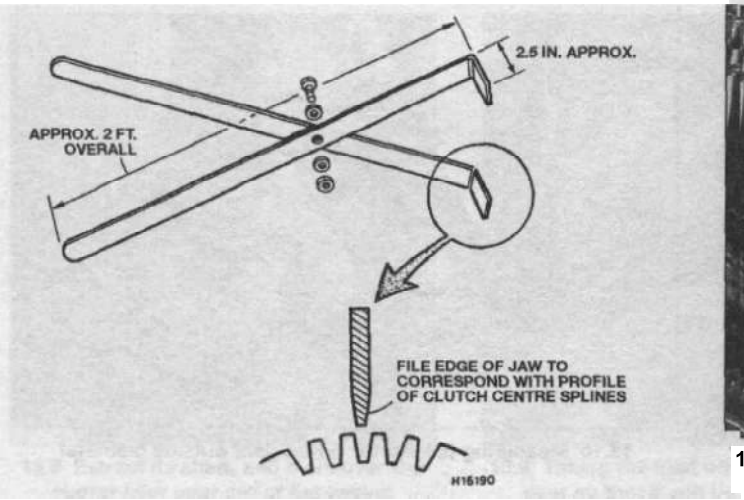
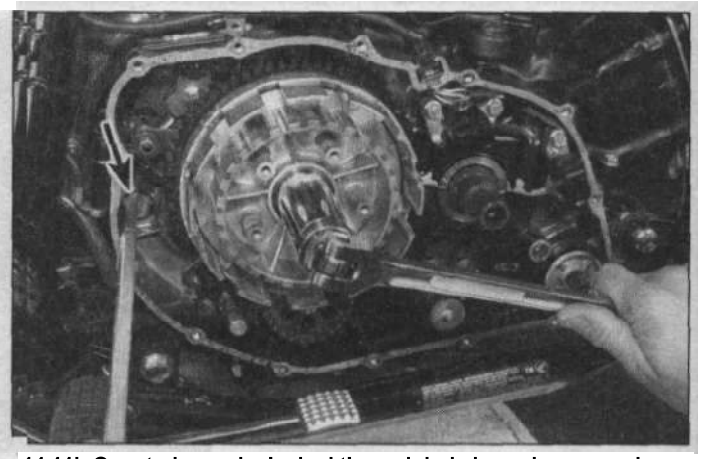


14.11a Clutch holding tool made from steel strap



14.11b Gear train can be locked through hole in casing - exercise extreme care

11 In order to loosen the clutch center nut, you'll need to prevent the mainshaft from rotating. The following methods can be used **(see illustrations).**

a) If the engine is in the frame, shift the transmission into top gear and have an assistant apply the rear bra e hard (install the pedal temporarily if removed) with the rear tire in firm contact with the ground.

b) The Honda service tool (part no. 07923-6890101) provides another means of locking the mainshaft via the splines of the output shaft.

c) The clutch center and housing can be locked together using the Honda clutch center holder (part no. 07724-0050001), or an equivalent can be made up from some steel strap bent at the ends and bolted together in the middle.

d) Another means of holding the clutch center is to insert a long screwdriver through the crankcase hole to the left of the clutch and engage the blade in the gear teeth visible there. If held securely, this will prevent the clutch center from rotating while the locknut is loosened and removed.

12 With the locknut removed, lift off the lock washer and clutch center. The clutch housing and clutch housing guide can also be lifted out **(see illustration).**

1983 750 Sabre and all 1100 cc models

13 Remove the large circlip from the clutch lifter plate and withdraw the lifter plate, complete with release bearing and lifter plate guide. Withdraw the long pushrod **(see illustration).**

14 Remove the clutch center locknut and its washer. Use one of the methods described in Step 11 above to lock the mainshaft.

15 With the locknut and washer removed, lift out the spring set plate, diaphragm spring and washer. Remove the pressure plate and clutch friction and plain plates from the clutch housing.

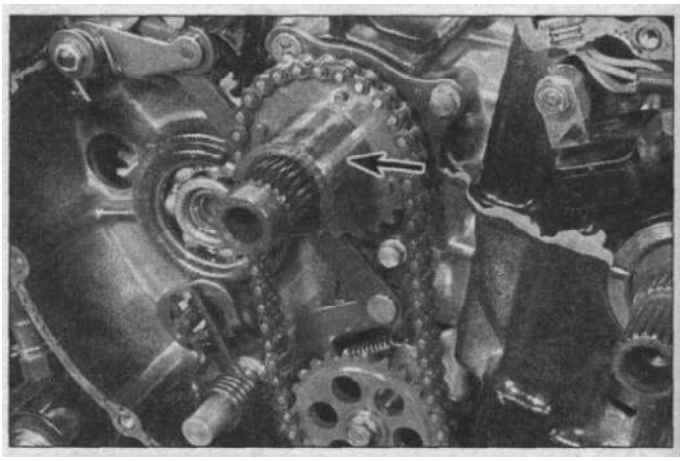
16 Remove the outer clutch center together with the one-way clutch and its inner piece. Withdraw the large washer and inner clutch center, followed by the clutch housing and its guide.

Inspection - all models

Refer to illustrations 14.18, 14.19, 14.20, 14.22 and 14.23

17 Examine the splines on both the inside and the outside of the clutch center(s). If any wear is evident, replace the clutch center(s).

18 On all 700/750 models except the 1983 750 Sabre measure the free length of the clutch springs and compare the results to the Specifications **(see illustration).** If the springs have sagged, or if cracks are noted, replace them with new ones as a set. The diaphragm spring on the 1983 750 Sabre and all 1100 models should be checked carefully for signs of cracking or fatigue - replacement is the only solution. The spring's free height can be measured with a tire tread-depth gauge with the spring placed dished side downward on a flat surface; if it is less than the service limit it should be replaced.

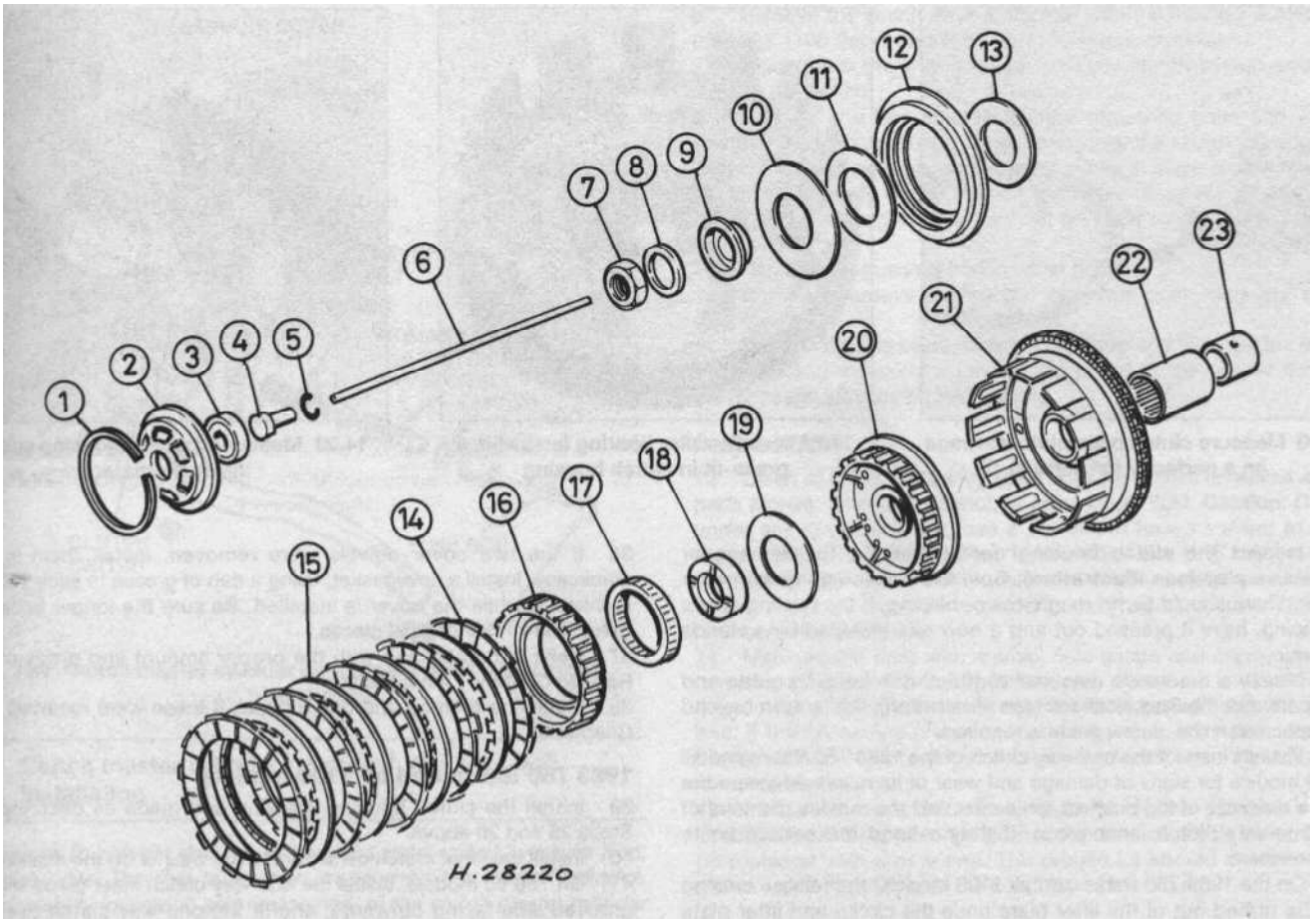


14.12 Remove the clutch housing guide (arrow) from the mainshaft

19 If the lining material of the friction plates smells burnt 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 **(see illustration).** Replace with new parts any friction plates that are near the wear limit.

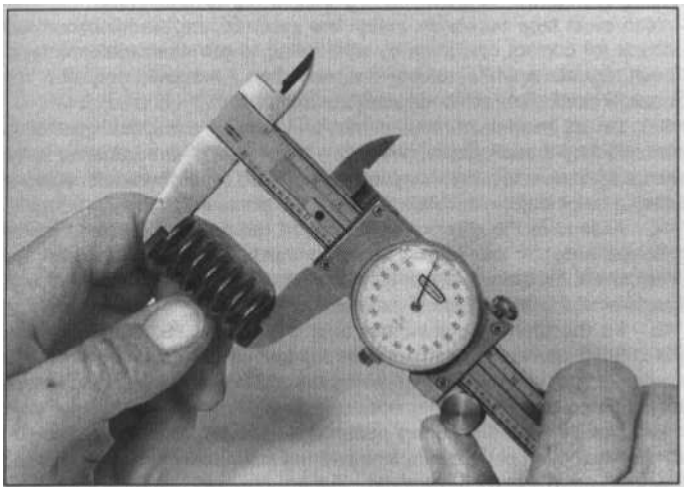
20 Lay the metal plates, one at a time, on a perfectly flat surface (such as a piece of plate glass) and check for warpage by trying to slip a 0.3 mm (0.012 in) feeler gauge between the flat surface and the plate **(see illustration).** Do this at several places around the plate's circumference. If the feeler gauge can be slipped under the plate, it is warped and should be replaced with a new one. 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.

21 Check the edges of the slots in the clutch housing for indentations made by the friction plate tabs. If the indentations are deep they can prevent clutch release, so 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. Also, 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.

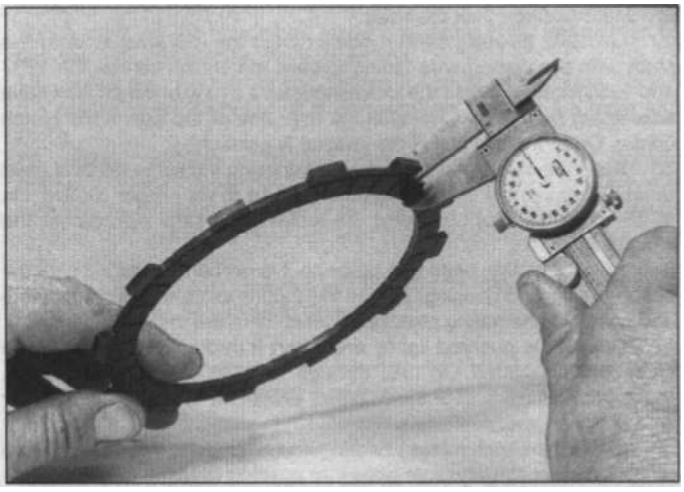


14.13 Clutch components (1983 750 Sabre and all 1100 models)

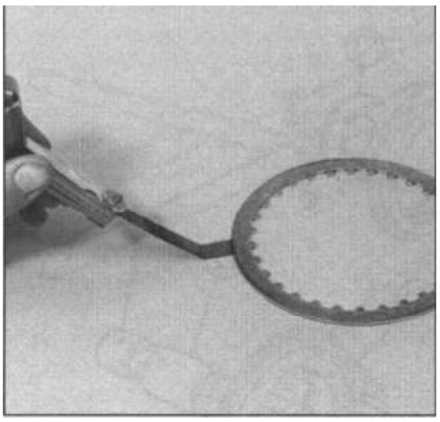
7 *Large circlip*
2 *Lifter plate*
3 *Release bearing*
4 *Lifter plate guide*
5 *Circlip*
6 *Pushrod*
7 *Locknut*
8 *Washer*
9 *Spring set plate*
10 *Diaphragm spring*
11 *Washer*
12 *Pressure plate*
13 *Washer*
14 *Friction plates*
15 *Plain plates*
16 *Outer clutch center*
17 *One-way clutch*
18 *Inner piece*
19 *Washer*
20 *Inner clutch center*
21 *Clutch housing*
22 *Needle roller bearing*
23 *Guide*



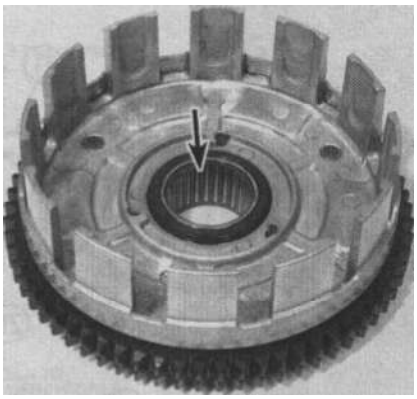
14.18 Measuring clutch spring free length



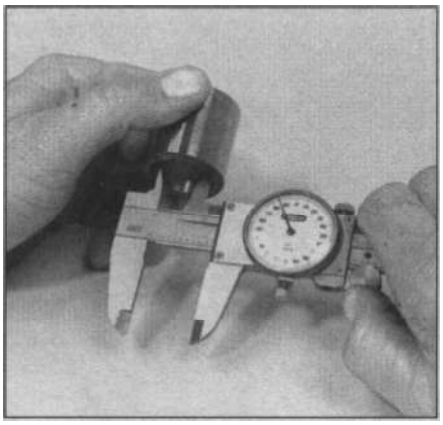
14.19 Measuring clutch friction plate thickness



14.20 Measure clutch plain plate warpage on a perfectly flat surface



14.22 Needle roller bearing (arrow) is a press-fit in clutch housing



14.23 Measuring clutch housing guide inside diameter

22 Inspect the clutch housing needle bearing for damage or excessive play **(see illustration).** Spin the rollers lightly with your finger. There should be no roughness or binding. If the bearing needs replacing, have it pressed out and a new one installed by a Honda dealer.

23 Measure the inside diameter of the clutch housing guide and compare it to the Specifications **(see illustration).** If it is worn beyond the specified limits, a new guide is required.

24 Visually inspect the one-way clutch of the 1983 750 Sabre and all 1100 models for signs of damage and wear of its rollers. Measure the inside diameter of the outer clutch center and the outside diameter of the one-way clutch inner piece. If they exceed the service limits replace them.

25 On the 1983 750 Sabre and all 1100 models, the release bearing can be drifted out of the lifter plate once the circlip and lifter plate guide have been removed.

Installation

All 700/750 models except the 1983 750 Sabre

26 Apply a coat of engine oil to the inside and outside of the clutch housing guide and install it over the mainshaft.

27 If the needle bearing was removed from the clutch housing reinstall it. Then install the clutch housing into position over the guide. Be sure the holes in the rear of the housing engage with the pins protruding from the oil pump drive sprocket behind the guide.

28 Lubricate the inner splines of the clutch center with engine oil and slip it into position over the shaft.

29 On 1982 through 1986 models install the lockwasher onto the shaft with the dished side facing toward the clutch center. On 1987 and 1988 models, install the lockwasher (use a new one if its tabs have weakened) so that its extension fits over one of the ribs in the clutch center. On all models install the locknut finger-tight.

30 Keep the clutch center from rotating using the same method used during disassembly and tighten the locknut to its proper torque. On 1987 and 1988 models, bend the lockwasher tabs up against the locknut sides.

31 Install a friction plate into place so it is properly engaged with the clutch center and housing. Follow the friction plate with a metal plate and continue alternating plates until all of them are installed.

32 Grease the pushrod lightly and insert it through the center of the shaft until it is seated. On 1985 through 1988 700/750 Magna models, the gold anodized end of the pushrod should be on the slave cylinder side of the engine.

33 Install the clutch release bearing and lifter guide into the pressure plate and place the pressure plate into position over the clutch center.

34 Place the clutch springs into place. Then install the pressure plate bolts and washers and tighten them evenly in a criss-cross pattern.

35 Reinstall the primary drive gear and starter clutch assembly.

36 If the two cover dowels were removed, install them in the crankcase. Install a new gasket, using a dab of grease to stick it to the crankcase while the cover is installed. Be sure the longer bolts are reinstalled in their original places.

37 Refill the crankcase with the proper amount and grade of oil. Refer to Chapter 1 if necessary.

38 Install the footpeg and brake pedal, if these were removed (see Chapter 6).

1983 750 Sabre and all 1100 models

39 Install the clutch housing, bearing and guide as described in Steps 25 and 26 above.

40 Install the inner clutch center and large washer on the mainshaft.

41 On 750 cc models, install the one-way clutch inner piece with its grooved side facing outwards, and fit the one-way clutch over the inner piece with its marked side facing outwards. The outer clutch center should be installed over the one-way clutch (its grooved side faces inwards) using a counterclockwise (anticlockwise) motion. At this point, check that the one-way clutch is assembled correctly by attempting to turn the outer clutch center in both directions while holding the mainshaft - it should only turn in a counterclockwise (anticlockwise) direction.

42 On 1100 cc models, assembly the outer clutch center, one-way clutch and inner piece before installing on the mainshaft. Fit the one-way clutch to the outer clutch center with its flanged side facing into the outer clutch center. Install the inner piece into the one-way clutch using a clockwise motion, noting that the grooved face of the inner piece must face outwards. Install the assembly on the mainshaft and check for correct operation by attempting to turn the clutch center in both directions while holding the mainshaft - it should only turn in a counterclockwise (anticlockwise) direction.

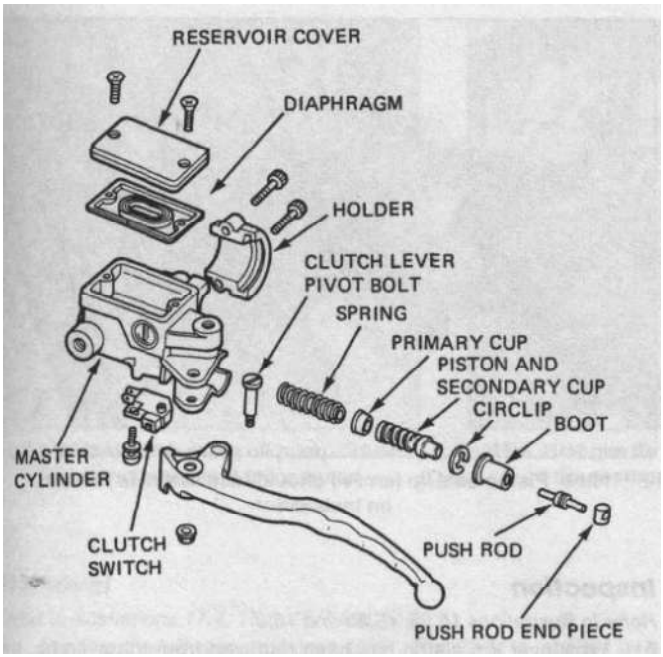
43 On all models, install a friction plate in the clutch housing, followed by a plain plate, alternating them until all are installed in the housing. If new friction plates are being fitted, coat them with a smear of engine oil before installation. Install the pressure plate.

