

5 An engine overhaul generally involves restoring the internal parts to the specifications of a new engine. During an overhaul the valves are serviced, the piston rings and/or the piston are replaced with new ones and the cylinder may require boring and/or honing. The main and connecting rod bearings are generally replaced with new ones and, if necessary, the crankshaft is also replaced. While the engine is being overhauled, other components such as the carburetor can be rebuilt also. The end result should be a like-new engine that will give as many troublefree miles as the original.

6 Before beginning the engine overhaul, read through all of the related procedures to familiarize yourself with the scope and requirements of the job. Overhauling an engine is not all that difficult, but it is time consuming. Plan on the vehicle being tied up for a minimum of two (2) weeks. Check on the availability of parts and make sure that any necessary special tools, equipment and supplies are obtained in advance.

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

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

3 Repair operations requiring engine removal

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

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

Crankshaft/connecting rod
Balancer system (where fitted)
Transmission shafts/gears
Shift drum/shift forks
Crankshaft and transmission bearings

3 Components and systems other than those mentioned above are accessible for inspection, repair or replacement with the engine in the frame, except for those given below.

4 On KLT200 models the cylinder head, cylinder barrel, piston and rings and cam chain guide and tensioner blades cannot be removed with the engine in the frame.

5 On KLT250 models it may just be possible to remove the cylinder head with the engine in the frame, but this is a very awkward and time-consuming task. It is recommended that if the cylinder head, cylinder barrel, piston and rings and cam chain guide and tensioner blades require removal, the engine be taken out of the frame beforehand.

4 Engine – removal and installation

1 Go back to the beginning of this book and read the Sections on *Maintenance techniques, tools and working facilities* and *Safety first*. Note especially that your working area throughout the entire teardown, overhaul and reassembly process must be *spotlessly clean*. This includes the vehicle and engine itself which should be cleaned as thoroughly as possible before you begin any operation in this Chapter.

2 Engine removal should be done with the aid of an assistant to avoid damage that could occur if the engine falls or is dropped.

3 Disconnect the battery negative (-) terminal to prevent the risk of short circuits (KLT200, 250).

4 Referring to Chapter 1, drain the engine/transmission oil. While the oil is draining you can be performing other removal procedures.

5 Remove the seat and rear fender assembly. Store the unit out of the way until the end of the procedures you are performing.

6 Refer to Chapter 3 and remove the fuel tank (KLT110, 160). Refer to Chapter 5 and remove the front cover and/or storage compartment (KLT200, 250).

7 Refer to Chapter 3 and remove the air cleaner assembly (KLT110).

8 Remove the carburetor according to the procedure in Chapter 3.

9 Pull the crankcase vent tube clear of the frame (KLT110, 160). Disconnect the vent tube at the crankcase (KLT200, 250). Disconnect the fuel pump pulse tube at the carburetor holder (KLT200 A1, A2, A3, 250 A1).

10 Remove the exhaust system according to the procedure in Chapter 3. It may not be necessary to remove the muffler completely, but merely to slacken its mounting bolts.

11 Mark the shift shaft and pedal so that the pedal can be refitted in its original position, then remove fully its pinch bolt and pull the pedal off the shaft.

12 Disconnect the starter motor cable, either at the motor or at the relay (magnetic switch), whichever is most convenient (KLT200, 250). Disconnect all generator and ignition system wiring and remove the cap from the spark plug. Release the wires from any clamps or ties securing them to the frame.

13 Slacken fully their locknuts and screw in the cable adjuster to gain the maximum cable free play, then disconnect the clutch cable from the release lever (KLT200, 250). Pull the cable clear of the crankcase lug/adjuster bracket.

14 Referring where necessary to Chapter 6, disconnect the final drive components from the engine as follows:

KLT160 models – Slacken both propeller shaft dust cover clamp screws. The shaft will be released as the engine is removed.

