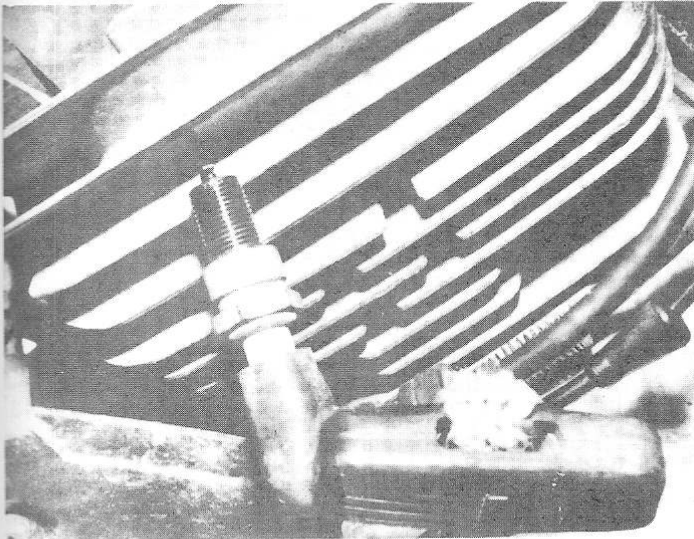
4 If no spark occurs, or if the spark is weak, substitute a new spark plug and repeat the test. If the spark is still not satisfactory, the following checks should be made.

5 Unscrew the spark plug cap from the plug wire and check the cap resistance with an ohmmeter (photo). If the resistance is infinite, replace it with a new one.

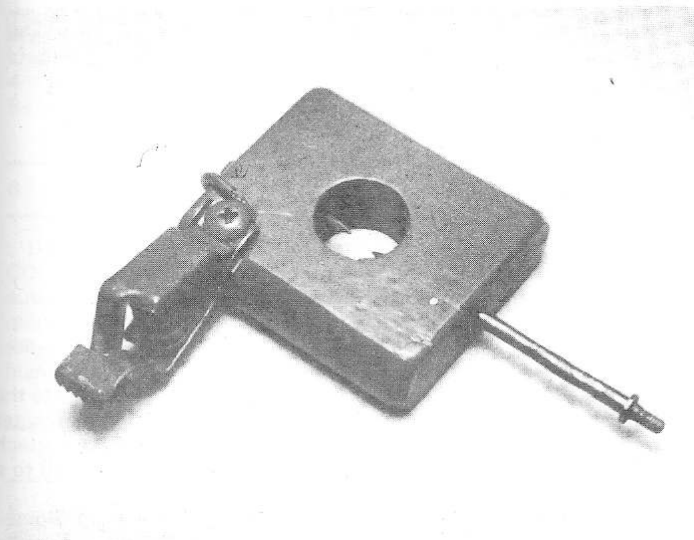
6 Make sure all electrical connectors are clean and tight. Check all wires for shorts and correct installation.

7 Check the engine kill switch, the ignition coil resistance, the pickup coil resistance and the CDI unit by referring to the appropriate Sections.

8 Make sure the AC generator/magneto rotor has not sheared the key and spun on the end of the crankshaft.



2.3 Checking for spark at the plug electrodes (make sure the metal plug body is touching the engine)



2.10 A simple spark gap testing fixture can be made from a block of wood, a large alligator clip, some nails, screws and wire and the cap end of an old spark plug

### Engine starts but misfires

9 If the engine starts but misfires, make the following checks before deciding that the ignition system is at fault.

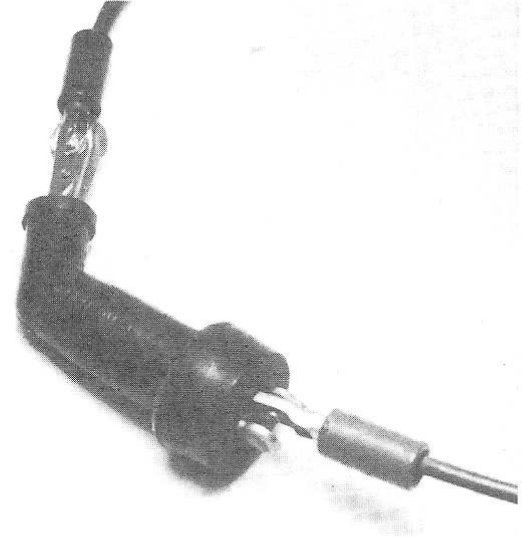
10 The ignition system must be able to produce a spark across a minimum gap (see the Specifications). A simple test fixture (photo) can be constructed to see if the minimum spark gap can be jumped. Make sure the fixture electrodes are positioned the specified distance apart.