44 Assemble the diaphragm spring on the setting plate so that the dished side of the spring faces inwards when installed on the mainshaft. Fit the washer against the inner (dished) side of the spring and install the assembly on the mainshaft.

45 Fit the dished lockwasher over the mainshaft (dished side or OUTSIDE marking facing outwards) and install the clutch center locknut. Retain the mainshaft using the method employed on removal and tighten the nut to the specified torque.

46 Lightly grease the long pushrod and slide it into the mainshaft. Install the lifter plate, complete with release bearing and guide and secure with the large circlip.

47 Refer to Steps 35 to 38 above to install the remaining components and refill the engine with the proper amount and grade of oil (see Chapter 1).



15.1 Clutch master cylinder component parts (early model type shown)

15 Clutch master cylinder - removal, overhaul and installation

Caution: *To prevent damage to the paint from spilled hydraulic fluid, always cover the fuel tank when working on the master cylinder. Disassembly, overhaul, and reassembly of the clutch master cylinder must be done in a spotlessly clean work area to avoid contamination and possible failure of the hydraulic system components. Refer to illustration 15.1*

Removal and dismantling

1 If the master cylinder is leaking fluid or if lever movement does not produce clutch disengagement, and bleeding the system does not help, master cylinder overhaul is recommended **(see illustration).** Before disassembling the master cylinder, read through the entire procedure and make sure that you have the correct rebuild kit. Also, you will need some new, clean brake fluid of the recommended type, some clean rags, internal snap-ring pliers, a O-to-1 inch micrometer and a small hole gauge.
2 Remove the left rear view mirror.
3 Refer to Chapter 1 and drain just enough fluid from the system to empty the master cylinder. **Note:** *When pumping the clutch lever, do not bring it all the way back to the handlebar, as this will cause piston over-travel and fluid leakage.* To prevent this, hold a 3/4 in (20 mm) spacer (made from a block of wood) between the lever and the handlebar. When the master cylinder is empty, retighten the bleeder valve on the slave cylinder.
4 To reduce the amount of air entering the clutch lines, and subsequent bleeding, the line should be securely plugged immediately after disconnecting it from the master cylinder. This can be done with an 8 x 20 mm bolt and nut.
5 Pull back the rubber boot, loosen the master cylinder banjo fitting bolt and pull the hose and bolt away from the cylinder as a unit. Have a container handy to catch any brake fluid that may drip out of the master cylinder fitting. Quickly place your finger over the end of the hollow bolt to prevent the entrance of air into the lower part of the hydraulic system. Working quickly, remove the hollow bolt, slip the 8 mm bolt (along with the sealing washers) through the banjo fitting, thread on the nut and tighten it securely. Wipe up any spilled brake fluid.
6 Remove the clutch lever (complete with the freeplay adjuster on the 1985 1100 Sabre and 1985/86 1100 Magna models).
7 Disconnect the wiring leads from the clutch switch and then remove the switch.
8 Remove the two master cylinder mounting bolts and lift the cylinder off the handlebars. On early models, the choke cable locates in the master cylinder clamp; leave the clamp in place on the cable.
9 If not already done, remove the reservoir cover, plate (where fitted) and diaphragm, plus the float on 1988 models. Drain off any residual fluid.
10 Remove the pushrod from its dust boot.
11 Carefully remove the rubber pushrod boot from the piston opening.
12 Using snap-ring pliers, remove the circlip and slide out the piston, the cups and the spring. Lay the parts out in the proper order to prevent confusion during reassembly.

Inspection

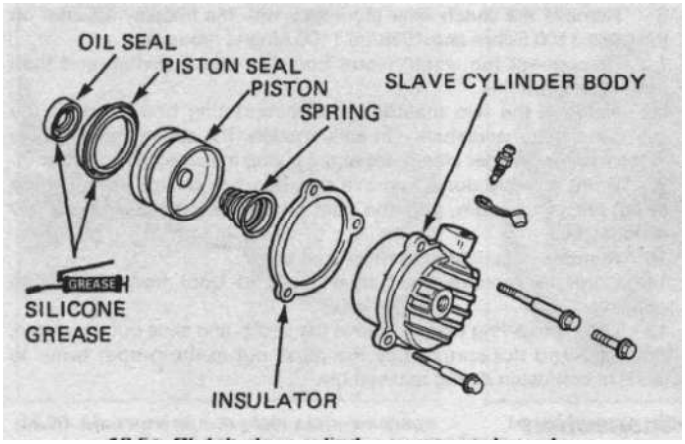
13 Clean all of the parts with brake cleaning solvent (available at auto parts stores), isopropyl alcohol, or clean brake fluid. **Caution:** *Do not, under any circumstances, use a petroleum based solvent to clean these parts.* If compressed air is available, use it to dry the parts thoroughly. Check the master cylinder bore for scratches, nicks and score marks. If damage is evident, the master cylinder must be replaced with a new one.
14 Measure the bore with a small hole gauge and micrometer and compare the results to the Specifications. If the bore is worn beyond the allowable limits, the master cylinder must be replaced with a new one. If the necessary precision measuring tools are not available, a dealer service department or motorcycle repair shop can make the measurements for you.
15 Measure the outside diameter of the piston and compare it to the Specifications. If the piston is worn beyond the allowable limits, it must be replaced with a new one. The rebuild kit should contain a new piston; use it regardless of the condition of the old one.

Reassembly and installation

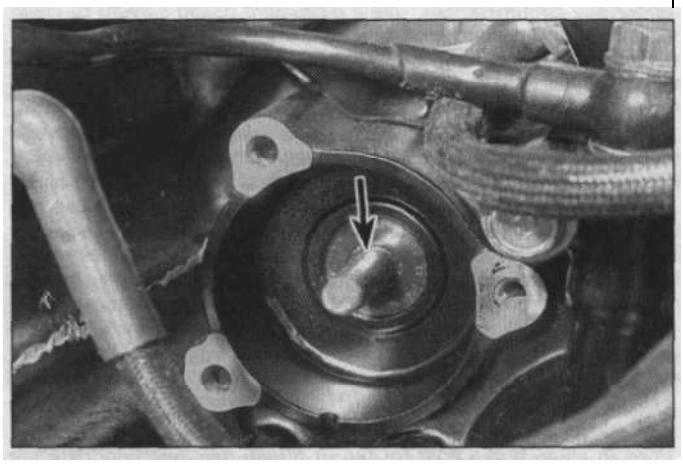
16 Before reassembling the master cylinder, soak the new rubber cups in clean brake fluid for ten or fifteen minutes. Lubricate the master cylinder bore with clean brake fluid, then carefully insert the piston and related parts in the reverse order of disassembly. Make sure the lips on the cups do not turn inside out when the cups are slipped into the bore.
17 Install the circlip, making sure it is properly seated in its groove, then install the rubber dust boot and pushrod.
18 Attach the master cylinder to the handlebar (if the clamp has an UP marking, fit is so that it is facing upwards) and position the assembly so that the body-to-clamp top mating surface aligns with the punch mark on the handlebar. Install the clamp bolts and tighten the top one fully, followed by the bottom bolt.
19 Install the clutch lever and tighten the pivot bolt locknut. Be sure the master cylinder pushrod is correctly engaged in the lever end-piece.
20 Install the clutch switch and hook up the switch wiring. Connect the hose to the master cylinder and install the mirror. Fill the system with new hydraulic fluid and refer to Chapter 1 to bleed the air from the system, then install the reservoir float (1988 models), diaphragm, plate (where fitted) and cover.
21 On the 1985 1100 Sabre and 1985/86 1100 Magnas set the clutch lever freeplay as described in Chapter 1.

16 Clutch slave cylinder - removal, overhaul and installation

Caution: To *prevent damage to the painted cycle parts from spilled brake fluid, always cover the surrounding area when working on the slave cylinder. Disassembly, overhaul, and reassembly of the clutch slave cylinder must be done in a spotlessly clean work area to avoid*



16.5a Clutch slave cylinder components parts



16.8 Pry pushrod oil seal out of casing when pushrod has been removed

contamination and possible failure of the hydraulic system components,

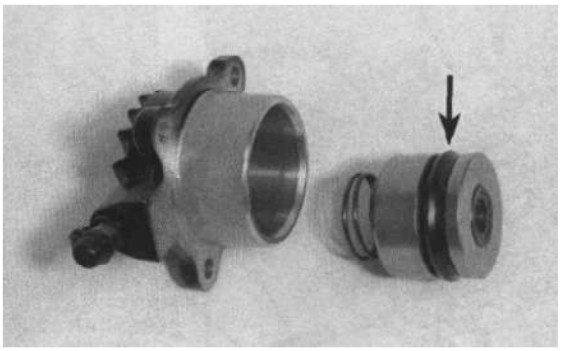
Removal and dismantling

1 Remove the left rear crankcase cover. The cover is retained by a single bolt on all 700/750 Sabre models and 1982 through 1984 700/750 Magna models; note the long collar inside the cover. On all 1100 models and 1985 through 1988 700/750 Magna models the cover is retained by three bolts.

2 Place a container under the slave cylinder to catch dripping fluid and then remove the banjo bolt that retains the fluid line coupling to the slave cylinder cover. Allow the clutch hose to drain into the container.

3 Remove the slave cylinder mounting bolts (plus the rear cover bracket bolts where the bracket might hinder removal) and withdraw the cylinder and insulating gasket from the crankcase. Note that the cylinder assembly may separate during removal. If the piston does not come out with the cylinder, pull the piston off of the clutch pushrod and remove it from the motorcycle.

4 If the piston and cylinder come out as one unit, the cylinder can be tapped with a block of wood to force the piston out. Another method is to reconnect the clutch hose to the cylinder and operate the clutch lever to force the piston out. A third method, if an air compressor is available, is to force the piston out using compressed air, but do not try to catch the piston with your hand. Always use a thick towel or rag and apply the air in short spurts.



16.5b Piston seal lip (arrow) should face towards the bore on installation

Inspection

Refer to illustrations 16.5a, 16.5b and 16.8

5 Whenever the piston has been removed from the cylinder, the piston seal and oil seal should both be replaced. Note that the lip of the piston seal should face into the bore **(see illustrations).**

6 Inspect both the outer surface of the piston and the inner surface of the cylinder for scoring or scratches.

7 Measure the outside diameter of the piston with a micrometer and the inside diameter of the cylinder bore and compare it to the Specifications at the beginning of this Chapter. If either the piston or the cylinder needs to be replaced, both should be replaced together, Remove the spring from the piston and check it for weakness or damage.

8 With the assembly out of the crankcase, wipe the cavity clean and inspect it for the presence of any crankcase oil, which would mean a new oil seal is needed in the cavity **(see illustration).** To replace this, pull out the clutch pushrod and pry the old seal out, drive the new one in using a suitable sized socket.

Reassembly and installation

9 If the long pushrod was removed, grease it lightly and insert it into the oil seal. On 1985 through 1988 700/750 Magna models, the gold anodized end of the pushrod should be on the slave cylinder side of the engine.

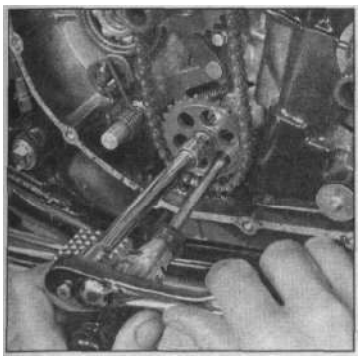
10 Assemble the slave cylinder by attaching the spring to the piston and installing the piston into the cylinder body with the oil seal side facing out. Prior to installing the piston or piston seal, lubricate them with a medium grade high-temperature silicon grease or brake fluid.

11 Installation of the assembly is the reverse of the removal procedure, while noting the following.

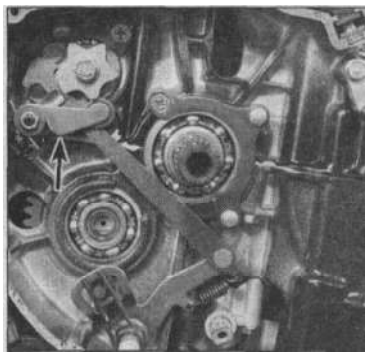
a) Install the insulating gasket between the slave cylinder and crankcase.
b) Ne sealing washers should be used on each side of the fluid line banjo bolt
c) On later models ensure that the line coupling butts against the cast tab on the slave cylinder.
d) Fill the clutch fluid reservoir with fresh fluid and bleed the system as described in Chapter 1.

17 External gearshift mechanism - removal, inspection and installation

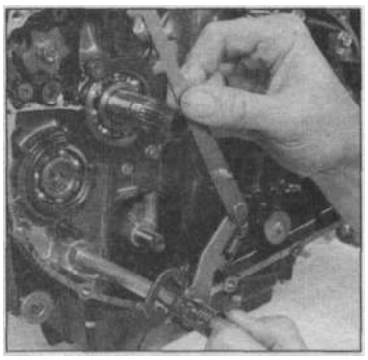
Note: *The gearshift mechanism components can be removed with the engine in the frame. If work is being carried out with the engine removed ignore the preliminary steps.*



17.4 Method of locking oil pump driven sprocket while bolt is loosened



17.6 Remove its nut and withdraw the drum stopper arm (arrow)



17.7 Support the claw arm as shown and withdraw the gearshift splindle from the crankcase

Removal

Refer to illustrations 17.4, 17.6, 17.7and 17.8

1 Remove the left rear crankcase cover. The cover is retained by a single bolt on all 700/750 Sabre models and 1982 through 1984 700/750 Magna models; note the long collar inside the cover. On all 1100 models and 1985 through 700/750 Magna models the cover is retained by three bolts.

2 Remove the gearshift lever, as described in Section 18.

3 Remove the clutch assembly as described in Section 14.

4 Insert a long screwdriver through one of the holes of the oil pump sprocket, located below the clutch, and engage it in the crankcase opening behind the sprocket **(see illustration).** This will keep the sprocket from rotating. Now remove the sprocket bolt, disengage the sprocket from the chain and lift it out.

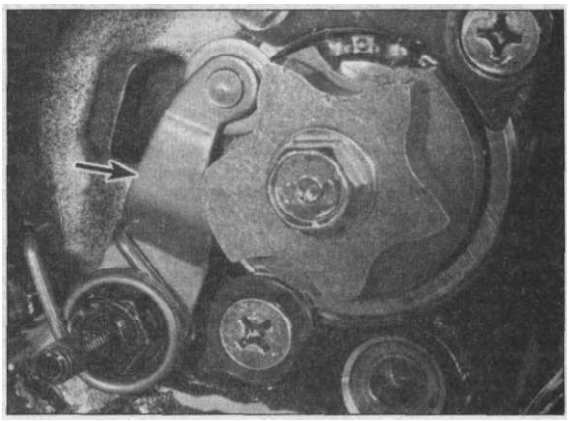
5 Lift off the drive chain, and remove the oil pump drive sprocket from the mainshaft.

6 Make a note of the engaged position of the spring, then remove the nut that retains the drum stopper arm and lift the arm off along with its spring, collar and washers **(see illustration).**

7 Withdraw the complete gearshift spindle assembly from the crankcase **(see illustration).** The springs do not need to be removed from the spindle unless they are being replaced.

8 Disengage the spring from the neutral stopper arm. Remove the bolt and lift off the arm **(see illustration).**

9 Remove the shift drum cam plate bolt and lift off the cam plate. Do not lose the five pins in the cam plate.



17.8 Remove its bolt and lift off the neutral stopper arm (arrow)

Inspection

10 Clean all the parts with solvent and dry them thoroughly.

11 Examine the gearshift spindle 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 small spring at the upper arm join was liable to fracture at its upper connecting hook on early models - ensure that this spring is replaced with the modified type, marked with yellow paint. The upper arm must be straight and free to move at its pivot point.

12 Check the stopper arm, the plate and the pins for excessive wear and replace any worn or damaged parts with new ones.

13 The gearshift shaft oil seal is located behind the output gear case on the left side of the lower crankcase half. If signs of oil leakage are evident, remove the output gear case (see Section 23) and with the gearshift shaft removed, pry the oil seal from position. Use a socket wrench as a drift to drive the new seal squarely into the crankcase.

Installation

14 If removed, insert the five pins in the cam plate. Position the cam plate on the shift drum so that the shift drum dowel pin is engaged in the cam plate hole. Apply thread sealant to the cam plate bolt and tighten it securely.

15 Install the neutral stopper arm and bolt. Again, apply thread sealant to the bolt before installing it. Slip the spring over the bolt and engage it with the stopper arm and crankcase boss.

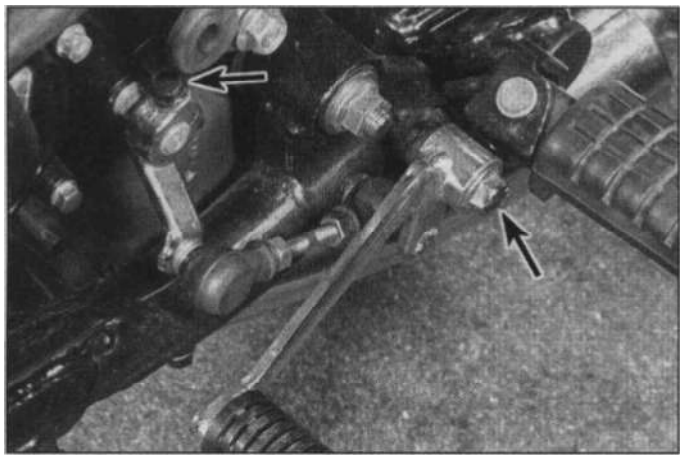
16 If the springs were removed from the gearshift spindle, assemble them. Apply a smear of grease to the gearshift spindle and wrap its splines with electrical tape, so they won't damage the seal as the shaft is installed. Insert it through the crankcase ensuring that the return spring is properly engaged on the crankcase stud. Also, be sure the upper arm is correctly positioned in relation to the cam plate.

17 Assemble the drum stopper arm, spring, washers and collar into position and secure them with the retaining nut. Be sure the spring is properly engaged. On later models, the inner washer has an extension which engages the cast rib in the bottom of the casing.

18 Having removed any tape from its splines, install the gearshift lever and operate the gearshift linkage mechanism to be sure it works smoothly. Be sure the punch mark on the lever aligns with the mark on the gearshift spindle.

19 The remainder of the components are installed in the reverse order of removal. When installing the oil pump drive sprocket, the drive dogs must face outwards. If the pump driven sprocket has an IN marking on one of its faces, position the sprocket with the IN marking facing the crankcase.

1



18.1 Gearshift lever-to-footpeg and gearshift shaft bolts

18 Gearshift lever - removal, and installation

Removal

Sabre models

Refer to illustration 18.1

1 Remove the shift lever bolt that attaches it to the footpeg bracket **(see illustration).**

2 Remove the left crankcase rear cover. Remove the pinch bolt that attaches the lever assembly to the gearshift shaft and slide it off of the shaft.

3 If only the gearshift lever needs to be replaced, loosen the locknut on the threaded link and unscrew the balljoint from the stud. The balljoint and lever are replaced as one unit. **Note:** *Prior to loosening the stud nuts, mark them with a dot of paint to show the original adjustment position.*

4 Both balljoints should be inspected for freedom of movement. If there is any roughness or binding they should be replaced by unscrewing them from the threaded link.