KLT110, 200 B, C and 250 models – Remove its retaining screws and withdraw the front chaincase. Remove its retaining circlip and pull the sprocket off the output shaft (KLT110). Flatten back the raised tab of its lockwasher, apply the rear brake hard to prevent rotation, unscrew the sprocket retaining nut and pull the sprocket off the shaft (KLT200, 250). Disengage the sprocket from the chain, noting that it may be necessary to slacken off the chain adjustment to permit this, then tie the chain to a convenient part of the frame to prevent it from dropping into the chaincase. Remove its retaining screws or bolts and withdraw the inner chain cover (KLT200, 250) or upper chain case (KLT110). Check that the engine rear mounting bolts are accessible.

KLT200 A models – Remove the chaincase front cover (KLT200 A2, A3, A4, A4A). Remove the left rear wheel, the chain adjuster brake rod lever and pedal, the chain cover plates and final drive case cover, the outer chaincase, the gearbox sprocket and chain tensioner assembly and the inner chain case.

15 Remove the footrest mounting bracket (KLT200).

16 Support the engine with wood blocks or a jack. Remove the engine mounting bolts and withdraw the engine as follows:

KLT110 and 250 models – Disassemble the engine top and front mountings, then remove the two rear mounting bolts and lift the engine out to the right.

KLT160 models – Disassemble the engine top and front mountings, then remove the two rear mounting bolts and slide the engine forward to release the propeller shaft from the final drive gear case. Note the coil spring. Remove the shaft dust cover and the shaft assembly and lift the engine out to the right.

KLT200 models – Remove the front mounting bracket, followed by the top mounting bolt. With the engine fully supported, remove the two rear mounting bolts and lower the engine to the ground.

17 Engine installation is the reverse of the removal procedure, paying attention to the following points:

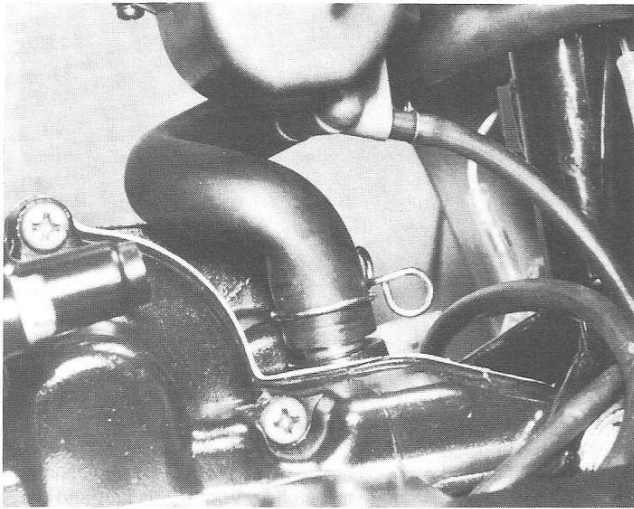
18 Check carefully for broken parts, stripped bolts and other damage that may have occurred during the removal procedure. Make a list of any parts that require replacement and have them available before beginning the installation procedure. Organize the various parts and components so that you will be able to tell exactly where they go during engine installation.

19 When installing the engine in the frame, use a jack to align the mounting bolt holes so that the bolt threads are not damaged. Check that all mounting brackets are correctly refitted so that the engine is seated securely and without stress. Tighten all bolts to the torque settings specified.

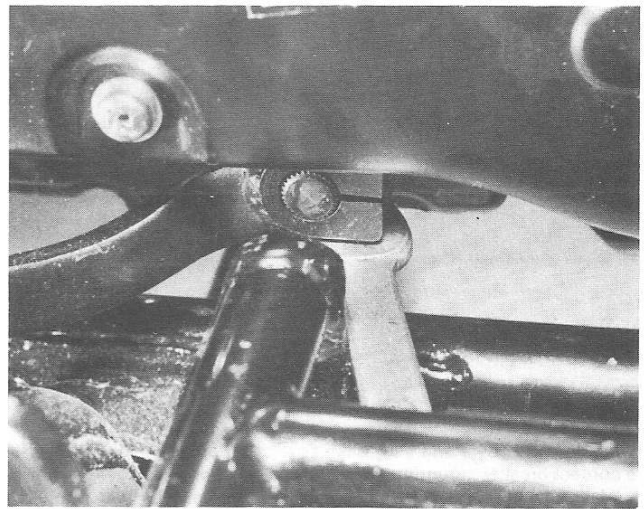
20 When installing components, be sure to refer to the appropriate Section or Chapter for the proper installation procedure.