11 Hook the spark plug wire to the electrode on the test fixture, then attach the fixture's alligator clip to a good engine ground (photo).

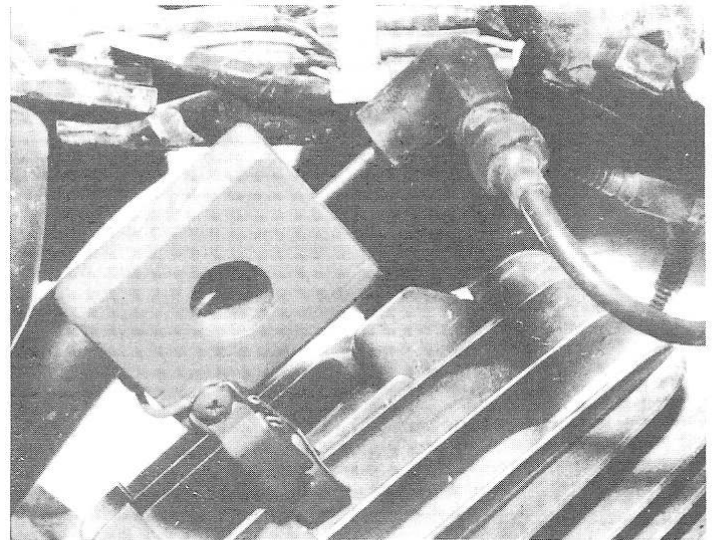
12 Operate the starter and see if well-defined, blue sparks occur between the test fixture electrodes. If the minimum spark gap test is positive, the ignition system is functioning properly. If the spark will not jump the gap, or if it is weak (orange colored), refer to Steps 5 through 7 of this Section and perform the checks described there.

## 3 Ignition coil — check

1 The ignition coil is a type of transformer which develops the voltage required to jump the spark plug gap. Maintain the coil by keeping the electrical connections clean and tight and occasionally checking to see that the coil is securely mounted.



2.5 Checking the spark plug cap resistance with an ohmmeter



2.11 The spark must be able to jump the minimum specified gap

## PRIMARY COIL CHECK

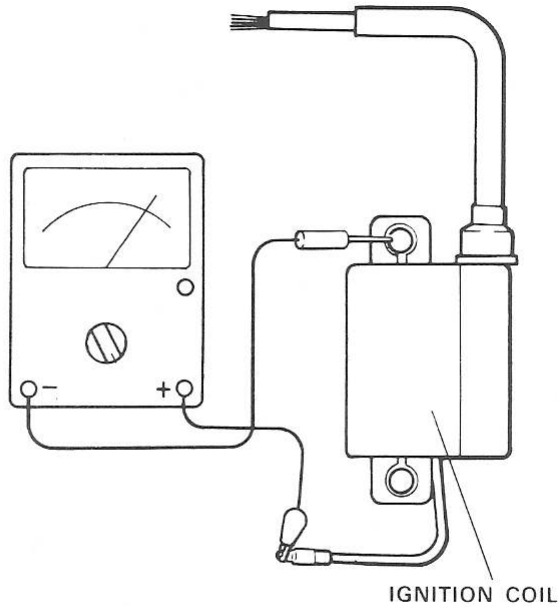


Fig. 4.2 Checking the ignition coil *primary* winding resistance (models with *one* primary wire only) (Sec 3)