Magna models

5 Remove the left crankcase rear cover.

6 Disconnect the gearshift lever from the gearshift shaft.

7 Remove the left footpeg bracket bolts and lift off the bracket with the gearshift lever.

8 Unscrew the attaching bolt and lift the gearshift lever off of the bracket.

9 Dismantle the balljoints and threaded link as described in Steps 3 and 4 above.

Installation - all models

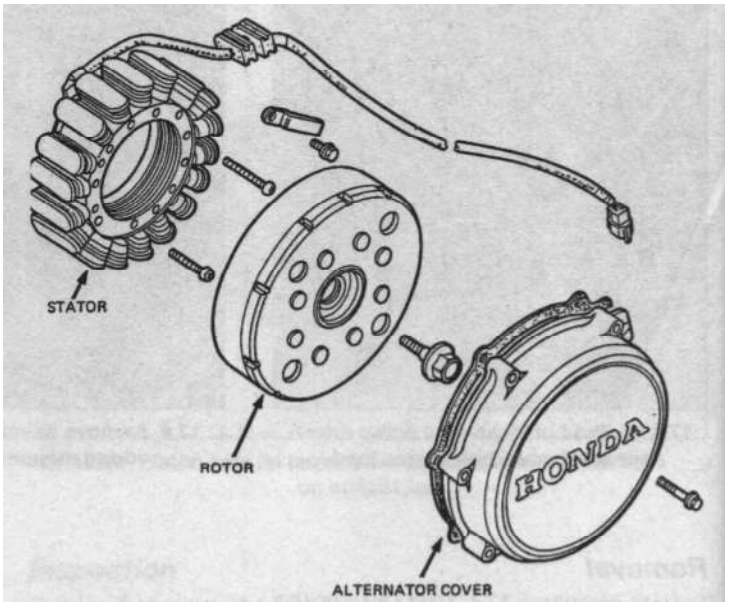
10 Installation is the reverse of the removal procedure, noting the following.

a) When installing the gearshift lever onto the gearshift shaft ensure that the two punch marks line up.

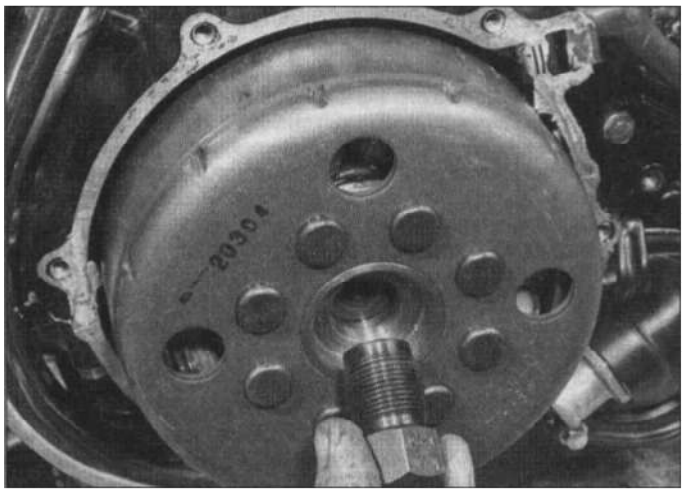
b) If the balljoints positions were disturbed, ensure that they are returned to their original positions on the threaded link. If no record was made, or new parts are being fitted, adjust the threaded link so that pedal height is comfortable in the riding position.

19 Alternator - removal and installation

Note: To *remove the alternator rotor the special Honda rotor puller, Part Number 07733-0020001 or 07933-3290001, or a pattern equivalent will be required. Do not attempt to remove the rotor using any other method. The alternator can be removed with the engine in the frame. If wor is being carried out with the engine removed, ignore the preliminary steps.*



19.1 Alternator component parts (early type shown)



19.3 Rotor must be withdrawn using center-bolt puller

Removal

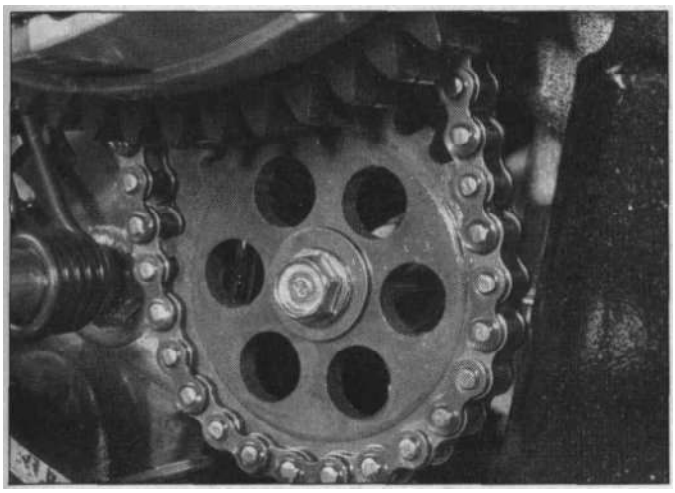
Refer to illustrations 19.1 and 19.3

1 There will be a certain amount of oil loss when the alternator cover is removed, so make sure the motorcycle is positioned upright (on its main stand if one is fitted) and place a drain tray under the cover. Remove its six bolts and withdraw the alternator cover from the left side of the engine **(see illustration).**

2 In order to remove the rotor mounting bolt, the rotor must be kept from turning. Honda dealers can supply service tools to engage the holes in the rotor face or a band-type strap wrench to fit around the rotor periphery. Alternatively, try one of the following methods.

a) A strap wrench can be used on the periphery of the rotor to hold it still.

b) The engine can be locked through the transmission. If the engine is in the frame, shift it into sixth gear and have an assistant sit on the motorcycle while applying the rear brake hard.



21.15 Oil pump driven sprocket bolt

3 Once the rotor bolt has been removed, the rotor can be pulled from its shaft by screwing the special Honda tool (see Note at beginning of this section) into its thread. The tool threads into the rotor and pushes against the crankshaft to draw the rotor off its taper **(see illustration).** A bolt of the correct diameter and thread size would also work if one large enough is available. Carefully tighten the tool until the rotor pops off of the shaft. **Caution:** *Be careful not to drop or strike the rotor or its magnetism will be impaired. Do not, under any circumstances use a common gear puller to remove the rotor, as damage will result.*
4 If the Woodruff key in the crankshaft taper is loose, keep it with the rotor for safekeeping.
5 If the stator needs to be removed, first remove the seat and left side cover from the motorcycle to gain access to its wiring connector. Disconnect the connector and free the wiring from any clamps and ties on the frame.
6 Remove the wiring harness clamp from inside the alternator housing and free the grommet from the casing.
7 Remove the stator mounting screws and lift it off, complete with the harness.

Installation

8 Installation is the reverse of the removal procedure, with the following notes.

a) *Degrease the rotor and crankshaft tapers and remove any metal particles of swarf from the rotor magnet. Remove all traces of gasket from the cover and crankcase mating surfaces.*
b) *Be sure the wiring harness is properly routed and secured with the wire bands.*
c) *The rotor is installed on the crankshaft by aligning its groove with the Woodruff key and sliding it on. Install the mounting bolt and, while keeping the rotor from turning, tighten the bolt to its proper torque.*
d) *Top up the engine oil if work is being carried out with the engine in the frame (see Chapter 1).*

20 Oil pan and strainer - removal and installation

Note: *The oil pan and strainer can be removed with the engine in the frame. If work is being carried out with the engine removed ignore the preliminary steps.*

Removal

1 Place the motorcycle on its main stand or an auxiliary stand if no main stand is fitted. Remove the front cylinder bank exhaust pipes (see Chapter 4). On 1987 and 1988 700/750 Magna models, remove the belly fairing (see Chapter 6). On 1986 through 1988 California models, detach the secondary air supply system air suction valve from the front of the oil pan.
2 Drain the engine oil (see Chapter 1).
3 Remove the nine oil pan bolts and lift off the oil pan. Have a drain pan handy to catch any residual oil.
4 Remove the oil strainer from the oil pump **(see illustration 21.18).**

Installation

5 Clean the strainer thoroughly with solvent and reinstall it on the oil pump, taking care not to displace the sealing ring on its union.
6 While the oil pan is removed, check the operation of the pressure relief valve as described in Section 22.
7 Clean the oil pan interior thoroughly and install it on the engine (if its sealing ring is damaged, replace it with a new one). Install the exhaust pipes, air suction valve and belly fairing (where fitted), then fill the crankcase with the proper amount and grade of oil (see Chapter 1).

21 Oil pump - pressure check, removal, overhaul and installation

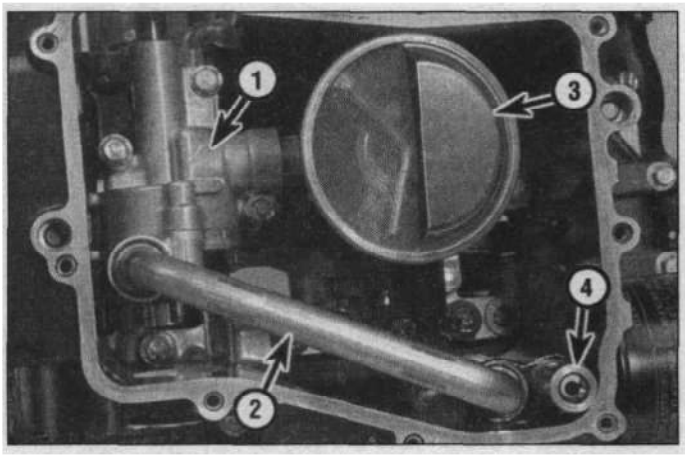
Pressure check

1 To check the oil pressure, a suitable gauge and adapter piece (which screws into the oil pressure switch thread) will be needed.
2 Check the oil level (Chapter 1). Warm the engine up to normal operating temperature then stop it.
3 Remove the oil pressure switch as described in Chapter 8.
4 Screw the adapter into the oil pressure switch threads in the top of the crankcase and connect the gauge to the adapter.
5 Start the engine and increase the engine speed to 5000 rpm while watching the gauge reading. The oil pressure should be similar to that given in the Specifications at the start of this Chapter.
6 If the pressure is significantly lower than the standard, either the relief valve is stuck open, the oil pump is faulty, the oil pump pick-up strainer is blocked or there is other engine damage. Begin diagnosis by checking the oil pump pick-up strainer and relief valve, then the oil pump. If those items check out okay, chances are the bearing oil clearances are excessive and the engine needs to be overhauled.
7 If the pressure is too high, the relief valve is stuck closed. To check it, see Section 22.
8 Stop the engine and unscrew the gauge and adapter from the crankcase.
9 Install the oil pressure switch as described in Chapter 8.

Removal

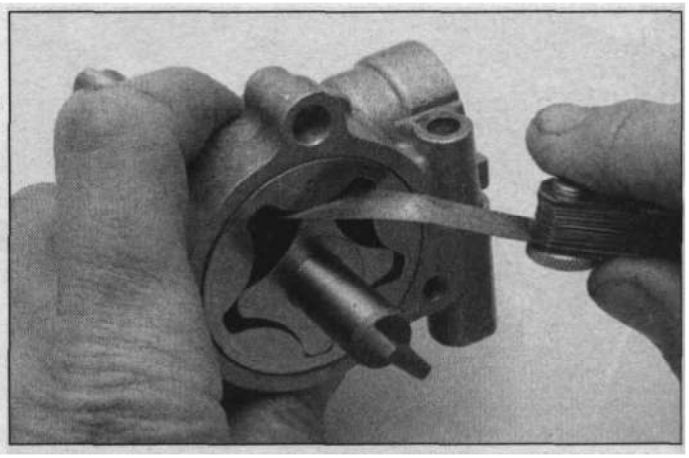
Refer to illustrations 21.15 and 21.18

Note: *The oil pump can be removed with the engine in the frame; if the engine has already been removed ignore the steps which don't apply.*
10 Drain the engine oil.
11 Remove the oil pan (see Section 20).
12 On all models remove the rear brake pedal, and on 1100 Magna models also remove the right footpeg.
13 Remove the right crankcase cover bolts. There are two different size bolts, so make a note of their location or store them in the old gasket when this has been removed.
14 Tap the crankcase cover gently with a soft-faced hammer to break the gasket seal, then pull it away from the engine. Do not pry between the gasket sealing surfaces, as damage and eventually oil leaks will occur. Discard the old gasket and remove the dowels for safekeeping in they are loose.
15 Locate the oil pump driven sprocket, directly below the clutch assembly, and remove the sprocket bolt and washer **(see illustration).** Hold the sprocket in place in order to loosen the bolt by inserting a screwdriver through one of the sprocket holes and engaging it in the crankcase opening behind the sprocket **(see illustration 17.4).**

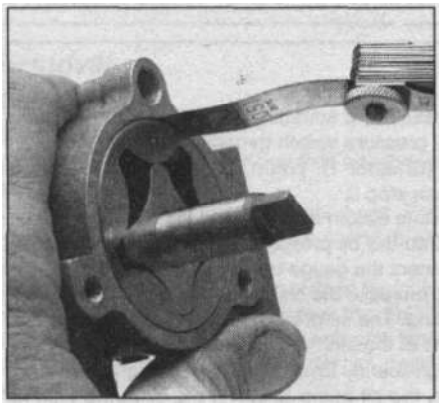


21.18 Oil pan component locations

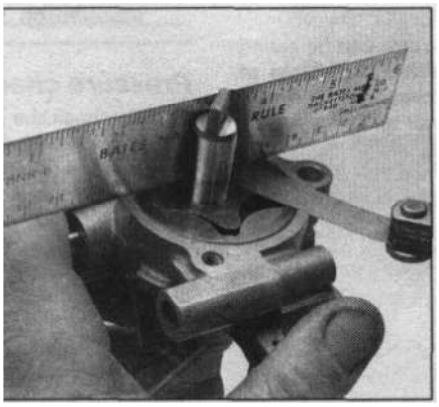
1 Oil pump
2 Oil pass pipe
3 Oil strainer
4 Oil pressure relief valve



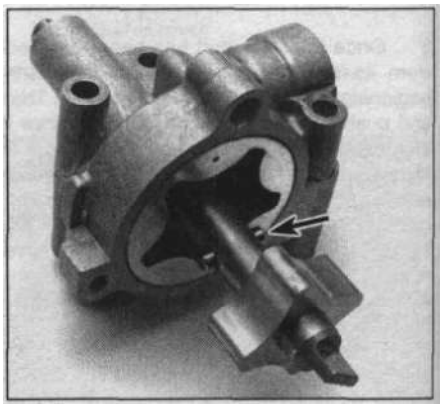
21.26a Measuring oil pump inner-to-outer rotor clearance



21.26b Measuring oil pump outer rotor-to-body clearance



21.26c Use a straightedge and feeler blades to measure rotor end clearance



21.29 Engage inner rotor slots with drive pin (arrow) on installation

16 Disengage the sprocket from the chain and remove it.
17 Remove the water pump on all models except the 1985 through 1988 700/750 Magna models (see Chapter 3).
18 Remove the oil strainer and lift out the oil pass pipe **(see illustration).** Check the condition of the O-rings on both ends of the pass pipe. If they are nicked or damaged, replace them with new ones.
19 Remove the oil pump mounting bolts and lift out the pump.
20 If the oil pump is to be disassembled, straighten and remove the pin that retains the oil strainer stay to the oil pump. Check the oil strainer stay O-rings for damage and replace them if necessary.

Overhaul

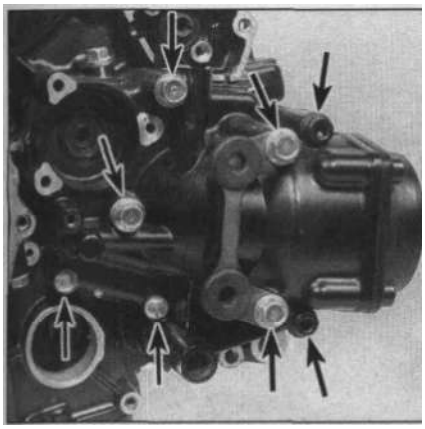
Refer to illustrations 21.26a, 21.26b, 21.26c and 21.29

21 Remove the three bolts that secure the oil pump body cover and lift it off. Do not lose the dowel pin.
22 Withdraw the rotor shaft and inner rotor from the body and remove the drive pin from the shaft. Separate the inner rotor from the shaft.
23 Remove the outer rotor from the body.
24 Clean the parts with solvent and dry them thoroughly. If available, use compressed air to blow out all of the passages.
25 Check the entire pump body and cover for cracks and evidence of wear. Look closely for a ridge where the rotors contact the body and cover.
26 Reassemble the rotors and the shaft in the pump body and use feeler gauges to check the inner rotor-to-outer rotor clearance, the outer rotor-to-pump body clearance and the rotor end clearance **(see illustrations).**
27 If the oil pump clearances are excessive, or if excessive wear is evident, replace the oil pump as a complete unit.
28 As the parts are assembled, lubricate them liberally with clean engine oil or grease.
29 Install the outer rotor in the pump body. Be sure the indented mark in the rotor faces away from the body. Slip the drive pin through the shaft, then slide the inner rotor onto the shaft and engage the slots in the rotor with the drive pin ends **(see illustration).**
30 Insert the shaft through the pump body and mesh the rotors. Install the cover (with the dowel pin in place) and tighten the screws evenly and securely.
31 Make sure the pump operates smoothly.

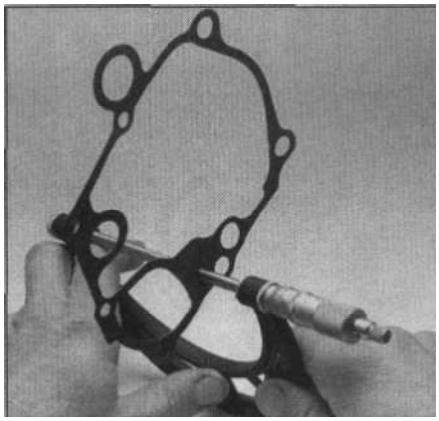
Installation

32 Installation is the reverse of the removal procedure with the following notes:

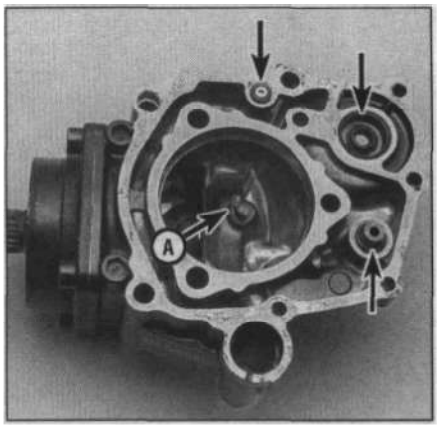
a) On 1985 through 1988 700/750 Magna models, where the water pump remained in place, mesh the oil pump and water pump driveshaft ends.
b) When installing the strainer stay to the oil pump, use a ne pin. Also, be sure the O-rings are properly installed on the strainer stay and pass pipe.
c) If the oil pump driven sprocket has an IN marking on one of its faces, this must be installed so that it faces the cran case.
d) Following installation, fill the crankcase with the proper amount and grade of ne engine oil. Refer to Chapter 1, if necessary.



23.2 Release all eight bolts (arrows) to release output gearcase from crankcase and countershaft bearing holder



23.4 Measuring gearcase gasket thickness (1982 models)



23.5 O-ring and pushrod oil seal positions (arrow). Check that oil nozzle (A) is clear.

22 Oil pressure relief valve - removal, inspection and installation

Note: *The pressure relief valve can be removed with the engine in the frame.*

Removal

1 Remove the oil pan as described in Section 20.
2 Pull the oil pressure relief valve out of its location in the crankcase, next to the oil pass pipe **(see illustration 21.18).**

Inspection

3 Push the plunger into the relief valve body and check for free movement. If the valve operation is sticky it must be replaced (apart from the O-ring, individual parts are not available). It is, however, possible to dismantle the valve for cleaning; using snap-ring pliers, remove the snap-ring from the valve end and withdraw the plain washer, spring and piston from the body.