21 Following installation, fill the crankcase with the proper amount and grade of oil. Refer to Chapter 1 if necessary.

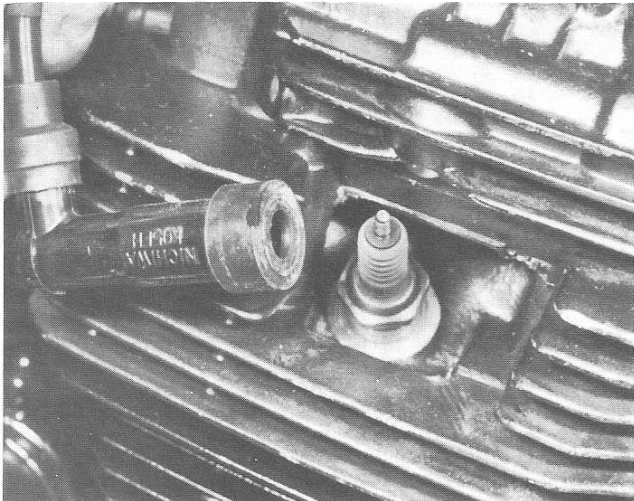
22 As these components are refitted, adjust the throttle and clutch cables, the drive chain (grease the propeller shaft joints, KLT160) and the rear brake. Check that all vent tubes, control cables and wiring are correctly routed.



4.9 Disconnect the crankcase vent tube



4.11 Mark shift shaft before removing pedal so that it can be installed in same position



4.12 Disconnect spark plug cap

5 Engine disassembly and reassembly – general information

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

2 To strip the engine, it is best to start from the top down. The crankcase can provide a firm base on which the engine can be supported in an upright position.

3 Probe the oil passages in the crankshaft with a stiff brush and if an air line is available, blow through the oil passages to clean them.

4 **Caution:** *Never use cleaning solvents near an open flame or inside an enclosed work area. Fumes can ignite from a lighted cigarette or a hot water heater pilot light. Wipe up any fuel or solvent spills immediately and do not store greasy or solvent-soaked rags where they can ignite.*

5 Reuse of old engine gaskets is not recommended. *Always* use new gaskets and seals when reassembling the engine.

6 Do not throw the old gaskets away, as it sometimes happens that replacements cannot be found and the old gasket is then very useful as

a template. Hang up the old gaskets on a suitable hook or nail as they are removed.

7 Wherever possible, replace nuts, bolts and washers fingertight from wherever they were removed. This helps avoid later loss and confusion. If they cannot be replaced, then lay them out in an orderly manner according to their locations.

8 Certain special tools and measuring instruments will be required throughout the overhaul. Most of these are shown in the preliminary section of this manual dealing with tools. It is always best to read through the appropriate Section before beginning disassembly, noting what tools, parts or other supplies might be needed.

9 If the engine has never been apart before, a hand impact screwdriver will be absolutely essential. The Phillips head screws used in various places are nearly impossible to remove (without damaging them) if a normal screwdriver is used. Although it may not be considered a tool, some Plastigage of various types should also be obtained to use for checking bearing oil clearances.

10 A normal sequence to follow for disassembling the engine and transmission for an overhaul is as follows (refer to the appropriate Section for each):

Cylinder head (including camshaft, rockers and valves)

Cylinder barrel (including piston and rings)

Recoil starter (KLT110, 160)

Crankcase left cover

Generator

Starter motor and drive

Cam chain and guide and tensioner blades

Clutch release

Crankcase right cover

Clutch and primary drive

Oil pump and filter(s)

External shift mechanism

Kickstart (KLT200 A1, A2, A3)

Balancer drive (KLT200 B1, C, 250 A2, C, P)

Separate the crankcase halves

Crankshaft

Balancer shaft (where fitted)

Shift drum and forks

Transmission shafts

11 KLT160 models – If the crankcases are to be separated, the output shaft bevel drive gear must be removed as follows:

12 Remove its two retaining screws and withdraw the cam from the left side of the front gear case. Remove the four bolts and pull the driven gear and cam damper assembly out to the rear.