## PRIMARY COIL CHECK

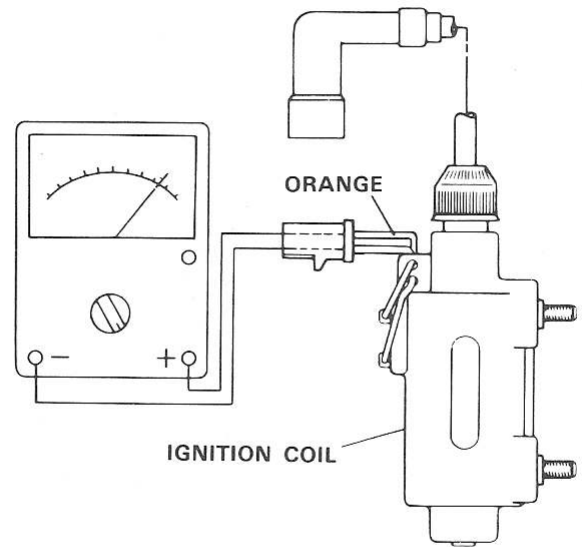


Fig. 4.3 Checking the ignition coil *primary* winding resistance (models with *two* primary wires) (Sec 3)

## SECONDARY COIL CHECK

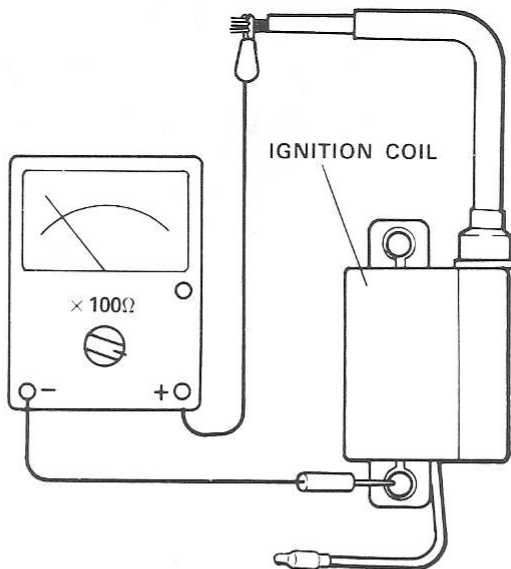


Fig. 4.4 Checking the ignition coil *secondary* winding resistance (all models with *one* primary wire except YTZ 250) (Sec 3)

## SECONDARY COIL CHECK

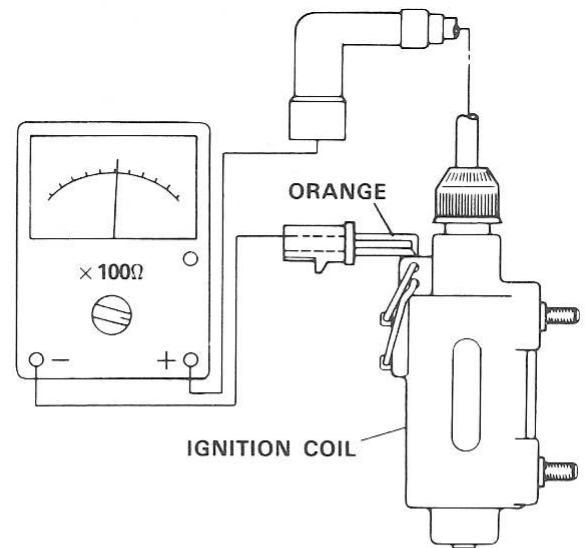


Fig. 4.5 Checking the ignition coil *secondary* winding resistance (all models with *two* primary wires) (Sec 3)

2 Ignition coil testing is best left to an authorized Yamaha dealer who has the special equipment needed. However, you can test it yourself if you have access to an ohmmeter or a multimeter. The coil does not have to be removed from the machine.