Installation

4 Use a new O-ring on the relief valve body and push it into the crankcase. Install the oil pan (see Section 20).

23 Output gearcase - removal, inspection and installation

Note: *The output gear assembly must be removed ith the engine out of the frame.*

Removal

Refer to illustrations 23.2, 23.4 and 23.5

1 Remove the engine from the frame (see Section 5). Release its cover and remove the gearchange/neutral/OD switch and its wiring (see Chapter 8). Remove the water pump (see Chapter 3).
2 Remove all eight output gear assembly case bolts, and store them in a cardboard template of the case to ensure they can be returned to their original locations **(see illustration).** This will detach the case from the crankcases and from the output gear bearing housing, leaving the output gear and bearing housing installed on the countershaft.
3 Don't pry the output gear case off the crankcase; if it is stubborn, tap it with a soft-faced hammer while simultaneously pulling it off the casing and rotating the output shaft stub to help disengagement of the helical gears. **Caution:** *There will be a certain amount of resistance due to the countershaft bearing holder being an interference fit in the output shaft case - ensure that the output case is withdrawn squarely to prevent the bearing holder tying in the case bore.*
4 After removing the gearcase peel off the case gasket; a new one must be fitted on installation. On 1982 models the gasket must be inspected closely for a thickness marking. If marks can be found, be sure to use a new gasket of the same thickness, but if not use a micrometer to measure the thickness of the gasket **(see illustration).** When doing this, be sure the gasket is not torn at the point of measurement and due to the old gasket having been crushed slightly in use, add 0.05 mm (0.002 in) to the measurement to arrive at the required thickness of the replacement. **Note:** *Correct gasket thickness is critical to the alignment of the output gears.* On all later models only one thickness gasket is available so this check is not necessary.
5 Inspect the condition of the visible O-rings and pushrod oil seal **(see illustration).** If they show any signs of hardening, cracking or other damage they must be replaced. Also check the condition of the gearshift shaft oil seal located at the bottom of the output gearcase gasket surface on the crankcase. Due to its inaccessibility, it is a good idea to replace it at this stage if in an doubt about its condition (the gearshift shaft will have to be removed first - see Section 17).
6 Before disturbing the position of the countershaft, make thin alignment marks with a scribe or white paint across the bearing holder and crankcase as an aid to installation of the output gearcase.

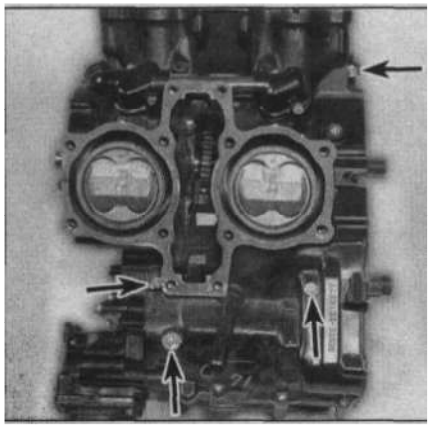
Inspection

7 Because of the critical nature of the output gear assembly and the number of special tools needed to disassemble, inspect and reassemble it, the assembly should be taken to a Honda dealer if overhaul is required. This applies equally to removal of the helical gear and bearing on the countershaft end, although removal and disassembly of the countershaft gears can be accomplished in the home workshop (see Section 31).

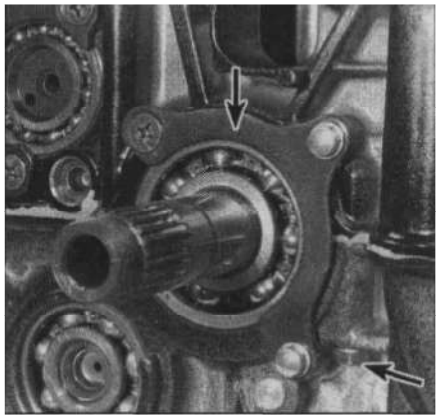
Installation

Note: *If a new output gearcase or ne crankcase, new countershaft or bearing has been installed, the countershaft spacer clearance (endfloat) must be measured and if necessary adjusted, as described in Section 31.*

8 Using the marks made on removal, check that the countershaft bearing holder-to-crankcase alignment is correct; this will ensure that the holes line up when the output gearcase is fitted.
9 Fit a new gasket on the crankcase, having selected the correct thickness gasket on 1982 models. Check that the new O-rings and the dowel are in position and make sure any shims found when removing the output gearcase are installed against the bearing holder. Install the output gearcase on the crankcase and tap it squarely onto the bearing holder shoulder using a soft-faced hammer, rotating the output shaft stub to help the helical gears engage.



24.2 Upper crankcase half bolts (arrows) - rear three bolts have washers under their heads



24.3 Mainshaft bearing retaining plate and hidden crankcase bolt (arrows)

24.10 Do not apply sealant to this area of main bearing mating surfaces

10 Install the gearcase mounting bolts in their original positions and tighten them to the specified torque.
11 Refit the water pump (see Chapter 3), gearchange/neutral/OD switch (see Chapter 8), and engine (see Chapter 5).

24 Crankcase - separation and reassembly

Separation

Refer to illustrations 24.2 and 24.3

1 Prior to separating the crankcase halves, the engine must be removed from the frame as described in Section 5 and the following components removed from the engine.

Cylinder heads (Section 10)
Camchain fens/oner *guides (Section 8)*
Starter clutch (Section 13)
Clutch (Section 14)
Pulse generators (Chapter 4)
Oil pressure s itch (Chapter 8)
Alternator rotor and stator Section 19)
Water pump (Chapters)
Gearchange/neutral/OD switch (Chapter 8)
External gearshift linkage (Section 17)
Starter motor (Chapter 8)
Oil pump (Section 21)
Output gearcase (Section 23)

2 Remove the four upper crankcase bolts **(see illustration).**
3 Remove the mainshaft bearing holder by removing the screw and two bolts. Also remove the crankcase bolt located behind the holder, across the casing joint **(see illustration).**
4 Turn the engine over so it is resting on the upper half of the crankcase and remove the remaining 24 (1987 and 1988 700/750 Magnas) or 28 (all other models) lower crankcase bolts. To prevent distortion of the case, loosen the bolts evenly in a criss-cross pattern for 1987 and 1988 700/750 Magnas, or in a reverse of the tightening sequence for all other models. The bolts are of differing lengths, and some have washers under their heads; make up a cardboard template of the lower crankcase so that the bolts can be stored in their original locations.
5 Gently tap the lower case with a soft-faced hammer to break the seal, then carefully lift it away from the upper case. **Caution:** Do not *under any circumstances pry between the cases to separate them as damage to the sealing surfaces will result.* If resistance is encountered, double check to make sure that all of the bolts have been removed.
6 To completely strip the crankcase, refer to the following Sections to remove the pistons, connecting rods, crankshaft, transmission shafts and shift drum/forks.

Reassembly

Refer to illustrations 24.10, 24.12a and 24.12b

Note: *If new crankcases, or a new output gearcase, countershaft or countershaft bearing have been fitted, the countershaft endfloat must be checked before assembling the case halves (see Section 31).*
7 Prior to assembling the crankcase halves, be sure the shift drum and forks, transmission shafts, crankshaft (with camchains), pistons and connecting rods have been installed.
8 Clean the mating surfaces of both crankcase halves with lacquer thinner or acetone.
9 If not done previously, apply molybdenum disulfide grease to the shift fork grooves of the transmission gears.
10 Apply a thin coat of liquid gasket sealant to the mating surfaces of both crankcase halves. **Note:** *Do not apply sealant to the area near the main bearings* **(see illustration).** Ensure the locating dowel(s) is/are in position.
11 Carefully lower the crankcase half onto the upper crankcase, being sure to align the shift fork claws with the gear fork grooves.
12 With the crankcase halves pressed together, install the lower crankcase bolts, being sure they are installed in their original locations. Tighten the bolts evenly, in two or three steps to the specified torque, noting that the torque differs according to thread diameter. On 1987 and 1988 700/750 Magnas tighten them in a criss-cross pattern, starting with the 9 mm main bearing bolts first; on all other models follow the tightening sequence **(see illustrations).**
13 Turn the engine over so it is resting on the lower crankcase. Install the four upper crankcase bolts, again tightening them evenly and in a criss-cross pattern to their proper torque. **Note:** *Where fitted, ensure the plain washers are installed with the three rear bolts.*
14 Install the crankcase bolt located behind the mainshaft bearing holder, then install the bearing holder and tighten it securely.
15 When installing the output gearcase, refer to Section 23 for the proper procedure, including new gasket selection on 1982 models.
16 The remainder of the reassembly sequence is the reverse of the dismantling.

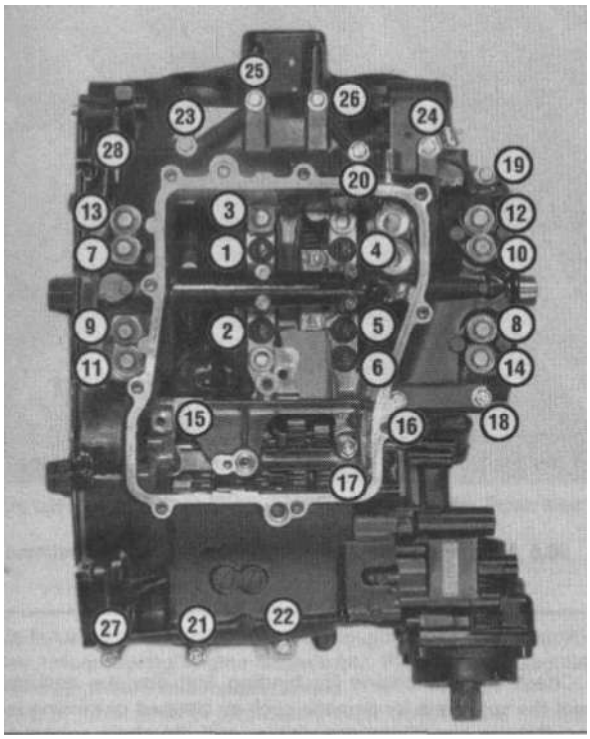
25 Crankcase - inspection and servicing

1 After the crankcases have been separated and the crankshaft and transmission components have been removed, the crankcases should be cleaned thoroughly with new solvent and dried with compressed air.

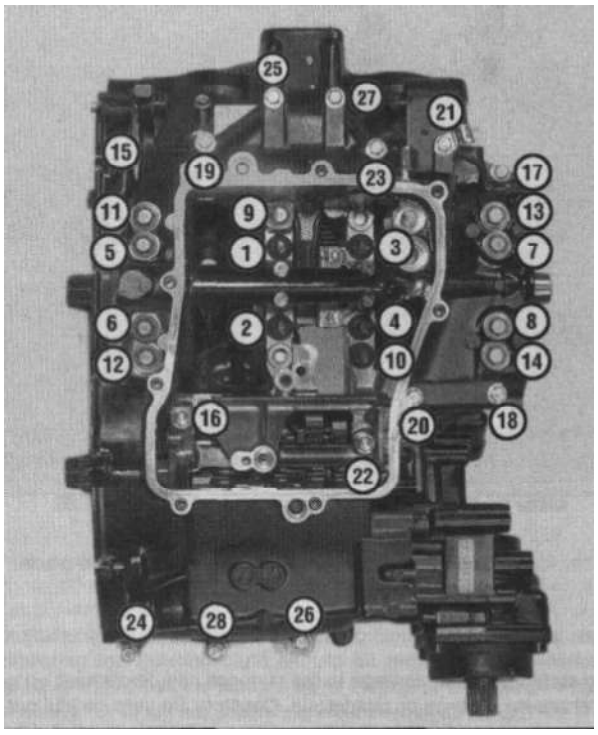
Cylinder bores

Refer to illustration 25.3

Note: *Don't attempt to separate the liners from the cylinder block.*



24.12a Lower crankcase bolt tightening sequence - 1982 through 1985 700/750 Sabre models, 1982 through 1984 700/750 Magna models, and all 1100 models



24.12b Lower crankcase bolt tightening sequence - 1985 and 1986 700 Magna models

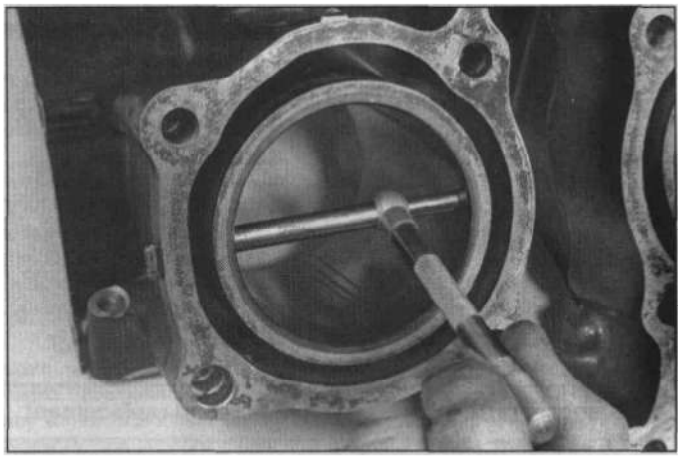
2 Check the cylinder walls carefully for scratches and score marks.

3 Using the appropriate precision measuring tools, check each cylinder's diameter **(see illustration).** Measure near the top, center and bottom of the cylinder bore, parallel to the crankshaft axis. Next, measure each cylinder's diameter at the same three locations across the crankshaft axis. Compare the results to this Chapter's Specifications. If the cylinder bores are tapered, out-of-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, oversize pistons and rings will be required as well. Honda produce four sizes of oversize pistons (see Section 29).

4 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 cylinders.

5 If they are in reasonably good condition and not worn to the outside of the limits, and if the piston-to-cylinder clearances can be maintained properly (see Section 29), then the cylinders do not have to be rebored; honing is all that is necessary.

6 To perform the honing operation you will need the proper size flexible hone with fine stones, or a "bottle brush' type hone, plenty of light oil or honing oil, some shop towels and an electric drill motor. Hold the upper crankcase half 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 top of 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 approximately a 60(тут за цифро заичок бесконечности был) 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 and repeat the procedure on the other cylinders. Remember, do not remove too much material from the cylinder wall. 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.



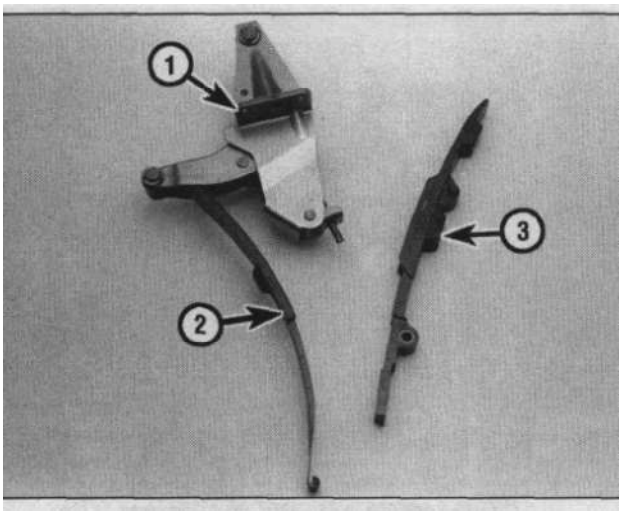
25.3 Measuring cylinder bore diameter

7 Next, the cylinders must be thoroughly washed 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 cylinders thoroughly and apply a coat of light, rust-preventative oil to all machined surfaces.

Crankcase castings

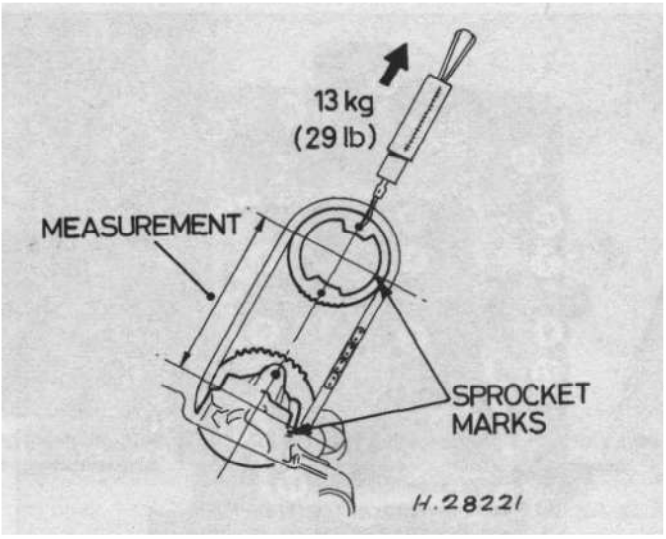
8 Remove any oil passage plugs that haven't already been removed. All oil passages should be blown out with compressed air.

9 All traces of old gasket sealant should be removed from the



26.2 Camchain tensioner components

1 Tensioner
2 Slipper blade
3 Guide blade



26.5 Measuring camchain stretch with a spring balance

mating surfaces. Minor damage to the surfaces can be cleaned up with a fine sharpening stone or grindstone. **Caution:** *Be very careful not to nick or gouge the crankcase mating surfaces or leaks will result. Chec both crankcase halves very carefully for cracks and other damage.*

10 Small cracks or holes in aluminum castings may be repaired with an epoxy resin adhesive as a temporary measure. Permanent repairs can only be effected by argon-arc welding, and only a specialist in this process is in a position to advise on the economy or practical aspect of such a repair. If any damage is found that can't be repaired, replace the crankcase halves as a set.

11 Damaged threads can be economically reclaimed by using a diamond section wire insert, of the Helicoil type, which is easily fitted after drilling and re-tapping the affected thread. Most motorcycle dealers and small engineering firms offer a service of this kind.

12 Sheared studs or screws can usually be removed with screw extractors, which consist of a tapered, left thread screws of very hard steel. These are inserted into a pre-drilled hole in the stud, and usually succeed in dislodging the most stubborn stud or screw. If a problem arises which seems beyond your scope, it is worth consulting a professional engineering firm before condemning an otherwise sound casing. Many of these firms advertise regularly in the motorcycle press.

26 Camchains and guides - inspection and replacement *Camchain tensioner, guides and slipper blades*

Note: *The camchain tensioner, guides and tensioner slipper blades can be removed with the engine in the frame (see Section 8). Refer to illustration 26.2*

1 Check for smooth operation of the tensioner, that its spring is unbroken and that there is no wear at any of the tensioner arm or body pivots.

2 Check the guides for deep grooves, cracking and other obvious damage, replacing them if necessary **(see illustration).**

Camchains

Note: *The engine must be removed from the frame and the crankcase halves separated to remove the camchains. Refer to illustration 26.5*

3 Remove the cylinder heads and separate the crankcase halves (see Sections 10 and 24). The camchains can then be slipped off the crankshaft sprockets.

4 Check the camchains for binding and obvious damage and inspect the sprockets for damage such as chipped or missing teeth. If either of these conditions are visible, or if the chain appears to be stretched, both chains and sprockets (crankshaft and both camshaft sprockets) should be replaced as a set.

5 With the use of a spring balance it is possible to measure the amount of chain stretch and compare it with the service limit (see Specifications) to determine whether it needs replacing. With the chain around the sprocket of one camshaft secured in the cylinder head, install the other sprocket in the chain loop and use apply a force of 13 kg (26 lbs) on the spring balance (hooked through the outer sprocket bolt hole). Measure the distance between the sprocket centers or between the sprocket alignment marks **(see illustration).**

6 Installation is a reverse of the removal procedure.

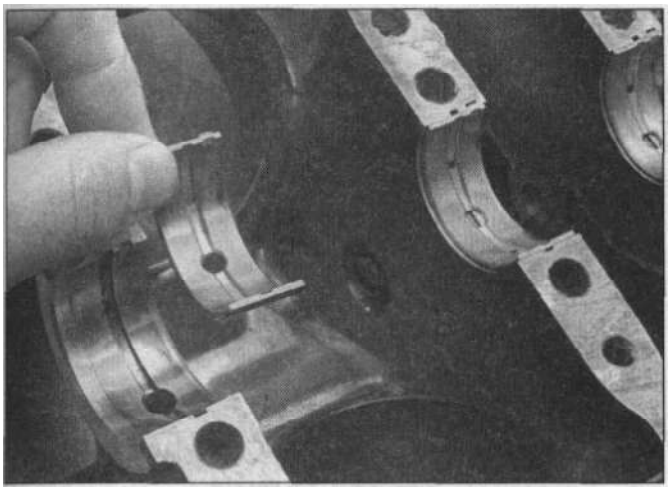
27 Main and connecting rod bearings - general note

1 Even though main and connecting rod bearings are generally replaced with new ones during the engine overhaul, the old bearings should be retained for close examination as they may reveal valuable information about the condition of the engine.