13 Remove the crankcase right cover. See Section 19.

14 Select top gear. If Kawasaki service tool 57001-1192 is not available to hold the secondary clutch and lock the transmission,

wedge a tightly folded piece of rag between the primary and secondary gears. Use a small chisel to pry open the staked part of the nut, unscrew the nut, and remove it, followed by the bevel gear. Note carefully the number and exact position of any shims behind the gear; these must be refitted in exactly the original positions to preserve the bevel gear tooth contact and backlash.

15 On refitting, renew the retaining nut and lightly oil it. Tighten it to the specified torque setting and stake it in place.

6 Camshaft – removal, inspection and installation

Note: *If the engine is removed from the frame, proceed to paragraph 2.*

1 KLT200 B, C and 250 models – Remove the seat and front cover. See Chapter 5.

2 KLT110 and 160 models – Remove the recoil starter. See Section 15. KLT160 – Unscrew the timing inspection plug. KLT200, 250 – Remove the inspection cover from the crankcase left cover.

3 KLT200 A1 models – Remove its two screws and withdraw the contact breaker cover and its gasket. Scratch or punch a line between the contact breaker mounting plate and the cylinder head cover so that the plate can be refitted in the same place. Remove its two screws, disconnect the low-tension lead and withdraw the contact breaker assembly. Prevent rotation by applying a spanner to the generator rotor bolt and remove the advancer mounting bolt and the advancer.

4 Remove its two screws and withdraw the left cylinder head (camshaft) cover with its O-ring. If the cover is tight insert a screwdriver blade into the pry point behind each screw hole boss and carefully lever off the cover.

5 With a spanner applied to the generator rotor/starter pulley retaining bolt, rotate the engine counterclockwise until the 'T' mark on the rotor aligns with the crankcase cover index mark at the same time as the camshaft sprocket mark aligns with the index mark formed by a pointer or projection on the cylinder head.

6 Remove the camchain tensioner lock bolt and replace it with a longer bolt (6 mm thread diameter, 1.0 mm thread pitch, at least 16 mm long) to lock the tensioner. Remove its mounting bolts and withdraw the tensioner.

7 Prevent rotation by applying a spanner to the generator rotor/starter pulley retaining bolt and remove the sprocket retaining bolt(s). Pull the sprocket off the camshaft, disengage it from the chain and remove it. Secure the cam chain, by passing a screwdriver or similar through it, so that it cannot drop into the crankcase.

8 KLT110 and 160 models – Remove the rocker arms and shafts. See Section 8. Rotate the camshaft so that the inlet (left) lobe points downwards – KLT160.

9 KLT110, 160, 200 A and 250 A1 models – Refitting the sprocket bolt(s) to aid removal if required, pull the camshaft out of the cylinder head.

10 KLT200 B, C, 250 A2, C and P models – Remove the two screws and withdraw the retainer plate, then pull the camshaft out of the cylinder head. Refit the sprocket bolt to aid removal if required.

11 The camshaft should be examined visually for wear, which will probably be most evident on the ramps of each cam and where the cam contour changes sharply. Also check the bearing surfaces for obvious wear and scoring. Cam lift can be checked by measuring the height of each lobe from the bottom of the base circle to the top of the lobe. If any measurement is less than the service limit, the camshaft must be renewed.

12 Where the camshaft runs in ball bearings, wash it in solvent, lightly oil the bearings and spin them. If any free play is felt, if the bearing feels or sounds rough or jerky and if it does not spin freely then it must be renewed. In some cases this will also mean the renewal of the camshaft.

13 On early KLT200 and 250 models the camshaft bears directly on the cylinder head material, there being no separate bearings. Check the bearing surfaces for wear and scoring. The clearance between the camshaft bearing journals and the aluminium bearing surfaces may be checked by measuring the journals and bearing surfaces, using an internal and external micrometer and calculating the amount of clearance. If the clearance is greater than the service limit the camshaft must be renewed if its bearing journals are excessively worn. If bad scuffing is evident on the camshaft bearing surfaces of the cylinder head, due to a lubrication failure, the only remedy is to renew the cylinder head, and the camshaft if it has been damaged also.