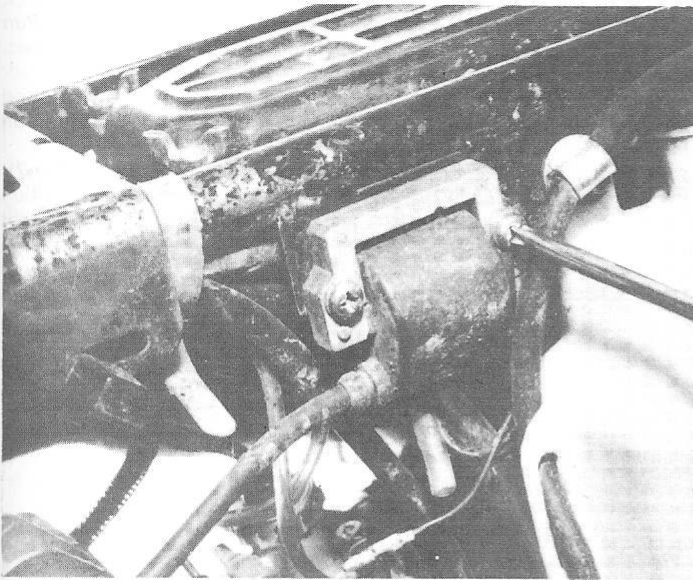
3 Disconnect the coil primary wire. The primary wire is the *small* wire attached to the coil. Some coils have two primary wires. Attach the ohmmeter leads to the primary wire and a good ground on the coil. On coils with two primary wires, attach the leads to both primary wires. Compare the resistance reading to the Specifications.

4 To check the secondary windings in the coil, detach the spark plug

wire from the spark plug and attach one of the ohmmeter leads to the end of the wire. On YTZ 250 models attach the remaining ohmmeter lead to the primary wire. On models with two primary wires attach the lead to the orange wire. On all other models attach the lead to a good ground on the coil.

5 If the resistance is not as specified for both circuits, the coil is probably faulty and should be replaced with a new one. Have the test results verified by a dealer service department before purchasing a new coil.

6 Reconnect all wires that were removed for the check and make sure all connections are clean and tight.



4.4 Removing the ignition coil mounting screws

#### 4 Ignition coil — removal and installation

- 1 On 125 and 175 models the ignition coil is attached to the frame under the seat. On all other models the ignition coil is mounted under the gas tank on the upper frame section. It is held in place by two bolts. The easiest way to locate the coil is to trace the spark plug wire from the plug to the coil.
- 2 Remove the spark plug cap from the spark plug.
- 3 Disconnect the primary wire(s) at the connector near the coil.
- 4 Remove the two mounting screws (photo) and separate the coil from the frame.
- 5 Installation is the reverse of removal.

#### 5 CDI unit — removal and installation

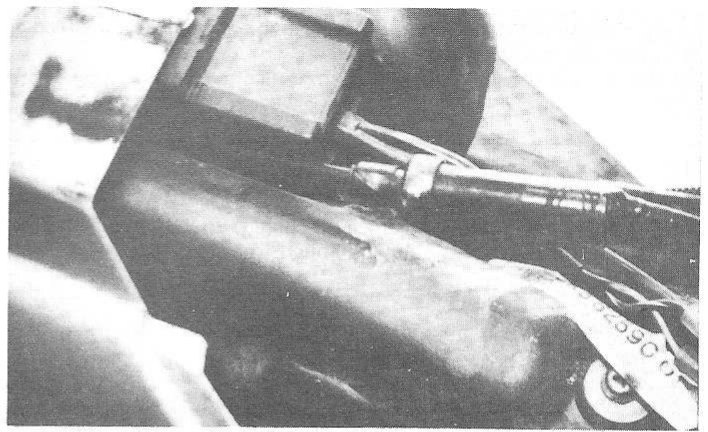
- 1 The CDI unit is usually mounted near the ignition coil and is held in place by a rubber mount. Trace the primary wires from the coil to locate the CDI unit.
- 2 To remove the CDI unit, unplug the wires and pull them out of the way. Peel back the rubber strap from the frame bracket and pull the CDI unit and strap off the frame mount (photo).
- 3 Check that all the terminals in the CDI unit and the wire connectors are clean and free of corrosion. Check the rubber retaining strap for cracks and other damage. Replace it with a new one if necessary.
- 4 Installation of the CDI unit is the reverse of the removal procedure. Be sure that the electrical connections are clean and tight.