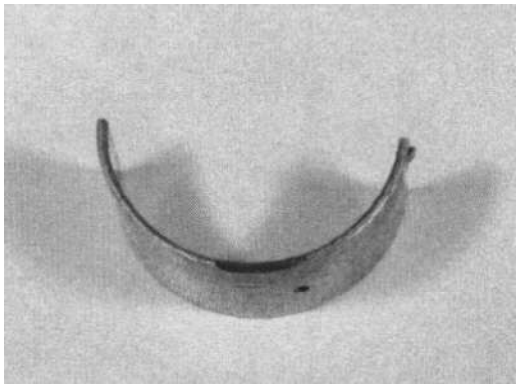
2 Bearing failure occurs mainly because of lack of lubrication, the presence of dirt or other foreign particles, overloading the engine and/or corrosion. Regardless of the cause of bearing failure, it must be corrected before the engine is reassembled to prevent it from happening again.

3 When examining the bearings, remove the main bearings from the case halves and the rod bearings from the connecting rods and caps and lay them out on a clean surface in the same general position as their location on the crankshaft journals. This will enable you to match any noted bearing problems with the corresponding crankshaft journal.

4 Dirt and other foreign particles get into the engine in a variety of ways. It may be left in the engine during assembly or it may pass through filters or breathers. It may get into the oil and from there into the bearings. Metal chips from machining operations and normal engine wear are often present. Abrasives are sometimes left in engine components after reconditioning operations such as cylinder honing, especially when parts are not thoroughly cleaned using the proper cleaning methods. Whatever the source, these foreign objects often end up imbedded in the soft bearing material and are easily recognized. Large particles will not imbed in the bearing and will score or gouge the bearing and journal. The best prevention for this cause of



28.4 Be careful when handling main bearing inserts. Push them to one side to release from casing



28.9 Bearing inserts are color-coded on their sides

bearing failure is to clean all parts thoroughly and keep everything spotlessly clean during engine reassembly. Frequent and regular oil and filter changes are also recommended.

5 Lack of lubrication or lubrication breakdown has a number of interrelated causes. Excessive heat (which thins the oil), overloading (which squeezes the oil from the bearing face) and oil leakage or throw off from excessive bearing clearances, worn oil pump or high engine speeds all contribute to lubrication breakdown. Blocked oil passages will also starve a bearing and destroy it. When lack of lubrication is the cause of bearing failure, the bearing material is wiped or extruded from the steel backing of the bearing. Temperatures may increase to the point where the steel backing and the journal turn blue from overheating.

6 Riding habits can have a definite effect on bearing life. Full throttle low speed operation, or lugging (labouring) the engine, puts very high loads on bearings, which tend to squeeze out the oil film. These loads cause the bearings to flex, which produces fine cracks in the bearing face (fatigue failure). Eventually the bearing material will loosen in pieces and tear away from the steel backing. Short trip riding leads to corrosion of bearings, as insufficient engine heat is produced to drive off the condensed water and corrosive gases produced. These products collect in the engine oil, forming acid and sludge. As the oil is carried to the engine bearings, the acid attacks and corrodes the bearing material.

7 Incorrect bearing installation during engine assembly will lead to bearing failure as well. Tight fitting bearings which leave insufficient bearing oil clearances result in oil starvation. Dirt or foreign particles trapped behind a bearing insert result in high spots on the bearing which lead to failure.

8 To avoid bearing problems, clean all parts thoroughly before reassembly, double check all bearing clearance measurements and lubricate the new bearings with clean engine oil during installation.

28 Crankshaft and main bearings - removal, inspection, bearing selection, oil clearance check and installation

Removal

Refer to illustration 28.4

1 Separate the crankcase halves as described in Section 24.

2 Remove the piston/connecting rod assemblies as described in Section 29. **Note:** *If no work is to be carried out on the piston/connecting rod assemblies there is no need to remove them from the bores. The cylinder heads can be left in position although the camchains should be detached from the camshaft sprockets, and the connecting rod bearing caps should be removed (see Section 29, Steps 2 and 3). Push the pistons up to the top of the bores so that the connecting rod ends are positioned clear of the crankshaft.*

3 Lift the crankshaft out of the upper crankcase half, taking care not to dislodge the bearing inserts.

4 The main bearing inserts can be removed from the crankcase halves by pushing their centers to the side, then lifting them out **(see illustration).** Keep the bearing inserts in order.

Inspection

5 Clean the crankshaft with solvent, using a rifle-cleaning brush to scrub out the oil passages. If available, blow the crank dry with compressed air.

6 Refer to Section 27 and examine the main bearing inserts. If they are scored, badly scuffed or appear to have been seized, new bearings must be installed. Always replace the main bearings as a set. If they are badly damaged, check the corresponding crankshaft journal. Evidence of extreme heat, such as discoloration, indicates that lubrication failure has occurred. Be sure to thoroughly check the oil pump and pressure relief valve as well as all oil holes and passages before reassembling the engine.

7 The crankshaft journals should be given a close visual examination, paying particular attention where damaged bearing inserts have been discovered. If the journals are scored or pitted in any way a new crankshaft will be required. Note that undersizes are not available, precluding the option of re-grinding the crankshaft.

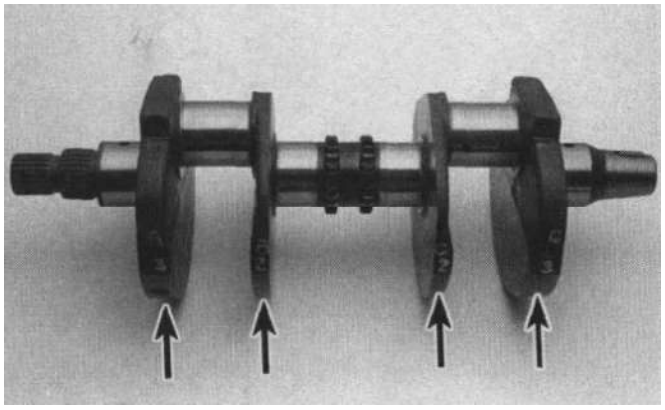
8 Set the crankshaft on V-blocks and check the runout with a dial indicator touching the center main bearing journal, comparing your findings with this Chapter's Specifications. If the runout exceeds the limit, replace the crank.

Bearing selection

Refer to illustrations 28.9, 28.10 and 28.11

9 The main bearing running clearance is controlled in production by selecting one of five (700/750 models) or three (1100 models) grades of bearing insert. The grades are indicated by a color-coding marked on the edge of each insert **(see illustration).** In order, from the thickest to the thinnest, the insert grades are: Black, Blue, Brown, Green and Yellow for 700/750 models and Brown, Green and Yellow for 1100 models. New bearing inserts are selected as follows using the crankshaft journal and crankcase main bearing bore size markings.

10 The standard crankshaft journal diameter is divided into size groups to allow for manufacturing tolerances. The size group of each journal can be determined by the numbers (1, 2 or 3 on 700/750



28.10 Location of main bearing journal size codes (arrows) - also connecting rod journal sizes

models and 1 or 2 on 1100 models) which are stamped on each crank web **(see illustration). Note:** *Ignore the letters as these refer to the crankpin journals.* The numbers indicate the diameter of the crankshaft journal immediately outboard of that web. If the equipment is available, these marks can be checked by direct measurement.

11 The crankcase main bearing bore diameters are also divided into size groups to allow for manufacturing tolerances. The size group of each main bearing bore can be determined using the four codes stamped on the rear outside face of the upper crankcase half **(see illustration).** These will be made up of the letters A, B or C on 700/750 models and I and II or 1 and 2 on 1100 models. The first letter indicates the diameter of the left journal, and the last the diameter of the right journal. If the equipment is available, these marks can be checked by direct measurement.

12 Match the relevant crankcase code with its crankshaft code and select a new set of bearing inserts using the following table.

700/750 models

Crank web mark	Case mark	Insert color
1	A	Yellow 1
B	Green 1	C
Brown 2	A	Green 2
B	Brown 2	C
Black 3	A	Brown 3
B	Black 3	C
Blue		

1100cc models

Crank web mark	**Case mark**	**Insert color**
1	**I or 1**	**Yellow 1**
II or 2	**Green 2**	**I or 1**
Green 2	**II or 2**	**Brown**

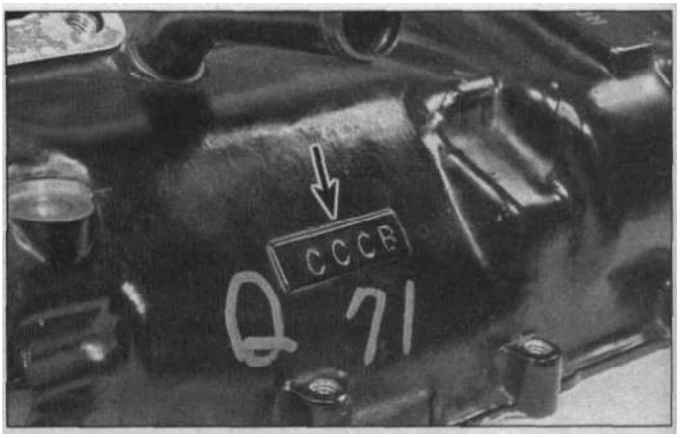
Oil clearance check

13 Whether new bearing inserts are being fitted or the original ones are being re-used, the main bearing oil clearance should be checked prior to reassembly.

14 Clean the backs of the bearing inserts and the bearing locations in both crankcase halves.

15 Press the bearing inserts into their locations, ensuring that the tab on each insert engages in the notch in the crankcase. Make sure the bearings are fitted in the correct locations and take care not to touch any insert's bearing surface with your fingers.

16 There are two possible ways of checking the oil clearance, the first method is by direct measurement (see Step 17 and 23) and the second by the use of a product known as Plastigage (see Steps 18 to 23).



28.11 Main bearing bore diameter codes are stamped in upper crankcase half (arrow)

17 If the first method is to be used, with the main bearing inserts in position, carefully lower the lower crankcase half onto the upper half. Make sure that the shift forks (if fitted) engage with their respective slots in the countershaft gears as the halves are joined. Check that the lower crankcase half is correctly seated. **Note:** *Do not tighten the cran case bolts if the casing is not correctly seated.* Install all the lower crankcase bolts and following the correct tightening sequence (see Section 24) tighten them to the specified torque. Measure the internal diameter of each assembled pair of bearing inserts. If the diameter of each corresponding crankshaft journal is measured and then subtracted from the bearing internal diameter, the result will be the connecting rod bearing oil clearance.

18 If the second method is to be used, ensure the main bearing inserts are correctly fitted and that the inserts and crankshaft are clean and dry. Lay the crankshaft in position in the upper crankcase.

19 Cut several lengths of the appropriate size Plastigage (they should be slightly shorter than the width of the crankshaft journal). Place a strand of Plastigage on each (cleaned) crankshaft journal, avoiding the oilway.

20 Carefully lower the lower crankcase half onto the upper half. Make sure that the shift forks (if fitted) engage with their respective slots in the countershaft gears as the halves are joined. Check that the lower crankcase half is correctly seated. **Note:** Do *not tighten the crankcase bolts if the casing is not correctly seated and make sure the crankshaft is not rotated as the bolts are tightened.* Install all the lower crankcase bolts and following the correct tightening sequence (see Section 24) tighten them to the specified torque.

21 Loosen and remove the crankcase bolts in a reverse of the tightening sequence, making sure the Plastigage is not disturbed.

22 Compare the width of the crushed Plastigage on each crankshaft journal to the scale printed on the Plastigage envelope to obtain the main bearing oil clearance **(see illustration 29.37).**

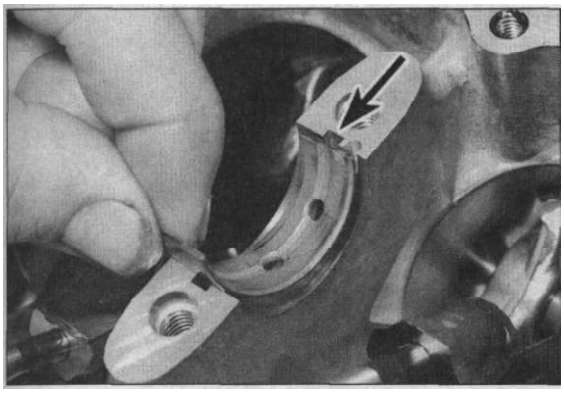
23 If the clearance is not within the specified limits, the bearing inserts may be the wrong grade (or excessively worn if the original inserts are being re-used). Before deciding that different grade inserts are needed, make sure that no dirt or oil was trapped between the bearing inserts and the crankcase halves when the clearance was measured. If the clearance is excessive, even with new inserts (of the correct size), the crankshaft journal is worn and the crankshaft should be replaced.

24 On completion carefully scrape away all traces of the Plastigage material from the crankshaft journal and bearing inserts; use a fingernail or other object which is unlikely to score the inserts.

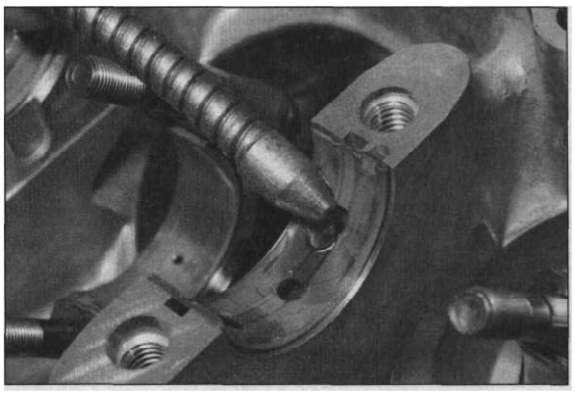
Installation

Refer to illustrations 28.26 and 28.27

25 Clean the backs of the bearing inserts and the bearing recesses in both crankcase halves. If new inserts are being fitted, ensure that all traces of the protective grease are cleaned off using kerosene



28.26 Ensure locating tab engages cutout (arrow) when installing main bearing inserts



28.27 Oil insert liberally before crankshaft is installed

(paraffin). Wipe dry the inserts and crankcase halves with a lint-free cloth.

26 Press the bearing inserts into their locations. Make sure the tab on each insert engages in the notch in the casing **(see illustration).** Make sure the bearings are fitted in the correct locations and take care not to touch any insert's bearing surface with your fingers.

27 Lubricate the bearing inserts in the upper crankcase with clean engine oil **(see illustration).**

28 Lower the crankshaft into position in the upper crankcase.

29 Fit the piston/connecting rod assemblies to the crankshaft as described in Section 29 if they were disconnected.

30 Reassemble the crankcase halves as described in Section 24.

29 Piston/connecting rod assemblies - removal, inspection, bearing selection, oil clearance check and installation

Removal

Refer to illustrations 29.1 and 29.8

1 Separate the crankcase halves as described in Section 24. Before removing the piston/connecting rods from the crankshaft measure the side clearance of each rod with a feeler gauge **(see illustration).** If the clearance on any rod is greater than the service limit listed in this Chapter's Specifications, that rod will have to be replaced with a new one.

2 Using a center punch or paint, mark the relevant cylinder number on each connecting rod and bearing cap (see illustration 1.1 at the beginning of this Chapter).

3 Unscrew the bearing cap nuts and withdraw the cap, complete with the lower bearing insert, from each of the four connecting rods. Push the connecting rods up and off their crankpins, then remove the upper bearing insert. Keep the cap, nuts and (if they are to be re-used) the bearing inserts together in their correct sequence.

4 Remove the ridge of carbon from the top of each cylinder bore. If there is a pronounced wear ridge at the top of each bore, remove it with a ridge reamer.

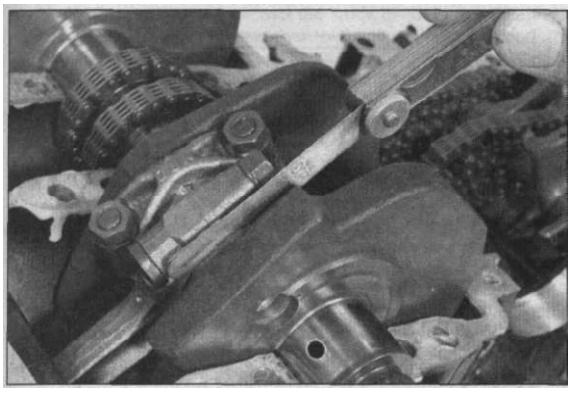
5 Push each piston/connecting rod assembly up and remove it from the top of the bore making sure the connecting rod does not mark the cylinder bore walls. **Caution:** Do *not try to remove the piston/connecting rod from the bottom of the cylinder bore. The piston will not pass the crankcase main bearing webs. If the piston is pulled right to the bottom of the bore the oil control ring will e pand and lock the piston in position. If this happens it is likely the ring ill be bro en.*

6 Immediately install the relevant bearing cap, inserts and nuts on each piston/connecting rod assembly so that they are all kept together as a matched set.

7 Using a sharp scriber, scratch the number of each piston into its crown (or use a suitable marker pen if the piston is clean enough).

8 Support the first piston and, using a small screwdriver or scriber, carefully pry out a circlip from the piston groove **(see illustration).**

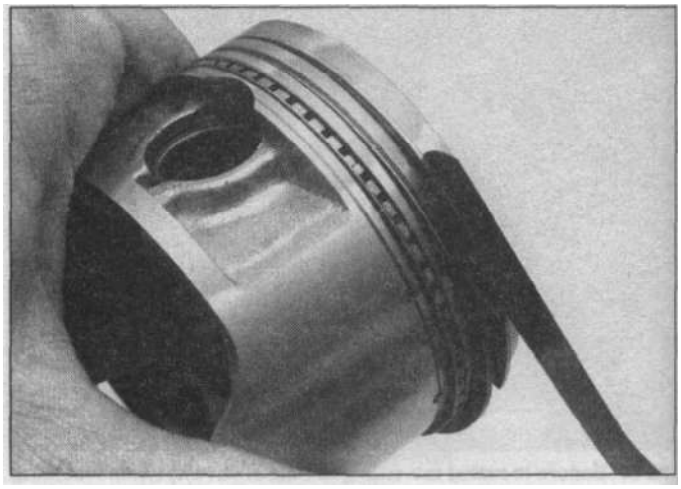
9 Push the piston pin out from the opposite end to free the piston from the rod. You may have to deburr the area around the groove to



29.1 Measuring connecting rod side clearance

29.8 Pry out the circlip from the piston groove

29.11 Use a ring removal and installation tool to remove top and second piston rings



29.18 Measuring piston ring-to-groove clearance

enable the pin to slide out (use a triangular file for this procedure). If the pin is tight, tap it out using a suitable hammer and punch, taking care not to damage the piston. Repeat the procedure for the other pistons.

Inspection

Refer to illustrations 29.11, 29.18, 29.19, 29.20a, 29.20b and 29.23

Pistons

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

11 Using a piston ring removal and installation tool, carefully remove the rings from the pistons **(see illustration).** Do not nick or gouge the pistons in the process.

12 Scrape all traces of carbon from the tops of the pistons. A hand-held wire brush or a piece of fine emery cloth can be used once most 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.

13 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 an 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.

14 Once the deposits have been removed, clean the pistons with solvent and dry them thoroughly. Make sure the oil return holes below the oil ring grooves are clear.