14 Before refitting, blow out the camshaft oilway with compressed air and oil the camshaft liberally. Check that the tensioner assembly is ready for refitting. See Section 7.

15 Refit the camshaft and set the valve timing as follows:

16 KLT110 models – Insert the camshafts with the lobes pointing downwards (to 4 and 8 o'clock positions respectively), then refit the rocker arms and shafts. Check that the generator rotor 'T' mark is aligned exactly with the crankcase pointer; hold the cam chain taut if it is necessary to rotate the crankshaft. Fit the sprocket to the cam chain so that the chain front run is taut and the stamped line on the sprocket outer face aligns exactly with the pointer on the cylinder head when the sprocket is pressed over the camshaft shoulder. Rotate the camshaft until the bolt holes align. Apply thread locking compound to their threads, refit the two bolts and tighten them to the specified torque setting. Proceed to paragraph 20.

17 KLT160 models – Check that the ACR unit and sprocket locating dowels are in place at each end of the camshaft. Insert the camshaft with the inlet (left) lobe pointing downwards and check that the camshaft fits into the ACR unit so that its dowel pin engages with the notch on the ACR. Refit the rocker arms and shafts. Check that the generator rotor 'T' mark is aligned exactly with the crankcase pointer; hold the cam chain taut if it is necessary to rotate the crankshaft. Fit the sprocket to the cam chain so that the chain front run is taut and the stamped mark on the sprocket outer face aligns exactly with the projection on the cylinder head when the sprocket is pressed over the camshaft shoulder. Rotate the camshaft so that the dowel pin engages correctly with the sprocket drilling. Refit the retaining bolt and its washer, tightening the bolt to the specified torque setting. Proceed to paragraph 20.

18 KLT200A and 250 A1 models – Check that the advancer locating dowel is in place (KLT200 A1). Insert the camshaft with the lobes pointing downwards (to 4 and 8 o'clock positions respectively) and the dowel in the 3 o'clock position. Check that the generator rotor 'T' mark is aligned exactly with the crankcase pointer; hold the cam chain taut if it is necessary to rotate the crankshaft. Fit the sprocket to the cam chain so that the chain front run is taut and the stamped line marked 'KZ200' on the sprocket outer face aligns exactly with the pointer on the cylinder head when the sprocket is pressed over the camshaft shoulder. Rotate the camshaft until its bolt holes align with those of the sprocket marked 'KZ200'. Apply thread locking compound to their threads, refit the two bolts and tighten to the specified torque setting. Proceed to paragraph 20.

19 KLT200 B, C, 250 A2, C and P models – Insert the camshaft with the lobes pointing downwards (to 4 and 8 o'clock positions respectively). Tap it into place and refit the bearing retainer. Apply thread locking compound to their threads and tighten securely the two screws. Check that the generator rotor 'T' mark is aligned exactly with the crankcase pointer; hold the cam chain taut if it is necessary to rotate the crankshaft. Fit the sprocket to the cam chain so that the chain front run is taut and the stamped line marked 'KL250, KZ250 W' on the sprocket outer face aligns exactly with the pointer on the cylinder head. Rotate the camshaft to align the projection on the sprocket rear face with the hole in the camshaft, press the sprocket into place and refit the mounting bolt and washer. Tighten the bolt to its specified torque setting.

20 Pass a slim rod through the cam chain tensioner aperture and apply moderate pressure to the tensioner blade. Rotate the engine counterclockwise through one or two full revolutions. If resistance is felt at any point, stop immediately or you may bend the valves.

21 Align the camshaft sprocket timing mark again and check that the rotor 'T' mark aligns exactly with the crankcase index mark. If not, remove the sprocket and re-set the timing as described above.