#### 6 CDI unit — check

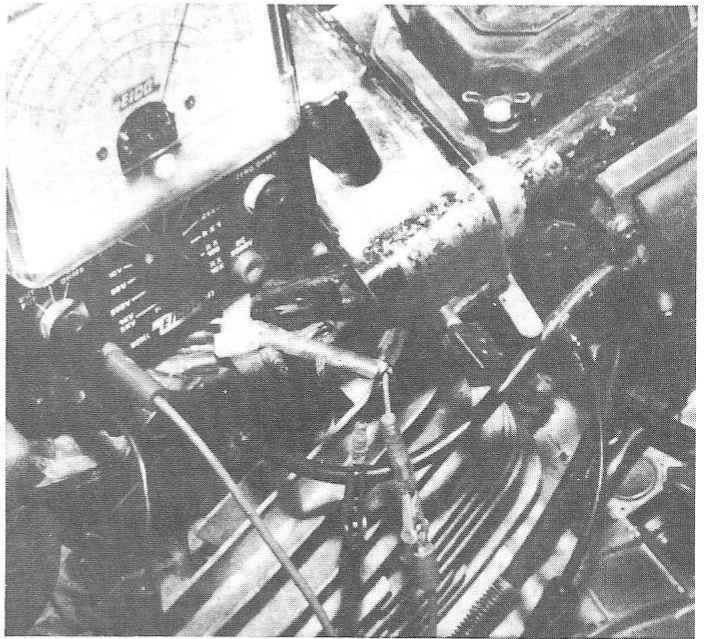
Because of the need for special test equipment and expertise, the CDI unit cannot be checked by the home mechanic. Take it to an authorized dealer service department where the checks can be made quickly and accurately. It should be noted that CDI control units seldom fail, so check the remaining ignition system components carefully before blaming the CDI unit for an ignition failure.

#### 7 Ignition charging (exciter) coil — check

- 1 A resistance check of the magneto exciter coil can be performed with the AC generator/magneto in the engine and may reveal whether or not the coil is causing ignition system problems.
- 2 Locate the wires running from the engine to the CDI unit. Unplug the wires at the connectors and attach the ohmmeter leads to the ex-



5.2 The CDI unit is mounted in a rubber shroud (YT 125 shown)



7.2 Checking the resistance of the CDI system charging (exciter) coil windings

citer coil wire terminals in the *engine* side of the connectors (photo). One exciter coil wire will be brown or brown with a red stripe and the other wire will be black.

- 3 The exciter coil can be considered normal if the resistance is as specified. If you find that the exciter coil is faulty, remove the AC generator/magneto and replace the coil with a new one.

#### 8 AC generator/magneto — removal and installation

- 1 It is usually not necessary to remove the magneto, which is actually a part of the AC generator, unless you are replacing one or more of the coils, or if you are performing major engine work which requires magneto removal as part of another procedure.
- 2 To remove and install the AC generator/magneto, follow the instructions in Chapter 2 for generator removal.

#### 9 Pickup coil — check

- 1 The pickup coil can be tested without removing it. The coil is part of the AC generator/magneto and is mounted inside the crankcase cover or under the rotor.
- 2 Disconnect the engine-to CDI-unit wires at the connectors.
- 3 With an ohmmeter or multimeter set at the proper resistance range, measure the resistance between the pickup coil wires. One of the wires

will be white with a red stripe and the other wire will be either solid black or white with a green stripe. Replace the pickup coil if the reading is not within the specified range.

4 Reconnect the wires, making sure the connections are clean and tight.

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#### 10 Engine speed control unit — check

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1 YT 60 models are equipped with an engine speed control unit that is designed to prevent the engine speed from exceeding 2300 rpm

when the recoil starter is operated with the switch in the *Start* position. If an attempt is made to start the engine with the switch in the *Run* position, the ignition system is grounded and no spark is produced. The system prevents the machine from moving when being started.

2 Check all wires and connections to make sure they are in good condition, then refer to the appropriate Section and check the ignition charging (exciter) coil.

3 Check the ignition control switch for continuity (refer to Chapter 7).

4 If the engine exceeds 2300 rpm with the switch in the *Start* position, replace the control unit with a new one. It is mounted under the seat on the upper frame rail.