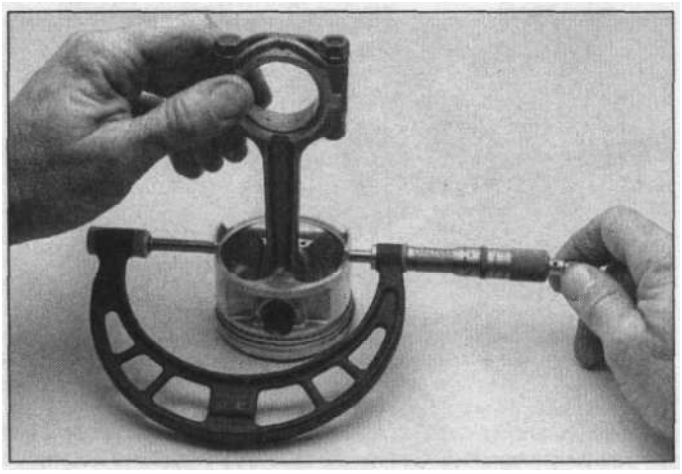
15 If the pistons are not damaged or worn excessively and if the cylinders are not to be rebored, new pistons will not be necessary. Normal piston wear appears as even, vertical wear on the thrust surfaces of the piston and slight looseness of the top ring in its groove. New piston rings, on the other hand, should always be used when an engine is rebuilt.

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

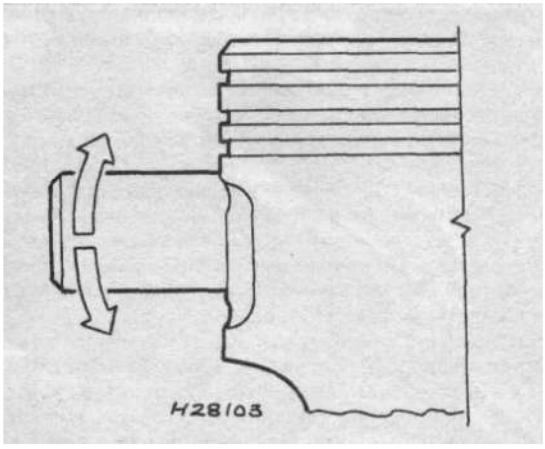
17 Look for scoring and scuffing on the thrust faces of the skirt, holes in the piston crown and burned areas at the edge of the crown. If the skirt is scored or scuffed, the engine may have been suffering from overheating and/or abnormal combustion, which caused excessively high operating temperatures. The oil pump should be checked thoroughly. A hole in the piston crown, an extreme to be sure, 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.

18 Measure the piston ring-to-groove clearance by laying a new piston ring in the ring groove and slipping a feeler gauge in beside it **(see illustration).** Check the clearance at three or four locations around the groove. Be sure to use the correct ring for each groove; they are different. If the clearance is greater than the service limit, new pistons will have to be used when the engine is reassembled.

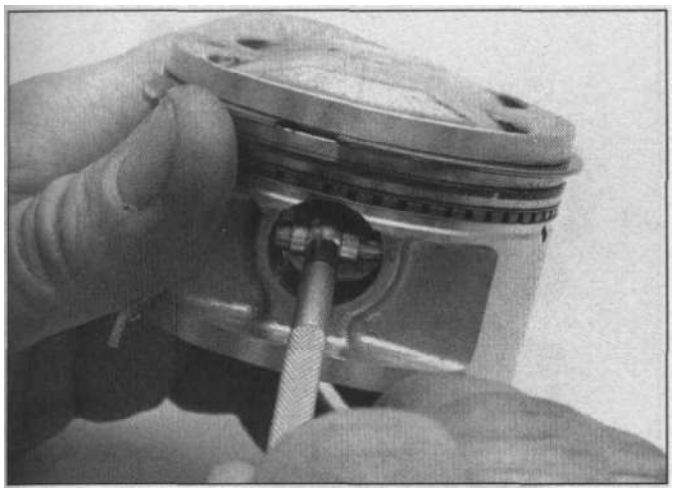
19 Calculate the piston-to-bore clearance by measuring the bore



29.19 Measuring piston diameter



29.20a Rock piston pin in piston boss to check for wear .



29.20b … or check by direct measurement

(see Section 25) and the piston diameter. Make sure that the pistons and cylinders are correctly matched. Measure the piston across the skirt on the thrust faces at a 90°° angle to the piston pin, 11 mm (1/2 inch) up from the bottom of the skirt **(see illustration).** Subtract the piston diameter from the bore diameter to obtain the clearance. If it is greater than specified, the cylinders will have to be rebored and new oversized pistons and rings installed.

20 Apply clean engine oil to the pin, insert it into the piston and check for freeplay by rocking the pin back-and-forth **(see illustration).** If the pin is loose, new pistons and pins must be installed. If the necessary measuring equipment is available measure the pin diameter and piston pin bore and check the readings obtained do not exceed the limits given in this Chapter's Specifications **(see illustration).** Replace components that are worn beyond the specified limit.

21 If the pistons are to be replaced, ensure the correct size of piston is ordered. Honda produce four oversizes of piston as well as standard pistons. The piston oversizes available are: +0.25 mm, +0.50 mm, +0.75 mm and +1.0 mm. **Note:** *Oversi e pistons have their relevant si e stamped on top of the piston crown, eg. a 0.25 mm oversi e piston will be marked 0.25.*

22 Install the rings on the pistons as described in Section 30.

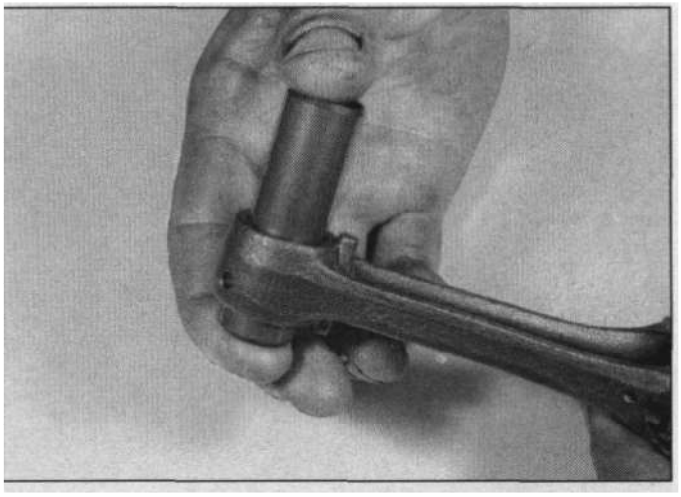
Connecting rods

23 Check the connecting rods for cracks and other obvious damage Lubricate the piston pin for each rod, install it in its original rod and check for play **(see illustration).** If it wobbles, replace the connecting rod and/or the pin. If the necessary measuring equipment is available measure the pin diameter and connecting rod bore and check the readings obtained do not exceed the limits given in this Chapter's Specifications. Replace components that are worn beyond the specified limit.

24 Refer to Section 27 and examine the connecting rod bearing inserts If they are scored, badly scuffed or appear to have been seized, new bearings must be installed. Always replace the bearings in the connecting rods as a set. If they are badly damaged, check the corresponding crankpin. Evidence of extreme heat, such as discol-oration, indicates that lubrication failure has occurred. Be sure to thoroughly check the oil pump and pressure relief valve as well as all oil holes and passages before reassembling the engine.

25 Have the rods checked for twist and bending at a dealer service department or other motorcycle repair shop.

26 If a connecting rod is to replaced, it is essential that the new rod is of the correct weight group to minimize vibration. The weight is indicated by a letter (A, B, C, D or E) stamped across the rod and cap join. This letter together with the connecting rod size number (see Step 29) should be quoted when purchasing new connecting rod(s). Note: *When ordering a new connecting rod also provide the dealer with the markings for the opposite cylinder's rod on that journal.*



29.23 Checking for play between piston pin and connecting rod small-end

Bearing selection

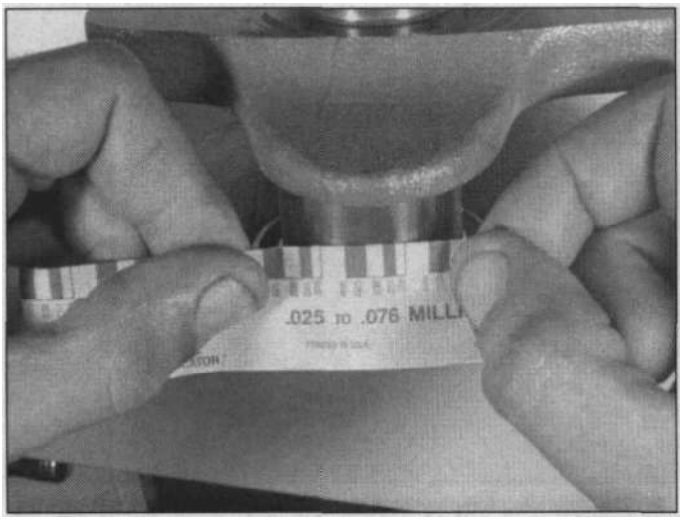
Refer to illustration 29.29

27 The connecting rod bearing running clearance is controlled in production by selecting one of five (700/750 models) or three (1100 models) grades of bearing insert. The grades are indicated by a color-coding marked on the edge of each insert **(see illustration 28.9).** In order, from the thickest to the thinnest, the insert grades for 700/750 models are: Blue, Black, Brown, Green and Yellow and for 1100 models are Brown, Green and Yellow. New bearing inserts are selected as follows using the crankpin and connecting rod size markings.

28 The standard crankpin journal diameter is divided into size groups to allow for manufacturing tolerances. The size group of each crankpin can be determined by the letters (700/750 models: A, B or C, 1100 models: A or B) stamped on the edge of each crank web **(see illustration 28.10). Note:** *Ignore the numbers as these refer to the main bearing journals.* Each letter indicates the diameter of each crankpin immediately inboard of that web. If the equipment is available, these marks can be checked by direct measurement.

29 The connecting rods are also divided into size groups to allow for manufacturing tolerances. The size group is in the form of numbers (700/750 models: 1, 2 or 3, 1100 models: 1 or 2) **(see illustration). Note:** *Ignore the letter as this indicates the weight group of the connecting rod.* If the equipment is available, these marks can be

29.29 Connecting rod bearing bore size group and weight marking (arrow)



29.37 Measure the crushed Plastigage to arrive at the connecting rod bearing oil clearance

checked by direct measurement.

30 Match the relevant connecting rod code with its crankshaft code and select a new set of bearing inserts using the following table.

700/750 models

Rod mark	Crank web mark	Insert color
1	A	Yellow
1	B	Green
1	C	Brown
2	A	Green
2	B	Brown
2	C	Black
3	A	Brown
3	B	Black
3	C	Blue

1100 models

Rod mark	Crank web mark	Insert color 1
A	Yellow 1	B
Green 2	A	Green 2
B	Brown	

Oil clearance check

Refer to illustration 29.37

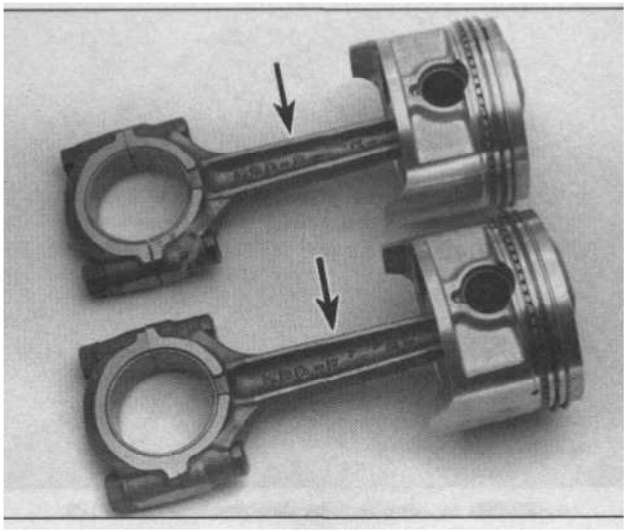
31 Whether new bearing inserts are being fitted or the original ones are being re-used, the connecting rod bearing oil clearance should be checked prior to reassembly.

32 Clean the backs of the bearing inserts and the bearing locations in both the connecting rod and bearing cap.

33 Press the bearing inserts into their locations, ensuring that the tab on each insert engages in the notch in the connecting rod/bearing cap. Make sure the bearings are fitted in the correct locations and take care not to touch any insert's bearing surface with your fingers.

34 There are two possible ways of checking the oil clearance, the first method is by direct measurement (see Steps 35 and 38) and the second by the use of a product known as Plastigage (see Steps 36 to 38).

35 If the first method is to be used, fit the bearing cap to the connecting rod, with the bearing inserts in place. Make sure the cap is fitted the correct way around so the connecting rod and bearing cap weight/size markings are correctly aligned. Tighten the cap retaining nuts to the specified torque and measure the internal diameter of each assembled pair of bearing inserts. If the diameter of each



29.40 Connecting rod identification markings (arrows)

corresponding crankpin journal is measured and then subtracted from the bearing internal diameter, the result will be the connecting rod bearing oil clearance.

36 If the second method is to be used, cut several lengths of the appropriate size Plastigage (they should be slightly shorter than the width of the crankpin). Place a strand of Plastigage on each (cleaned) crankpin journal and fit the (clean) piston/connecting rod assemblies, inserts and bearing caps. Make sure the cap is fitted the correct way around so the connecting rod and bearing cap weight/size markings are correctly aligned and tighten the bearing cap nuts to the specified torque while ensuring that the connecting rod does not rotate. Take care not to disturb the Plastigage. Loosen the bearing cap nuts and remove the connecting rod assemblies, again taking great care not to rotate the crankshaft.

37 Compare the width of the crushed Plastigage on each crankpin to the scale printed on the Plastigage envelope to obtain the connecting rod bearing oil clearance **(see illustration).**

38 If the clearance is not within the specified limits, the bearing inserts may be the wrong grade (or excessively worn if the original inserts are being re-used). Before deciding that different grade inserts are needed, make sure that no dirt or oil was trapped between the bearing inserts and the connecting rod or bearing cap when the clearance was measured. If the clearance is excessive, even with new inserts (of the correct size), the crankpin is worn and the crankshaft should be replaced.

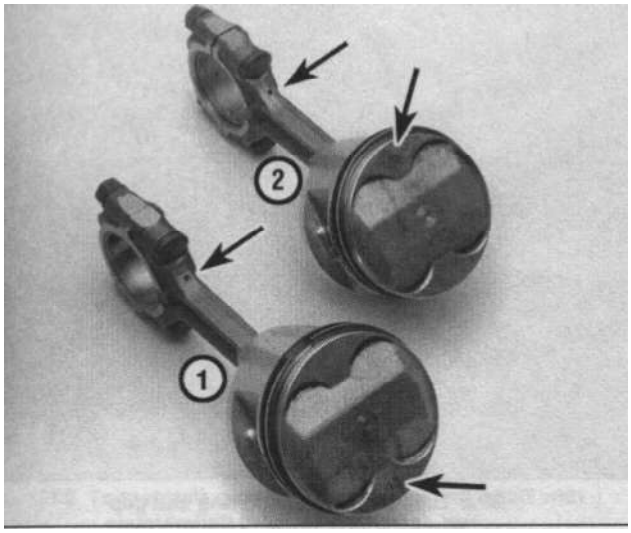
39 On completion carefully scrape away all traces of the Plastigage material from the crankpin and bearing inserts using a fingernail or other object which is unlikely to score the inserts.

Installation

Refer to illustration 29.40, 29.41, 29.44 and 29.47

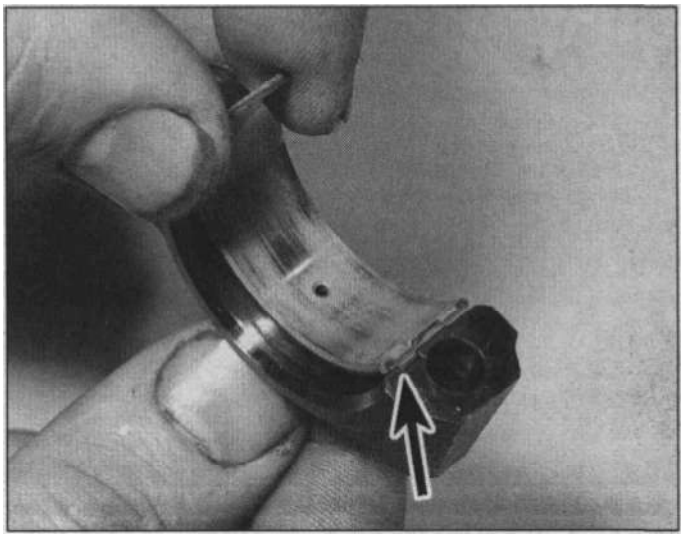
40 Check that each piston has one new snap-ring fitted to it and insert the piston pin from the opposite side. If it is a tight fit, the piston should be warmed first. If the original pistons/connecting rods are being installed, use the marks made on disassembly to ensure each piston is fitted to its correct connecting rod **(see illustration). Note:** *The front cylinder connecting rods are marked MBO-F or MBI-F on 700/750 models and MB -F on 1100 models; the rear cylinder rods are similarly mar ed, but carry the letter R.*

41 Lubricate the piston pin and connecting rod bores with clean engine oil and fit each piston to its respective connecting rod making sure that the IN mark on the crown of the piston is on the opposite side to the connecting rod oilway on front cylinder pistons, and on the same side as the oilway on rear cylinder pistons **(see illustration).** When the

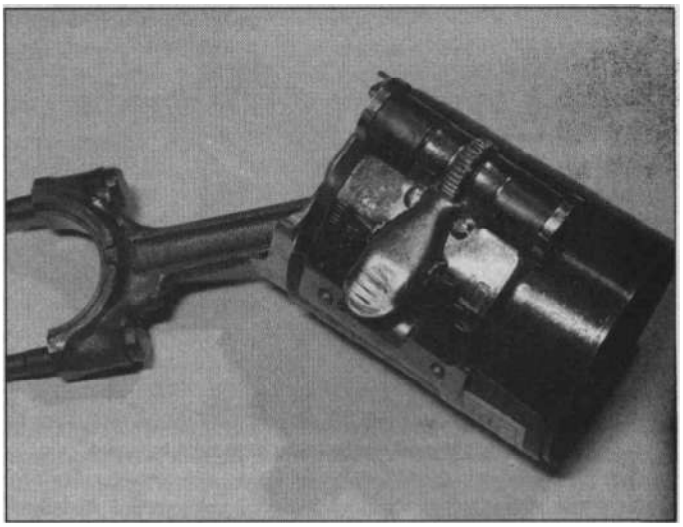


29.41 Piston crown IN marking to connecting rod oilway relationship

1 Front cylinder rods *2 Rear cylinder rods*



29.44 Align the bearing insert tab with the cutout (arrow) in the connecting rod and cap



29.47 Piston ring compressor installed

pistons are installed in their bores, the IN marks on their crowns should be on the carburetor side (toward the inside of the V formed by the cylinders).

42 Push the piston pin through both piston bosses and the connecting rod bore. If necessary the pin can be tapped carefully into position, using a hammer and suitable drift, while supporting the connecting rod and piston. Secure each piston pin in position with a second new snap-ring, making sure it is correctly seated in the piston groove.

43 Clean the backs of the bearing inserts and the bearing recesses in both the connecting rod and bearing cap. If new inserts are being fitted, ensure that all traces of the protective grease are cleaned off using kerosene (paraffin). Wipe dry the inserts and connecting rods with a lint-free cloth.

44 Press the bearing inserts into their locations, aligning the oilway in the insert with the corresponding oilway in the connecting rod. Make sure the tab on each insert engages in the notch in the connecting rod or bearing cap **(see illustration).** Make sure the bearings are fitted in the correct locations and take care not to touch any insert's bearing surface with your fingers.

45 Lubricate the cylinder bores, the pistons and piston rings then lay out each piston/connecting rod assembly in its respective position.

46 Starting with assembly number 1, position the top and second ring end gaps so they are 120°° apart then position the oil control ring side rails so that their end gaps are 120°° apart.

47 With the piston rings correctly positioned, clamp them in position with a piston ring compressor **(see illustration).**

48 Insert the piston/connecting rod assembly into the top of its bore, taking care not to allow the connecting rod to mark the bore. Make sure the IN mark on the piston crown is on the intake side of the bore and push the piston into the position until the piston crown is flush with the top of the bore.