22 If all is well, refit the cam chain tensioner. See Section 7.

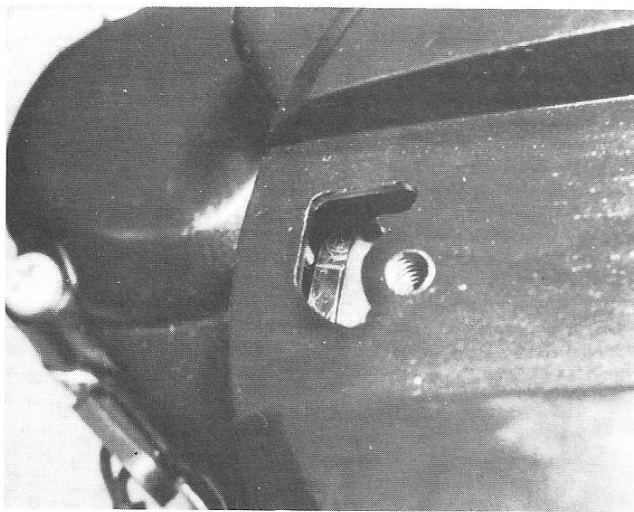
23 Smear a little oil over its sealing O-ring and refit the left head (camshaft) cover, tightening the two screws securely.

24 Check the valve clearances. See Chapter 1.

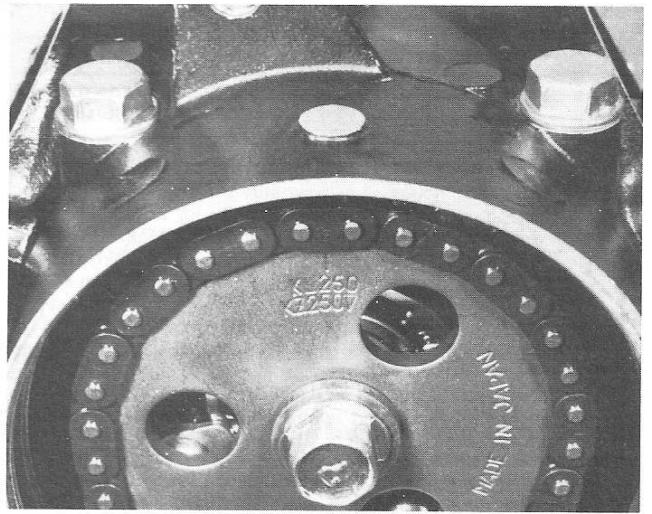
25 KLT200 A1 models – Fit the advancer assembly to the camshaft, aligning the notch on its rear face with the camshaft locating dowel. Refit the contact breaker mounting plate, aligning the marks made on dismantling to return the plate to its original position. Check the contact breaker gap and ignition timing. See Chapter 1.

26 KLT200 and 250 models – Refit the inspection cover to the crankcase left cover, checking that the sealing O-rings and/or gasket are correctly positioned.

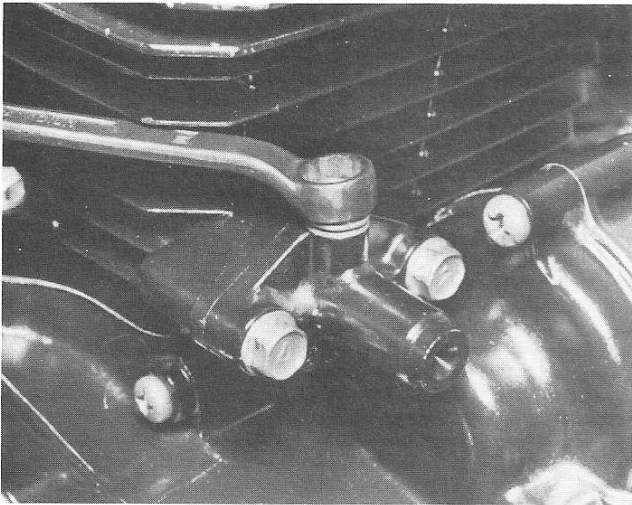
27 KLT110 and 160 models – Refit the recoil starter. KLT160 models – Refit the timing inspection plug.