# Chapter 5 Frame and suspension

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## Specifications

### Front forks

Spring type	
Standard .....	Marked with one slit on end
Soft .....	No slits
Hard .....	Marked with two slits on end
Fork spring free length	
YT 60 .....	4.33 in (110 mm)
YT 175 .....	13.43 in (341.1 mm)
YTM 200	
Standard .....	15.95 in (405.1 mm)
Service limit .....	15.56 in (395.1 mm)
YTM 225	
Standard .....	19.93 in (506.1 mm)
Service limit .....	19.73 in (501.1 mm)
YTZ 250N	
Long spring	
Standard .....	21.3 in (539.8 mm)
Service limit .....	21.01 in (534.8 mm)
Short spring	
Standard .....	2.6 in (65.8 mm)
Service limit .....	2.39 in (60.8 mm)
Air pressure (YTZ 250N only)	
Standard .....	0 (zero) psi
Maximum .....	8.53 psi
Fork oil type/capacity .....	See Chapter 1

### Rear shock absorber

Spring type	
Standard .....	No color code
Soft .....	Green
Hard .....	White
Spring free length	
YTM 225 .....	7.91 in (201 mm)
YTZ 250N .....	9.47 in (240.5 mm)
Spring installed length	
YTM 225	
Standard .....	7.72 in (196 mm)
Minimum adjustable length .....	7.32 in (186 mm)
YTZ 250N	
Standard .....	9.25 in (235 mm)
Minimum .....	8.68 in (220.5 mm)
Maximum .....	9.27 in (235.5 mm)
Enclosed gas pressure (YTZ 250N only)	
Standard .....	171 psi
Minimum .....	100 psi
Maximum .....	213 psi
Standard rebound damping setting ..	5 clicks out
Standard compression damping setting ..	10 clicks in

Torque specifications	Ft-lbs	m-Kg
<b>YT 60</b>		
Steering stem ring nut	Tighten by hand	
Triple clamp bolts	23	3.2
Handlebar nuts	13	1.9
Footrest bolts	17	2.3
<b>YT 125</b>		
Steering stem cap nut	36	5.0
Triple clamp bolts	25	3.5
Handlebar bolts	25	3.5
Footrest bolts	18	2.5
<b>YT 175</b>		
Fork damper rod bolt	4.3	2.3
Fork tube pinch bolts	39	5.4
Steering stem ring nut		
First step	18	2.5
Second step	Loosen 1/4-turn	
Steering stem cap nut	47	6.5
Triple clamp bolts	36	5.0
Handlebar bolts	24	3.4
Footrest bolts	18	2.5
<b>YTM 200K</b>		
Upper fork tube pinch bolts	14	2.0
Lower fork tube pinch bolts	22	3.0
Steering stem ring nut		
First step	27	3.8
Second step	Loosen 1/4-turn	
Triple clamp-to-steering stem bolt	65	9.0
Handlebar bolts	14	2.0
Footrest bolts	24	3.3
<b>YTM 200/225</b>		
Upper fork tube pinch bolts	14	2.0
Lower fork tube pinch bolts	22	3.0
Fork damper rod bolt	17	2.3
Triple clamp-to-steering stem bolt	65	9.0
Handlebar bolts	14	2.0
Footrest bolts		
YTM 200	24	3.3
YTM 225	65	9.0
Shock absorber mounting bolts ( <i>YTM 225 only</i> )	18	2.5
Swingarm pivot shaft ( <i>YTM 225 only</i> )	4.3	0.6
Swingarm pivot shaft locknut ( <i>YTM 225 only</i> )	72	10.0
<b>YFM 200N</b>		
Steering knuckle shaft nut	22	3.0
Tie-rod end-to-steering shaft nut	32	4.5
Tie-rod end-to-steering knuckle nut	29	4.0
Tie-rod locknut	22	3.0
Steering shaft nut	22	3.0
Steering shaft holder bolt	17	2.3
Handlebar holder nut	22	3.0
Handlebar bolts	14	2.0
<b>Y TZ 250N</b>		
Upper fork tube pinch bolts	29	4.0
Lower fork tube pinch bolts	14	2.0
Triple clamp-to-steering stem nut	61	8.5
Steering stem ring nut		
First step	32	4.5
Second step	Loosen 1/4-turn	
Handlebar bolts	17	2.3
Rear shock absorber spring retainer locknut	50	6.9
Shock absorber bolts	23	3.2
Shock connecting rod upper bolt	35	4.8
Shock connecting rod lower bolt	23	3.2
Relay arm front bolt	35	4.8
Swingarm pivot shaft nut	60	8.5
Bearing holder (hub)-to-swingarm bolts		
Upper	36	5.0
Lower	58	8.0
Footrest bolts	40	5.5