49 Ensure that the connecting rod bearing insert is still correctly installed. Taking care not to mark the cylinder bores, apply molybdenum disulfide grease to the crankpin and both bearing inserts, then pull the piston/connecting rod assembly down its bore and onto the crankpin.

50 Fit the bearing cap and insert to the connecting rod. Make sure the cap is fitted the correct way around so the connecting rod and bearing cap weight/size markings are correctly aligned **(see illustration 29.29).**

51 Apply a smear of clean engine oil the threads and underside of the bearing cap nuts. Fit the nuts to the connecting rod and tighten them evenly, in two or three stages, to the specified torque setting.

52 Check that the crankshaft is free to rotate easily, then install the three remaining assemblies in the same way.

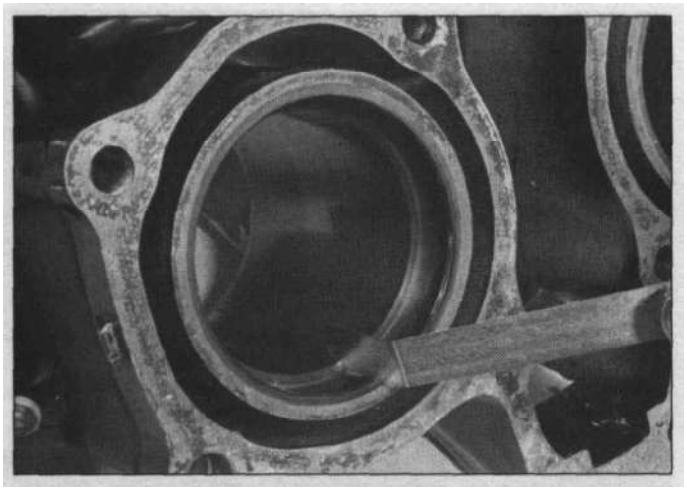
30 Piston rings - installation

Refer to illustrations 30.3, 30.5, 30.9a, 30.9b and 30.9c

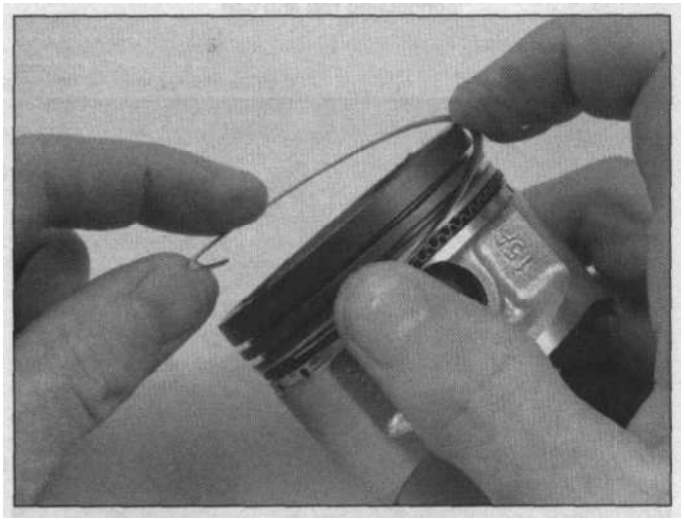
1 Before installing the new piston rings, the ring end gaps must be checked.

2 Lay out the pistons and the new ring sets so the rings will be matched with the same piston and cylinder during the end gap measurement procedure and engine assembly.

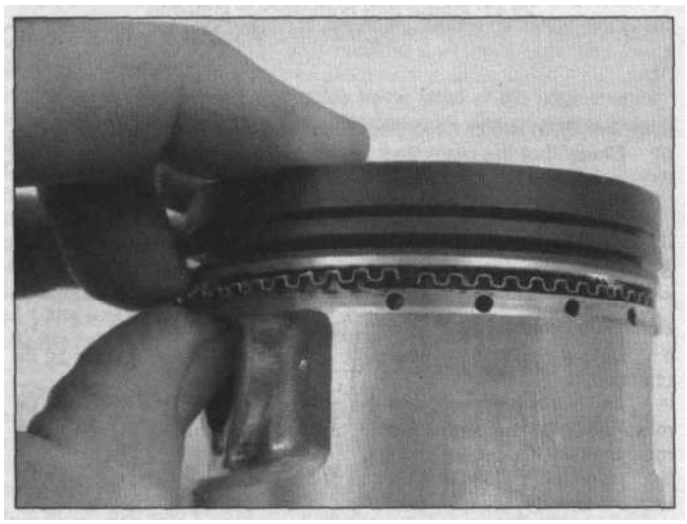
3 Insert the top ring into the top of the first cylinder and square it up with the cylinder walls by pushing it in with the top of the piston. The ring should be about 25 mm below the top edge of the cylinder. To measure the end gap, slip a feeler gauge between the ends of the ring



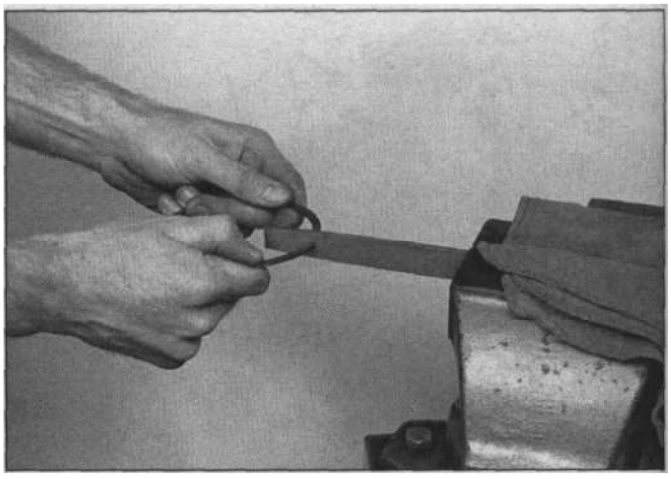
30.3 Position ring squarely in bore when measuring ring end gap



30.9a Install the oil control ring side rails by hand



30.9b Make sure the oil control expander ends don't overlap



30.5 Enlarging the piston ring end gap

and compare the measurement to the Specifications **(see illustration).**

4 If the gap is larger or smaller than specified, double check to make sure that you have the correct rings before proceeding.

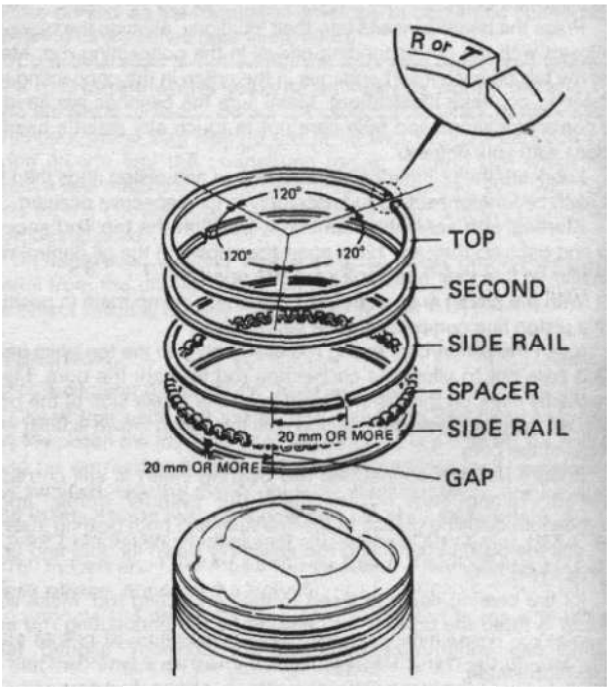
5 If the gap is too small, it must be enlarged or the ring ends may come in contact with each other during engine operation, which can cause serious damage. The end gap can be increased by filing the ring ends very carefully with a fine file. When performing this operation, file only from the outside in **(see illustration).**

6 Excess end gap is not critical unless it is greater than 1 mm. Again, double check to make sure you have the correct rings for your engine.

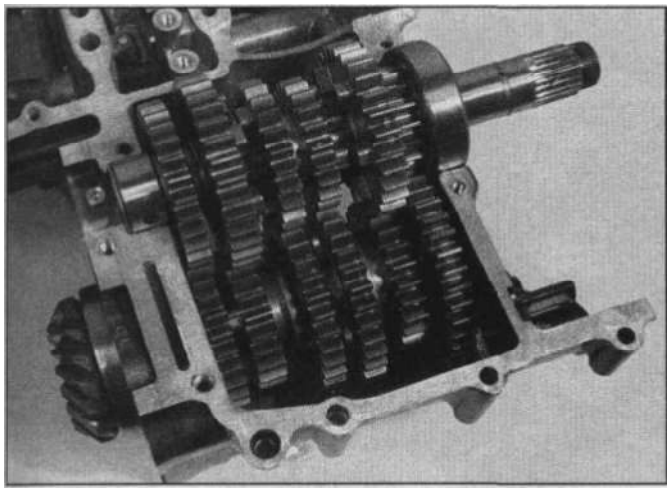
7 Repeat the procedure for each ring that will be installed in the first cylinder and for each ring in the remaining cylinders. Remember to keep the rings, pistons and cylinders matched up.

8 Once the ring end gaps have been checked/corrected, the rings can be installed on the pistons.

9 The oil control ring (lowest on the piston) is installed first. It is



30.9c Piston ring end gap positions



31.2 To measure gear backlash, mesh mainshaft with countershaft in lower crankcase half ...

composed of three separate components. Slip the expander into the groove, then install the upper side rail. Do not use a piston ring installation tool on the oil ring side rails as they may be damaged. Instead, place one end of the side rail into the groove between the expander and the ring land. Hold it firmly in place and slide a finger around the piston while pushing the rail into the groove. Next, install the lower side rail in the same manner (see illustrations).

10 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.

11 Install the second (middle) ring next. Note: *The second ring and top ring are different in profile - don't mi them up.* To avoid breaking the ring, use a piston ring installation tool and make sure that the identification mark (either a T or R) 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 Finally, install the top ring in the same manner. Make sure the identifying mark (either a T or R) is facing up.

13 Repeat the procedure for the remaining pistons and rings.

31 Transmission shafts - removal and installation

Note: *When disassembling the transmission shafts, place the parts on a long rod or thread a wire through them to keep them in order and facing the proper direction.*

1 Separate the crankcase halves as described in Section 24.

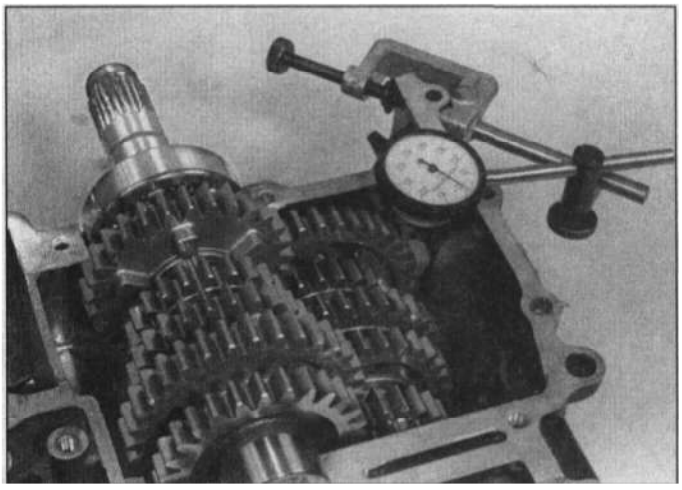
Backlash check (except 1985 through 1988 700/750 Magna models)

Refer to illustrations 31.2 and 31.3

2 Before removing any transmission components, use a dial gauge to check the gear backlash between all mating gears. To do this, remove the mainshaft assembly from the upper crankcase and lay it in position in the lower crankcase, so it is properly engaged with the countershaft assembly **(see illustration).**

3 Backlash measurement is done by setting the dial gauge up so it just contacts the tooth face on one of the countershaft gears **(see illustration).** Then, while holding the mainshaft to keep it from moving, rotate the countershaft gear back and forth with your finger while watching the movement of the needle on the gauge. Jot down the reading.

4 Repeat the procedure on the other countershaft gears that mate with gears on the mainshaft. Compare the readings with the Specifications. If any of the gears have excessive backlash, that gear and the mainshaft gear it mates with are worn and require replacement.



31.3 … and set dial gauge up as shown

Mainshaft

Refer to illustrations 31.10, 31.13a, 31.13b, 31.14 and 31.15

Removal and disassembly

5 Lift out the mainshaft.

6 Carefully remove the gears, washers, snap-rings and bushings from the mainshaft. Note: It *is very important that all components be kept in their installed order and relative position to each other. It is very easy to mix up transmission components, a mistake which will result in improper functioning of the transmission.*

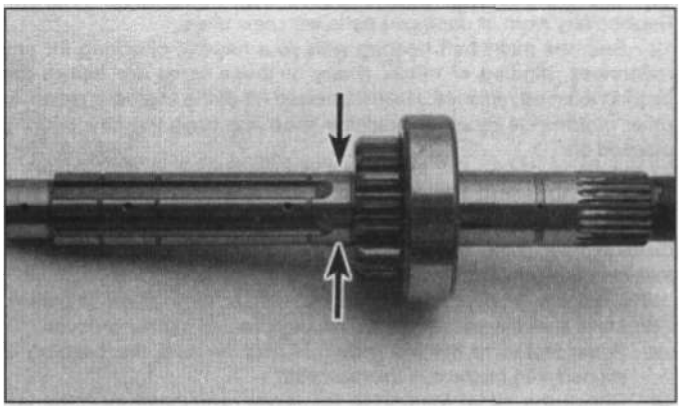
Inspection

7 Clean each part, one at a time, with solvent and dry them thoroughly. Make sure all the oil holes are not clogged.

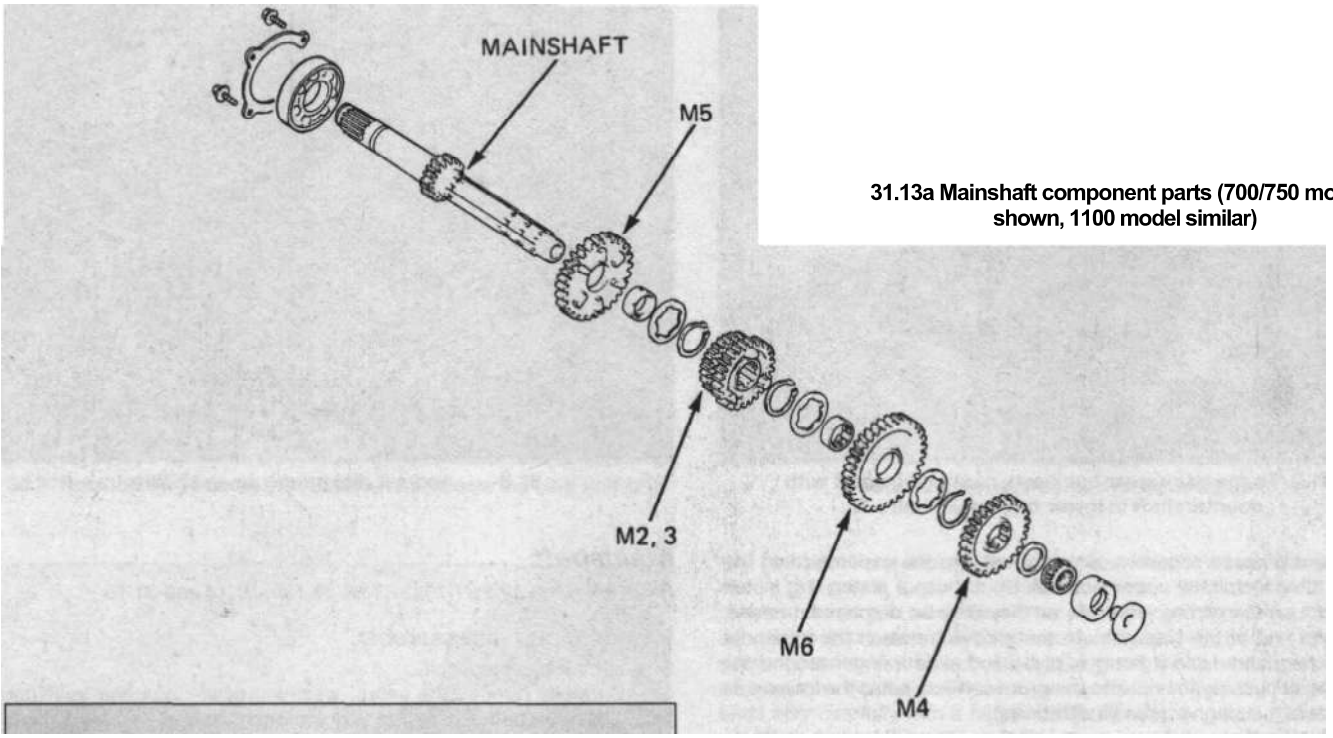
8 Check the gear teeth, the gear dogs and the shift fork grooves for cracks and excessive wear. If the gear dogs are rounded off, replace the gears with new ones. Measure the inside diameter of each gear and compare the results to the Specifications. If excessive wear has occurred, new gears are required.

9 Measure the outer diameter and inner diameter of the gear bushings, as appropriate, and compare the measurements to the Specifications. If they are excessively worn they must be replaced.

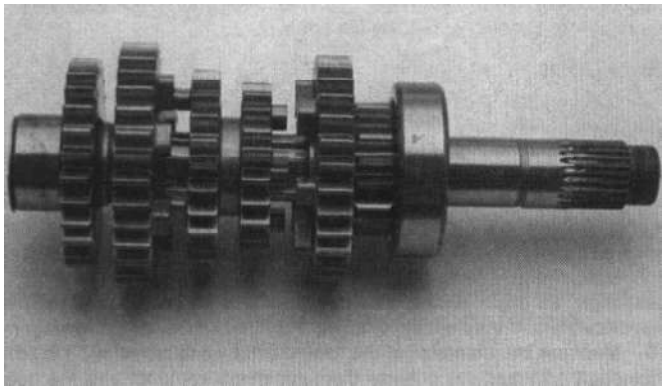
10 Measure the diameter of the mainshaft (see illustration). Use the mainshaft and bushing outside diameter measurements and the gear inside diameter measurements to determine the clearance between the gears and shaft or bushings. If they are excessive, a new mainshaft, bushings, and possibly new gears should be obtained. Also, check the shaft for score marks, cracks and evidence of seizure.



31.10 Measure mainshaft diameter at this point (arrows)



31.13a Mainshaft component parts (700/750 model shown, 1100 model similar)



31.13b Assembled mainshaft

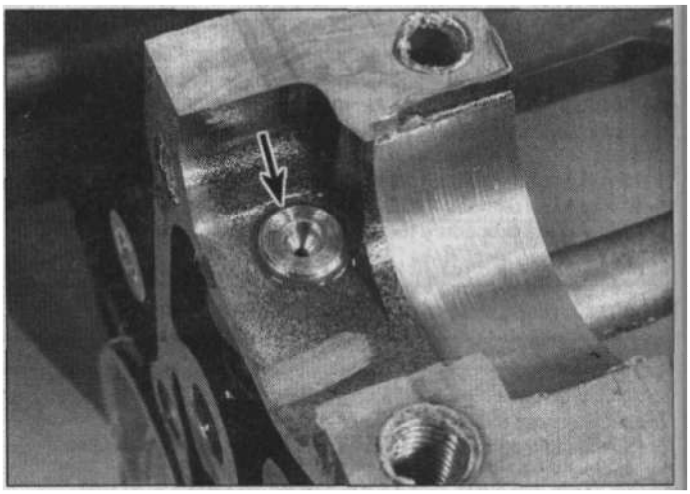
11 Check the thrust washers and snap-rings for wear and distortion. Replace any worn or damaged parts with new ones.
12 Spin the mainshaft bearing with your fingers, checking for any roughness, binding or noise. If any of these signs are found, the bearing must be replaced. Have it pressed off of the shaft at a dealer or other motorcycle repair or machine shop and have the new bearing pressed on.