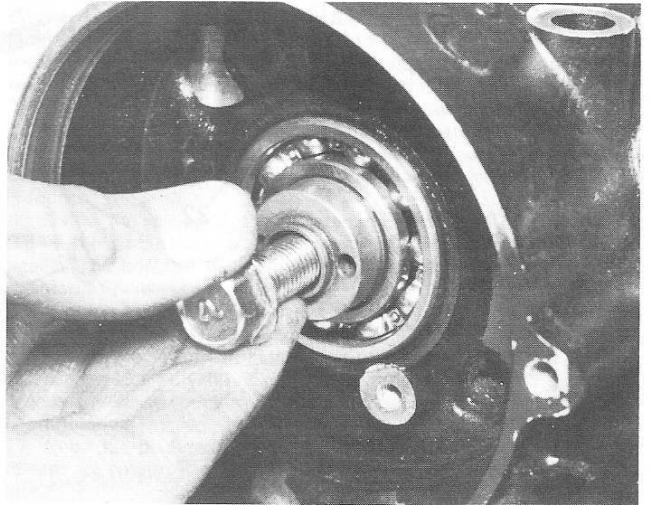
6.5a Before removing camshaft set engine to TDC on compression stroke ...



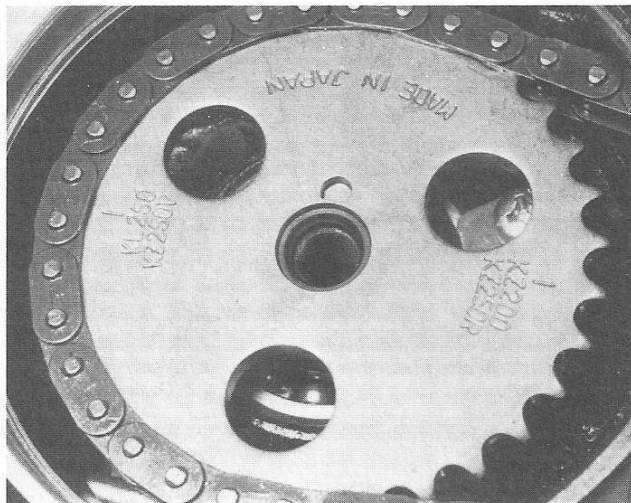
6.5b ... by aligning valve timing marks



6.6 Lock cam chain tensioner plunger before removing tensioner assembly



6.10 Use sprocket bolt to withdraw camshaft as shown



6.19 Align valve timing marks as described in text

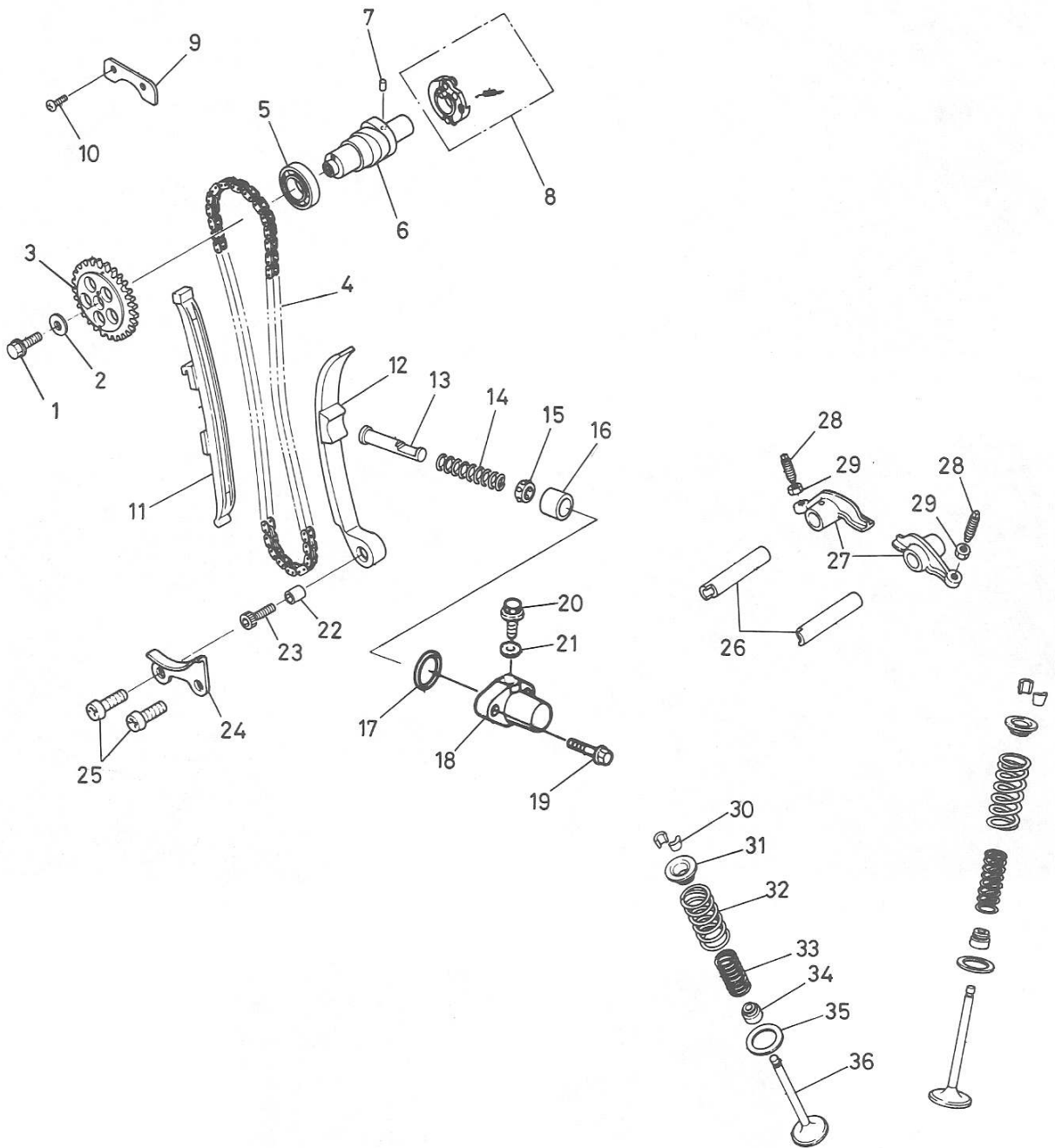


Fig. 2.1 Valve gear and cam chain – typical (Sec 6)

- | | | | |
|-----------------------------|------------------------------|----------------------------|-----------------------|
| 1 Bolt | 10 Screw – 2 off | 19 Bolt | 28 Adjuster screw |