Reassembly and installation

13 Reassemble the shaft components in the reverse order of disassembly, using the exploded view as a guide and noting the following **(see illustrations).**

a) Lubricate the contact surfaces with molybdenum disulfide grease.
b) Make sure the snap-rings are securely seated in their grooves.
c) When installing the M6 gear bushing, be sure the bushing is aligned with the hole in the mainshaft.

14 Check the oil jet located in the lower crankcase near the left mainshaft bearing surface **(see illustration).** Be sure it is not clogged.
15 If the shift drum and shift forks were removed, install them in the upper crankcase (see Section 32). Lay the mainshaft assembly in place. Be sure the center fork is correctly engaged with the proper gear **(see illustration).**
16 Reassemble the crankcases as described in Section 24.



31.14 Oil jet location (arrow) in lower crankcase

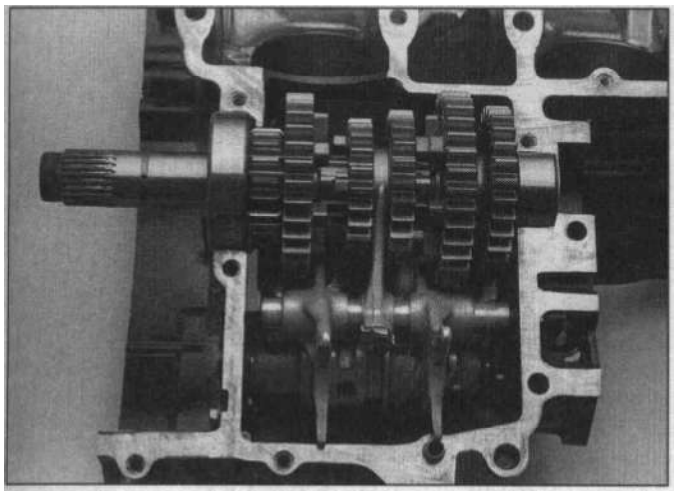
Countershaft

Refer to illustrations 31.18, 31.20, 31.21, 31.23 and 31.27

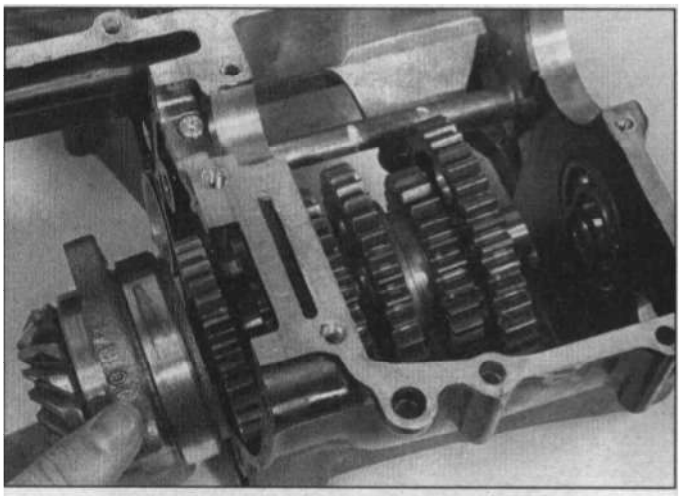
Removal and disassembly

Note: *The helical output gear assembly does not have to be removed from the countershaft in order to remove the countershaft from the crankcase, but it must be removed if the countershaft is to be replaced with a new one.*

17 Remove the mainshaft if not already done.
18 Before the countershaft can be removed from the crankcase,



31.15 Center shift fork engaged with mainshaft



31.18 Remove C1, C5, C2 and C3 then withdraw countershaft and bearing holder from crankcase

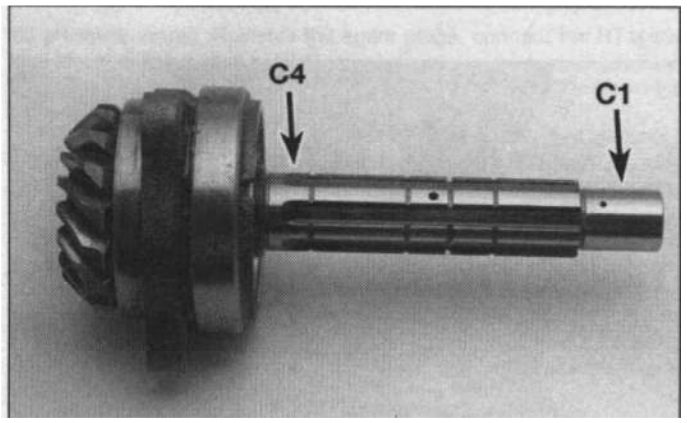
remove the C1, C5, C2 and C3 gears from the countershaft, along with their spline washers, snap-rings and bushings **(see illustration).**
19 After the countershaft has been removed from the crankcase, the remaining gears and related parts can be lifted off.

Inspection

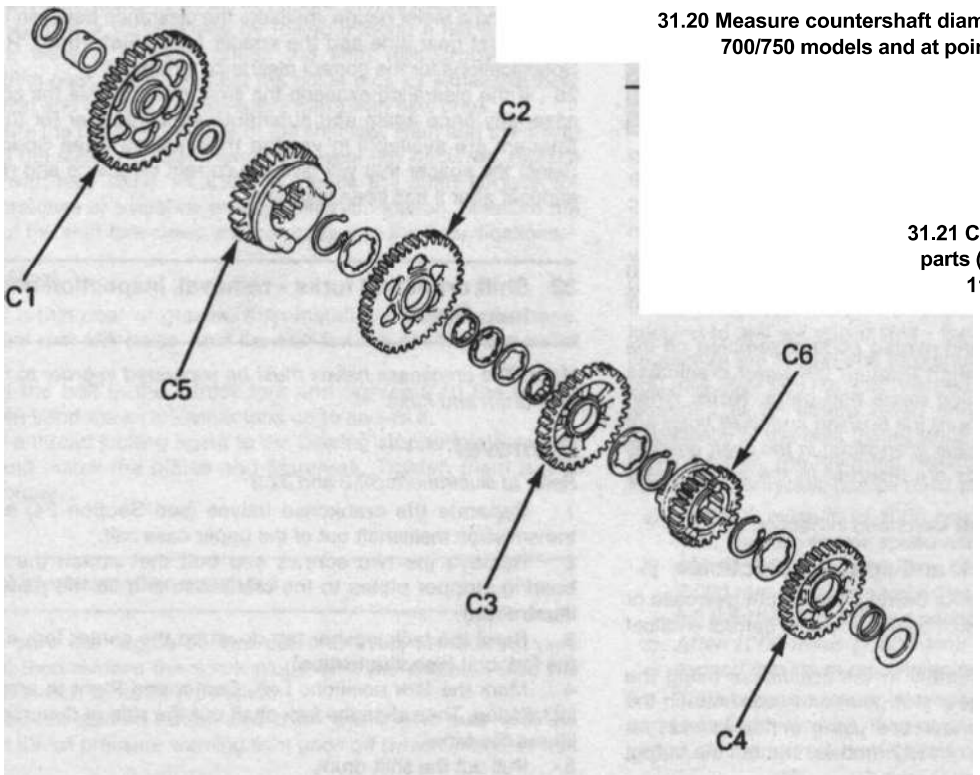
20 Refer to Steps 7 through 12 above, and examine the countershaft components. Measure the countershaft outside diameter at the C1 and C4 gear positions on 700/750 models and at the C4 gear position on 1100 models **(see illustration).**

Reassembly and installation

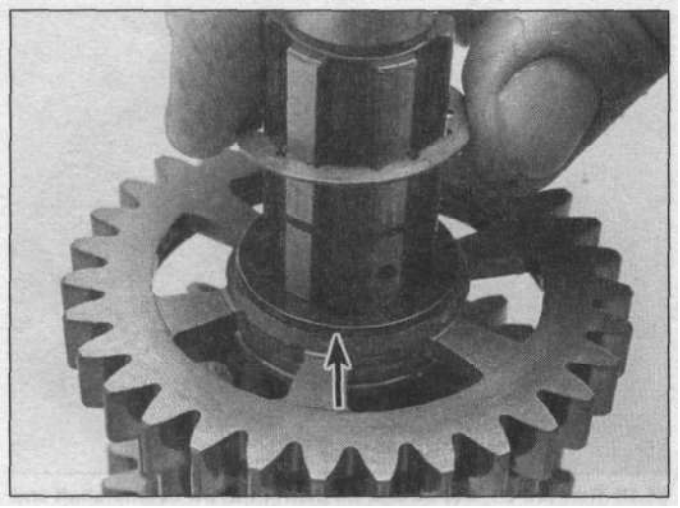
21 Reassemble the shaft components in the reverse order of disassembly, using the exploded view as a guide **(see illustration).**



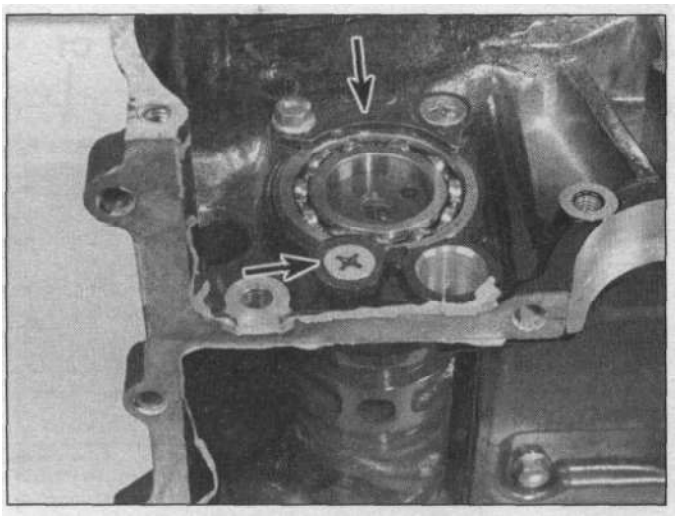
31.20 Measure countershaft diameter at point C4 and C1 on 700/750 models and at point C4 on 1100 models



31.21 Countershaft component parts (700/750 model shown, 1100 model similar)



31.23 The spline collar (arrow) is correctly installed when its tabs are engaged with the shaft grooves



32.2 Shift drum stopper plates

22 As the parts are assembled, lubricate the contact surfaces with molybdenum disulfide grease. Also, make sure the snap-rings are securely seated in their grooves.

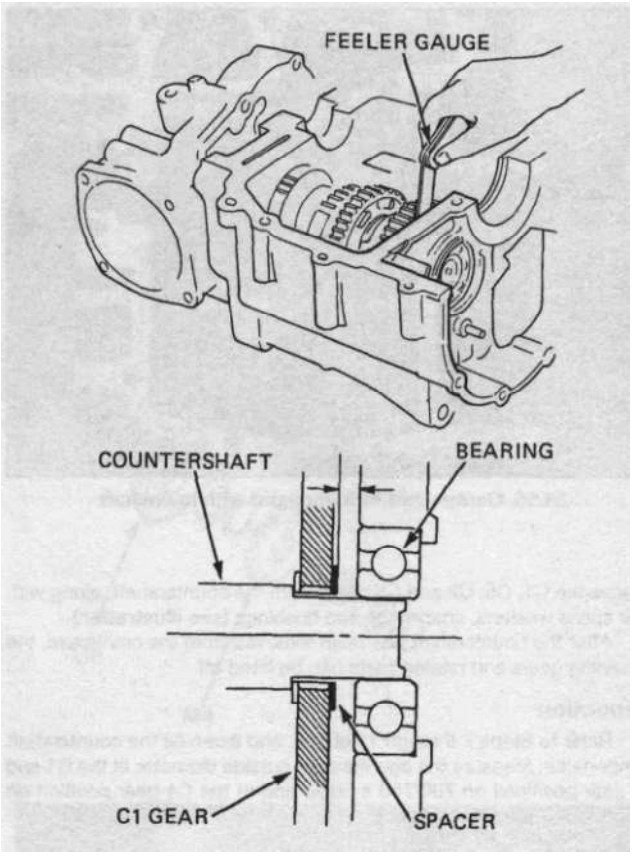
23 With the C4 and C6 gears and related parts assembled on the countershaft, insert the countershaft through the lower crankcase opening. Then install the remaining gears and parts. **Note:** *When installing the C3 gear bushing, be sure the bushing and shaft holes are aligned. Also, be sure the spline collar is engaged in the shaft grooves and that the stopper washer tabs are inserted in the spline collar indentations* **(see illustration).**

24 Reassemble the crankcases as described in Section 24.

Countershaft endfloat check and spacer selection

25 Whenever the countershaft or its bearing, the output gearcase or crankcase are replaced, a check must be made for the correct endfloat on the countershaft.

26 Install the countershaft assembly in the crankcase using the original spacer between the C1 gear (1 st gear) and case. Attach the output gearcase to the lower crankcase using a new gasket as selected in Section 23 in the case of 1982 models. Tighten the output gear assembly bolts to the specified torque.



31.27 Countershaft endfloat measurement

27 Using a feeler gauge, measure the clearance between the bearing on the first gear side and the spacer **(see illustration).** Refer to the Specifications for the correct clearance (endfloat).

28 If the clearance exceeds the limit, disassemble the countershaft assembly once again and substitute a new spacer for the old one. Spacers are available in varying thicknesses - see Specifications. Select the spacer that will give the correct clearance and recheck the endfloat after it has been installed.

32 Shift drum and forks - removal, inspection and installation

Note: *The crankcase halves must be separated in order to remove the shift drum and forks.*

Removal

Refer to illustrations 32.2 and 32.3

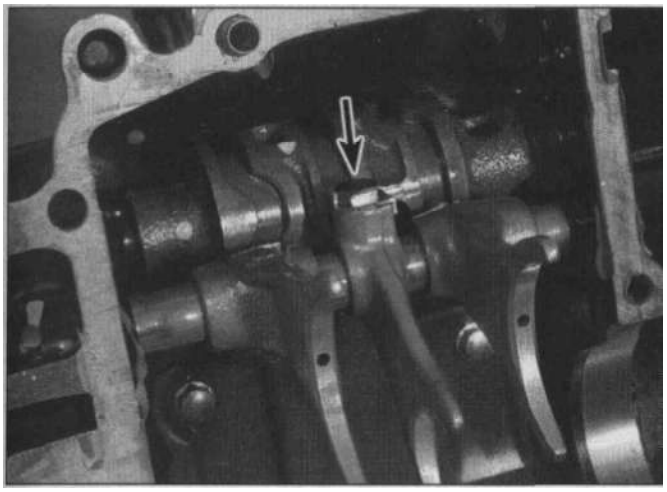
1 Separate the crankcase halves (see Section 24) and lift the transmission mainshaft out of the upper case half.

2 Remove the two screws and bolt that attach the shift drum bearing stopper plates to the crankcase and lift the plates off **(see illustration).**

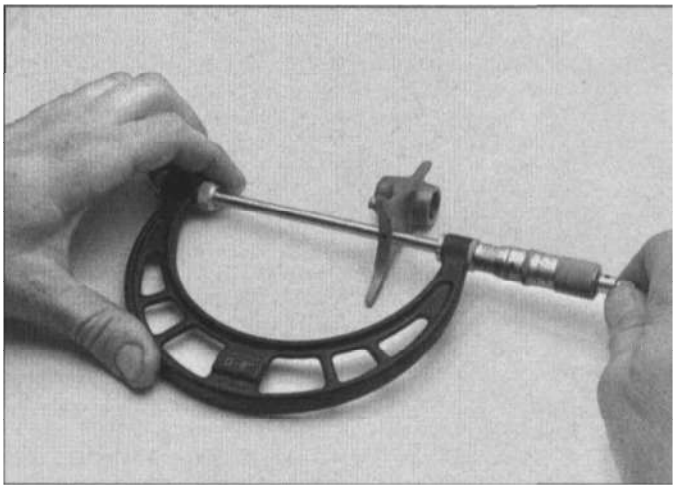
3 Bend the lock washer tab down on the center fork and remove the fork bolt **(see illustration).**

4 Mark the fork positions Left, Center and Right to ensure proper installation. Then slide the fork shaft out the side of the crankcase and lift out the forks.

5 Pull out the shift drum.



32.3 Center shift fork is retained by bolt and lockwasher; bend lockwasher up again onto bolt to secure it



32.8 Measuring shift fork thickness

Inspection

Refer to illustration 32.8

6 Check the edges of the grooves in the drum for signs of excessive wear. Also, check the shift drum hole and shift fork shaft hole in the crankcase for any scoring or scratches. If wear or damage is excessive, the drum, shaft and possibly the crankcase half will have to be replaced.

7 Check the ball bearing for smooth operation. If noise or binding is evident or there is any sign of freeplay between its inner and outer race, the bearing must be replaced with a new one.

8 Measure the shift fork thickness and compare it to the Specifications **(see illustration).** If it is excessively worn, it should be replaced .

9 Check the shift forks for distortion and wear, especially at the fork ends. If they are discolored or severely worn they are probably bent and will cause difficulty in selecting gears and make the gearshift action heavy; check for trueness by rolling it along a flat surface. If damage or wear is evident, check the shift fork groove in the corresponding gear as well. Inspect the guide pins for excessive wear and distortion and replace any defective parts with new ones.

10 Measure the outside diameter of the shift fork shaft and the inside diameter of the shift fork hole. If excessive wear has occurred, replace the parts with new ones. In addition, check the shaft surface for scoring, scratches or evidence of insufficient lubrication. Measure the thickness of the shift fork claws and compare it to the Specifications.

Installation

11 Apply a thin coat of grease, then install the drum in the case. Lubricate the shift fork holes, hold the shift forks in position and install the shaft.

12 Install the bolt in the center fork and tighten it to the proper torque. Then bend the lock washer tabs up to secure it.

13 Apply a thread locking agent to the bearing stopper plate screws and bolt and install the plates and fasteners. Tighten them to the specified torque.

33 Initial start-up after overhaul

1 Make sure the engine oil and coolant levels are correct (see Chapter 1), then remove the spark plugs from the engine. Place the engine stop switch in the OFF position.

2 Turn on the ignition switch and crank the engine over with the starter until the oil pressure warning light goes off (which indicates that oil pressure exists). Reinstall the spark plugs, connect the HT leads and turn the stop switch to RUN.

3 Make sure there is fuel in the tank, then turn the fuel valve to the ON position and operate the choke.

4 Start the engine and allow it to run at a moderately fast idle until it reaches operating temperature. **Warning:** *If the oil pressure warning light doesn't go off, or it comes on while the engine is running, stop the engine immediately.*

5 Check carefully for oil and coolant leaks and make sure the transmission and controls, especially the brakes, function properly before road testing the machine. Refer to Section 34 for the recommended break-in procedure.

6 Upon completion of the road test, and after the engine has cooled down completely, recheck the valve clearances and check the engine oil and coolant levels (see Chapter 1).

34 Recommended break-in procedure

1 Any rebuilt engine needs time to break-in, even if parts have been installed in their original locations. For this reason, treat the machine gently for the first few miles to make sure oil has circulated throughout the engine and any new parts installed have started to seat.

2 Even greater care is necessary if the engine has been rebored or a new crankshaft has been installed. In the case of a rebore, the engine will have to be broken in as if the machine were new. This means greater use of the transmission and a restraining hand on the throttle until at least 500 miles (800 km) have been covered. There's no point in keeping to any set speed limit - the main idea is to keep from lugging (labouring) the engine and to gradually increase performance until the 500 mile (800 km) mark is reached. These recommendations can be lessened to an extent when only a new crankshaft is installed. Experience is the best guide, since it's easy to tell when an engine is running freely. The following recommendations, which Honda provide for new motorcycles, can be used as a guide.

a) 0 to 600 miles (0 to 1000 km): Keep engine speed below 5,000 rpm. Vary the engine speed and don't use full throttle.

b) 600 to 1000 miles (1,000 to 1,600 m): Keep engine speed below 7,000 rpm. Rev the engine freely through the gears, but don't use full throttle for prolonged periods.

c) After 1000 miles (1,600 km): Full throttle can be used. Don't exceed maximum recommended engine speed (redline). 3 If a lubrication failure is suspected, stop the engine immediately and try to find the cause. If an engine is run without oil, even for a short period of time, severe damage will occur.