| 2 Washer | 11 Cam chain guide blade | 20 Lock bolt | 29 Locknut |
| 3 Sprocket | 12 Cam chain tensioner blade | 21 Washer | 30 Split keepers |
| 4 Cam chain | 13 Pushrod | 22 Collar | 31 Spring retainer |
| 5 Bearing | 14 Spring | 23 Allen bolt | 32 Outer valve spring |
| 6 Camshaft | 15 Ball and retainer | 24 Bearing retaining plate | 33 Inner valve spring |
| 7 Dowel pin | 16 Collar | 25 Screw | 34 Oil seal |
| 8 ACR unit – 160 model only | 17 O-ring | 26 Rocker shafts | 35 Spring seat |
| 9 Bearing retaining plate | 18 Tensioner body | 27 Rockers | 36 Valve |

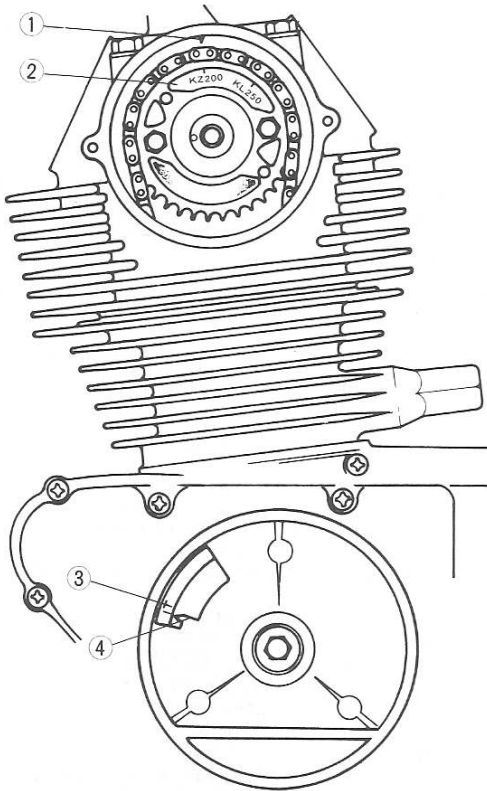
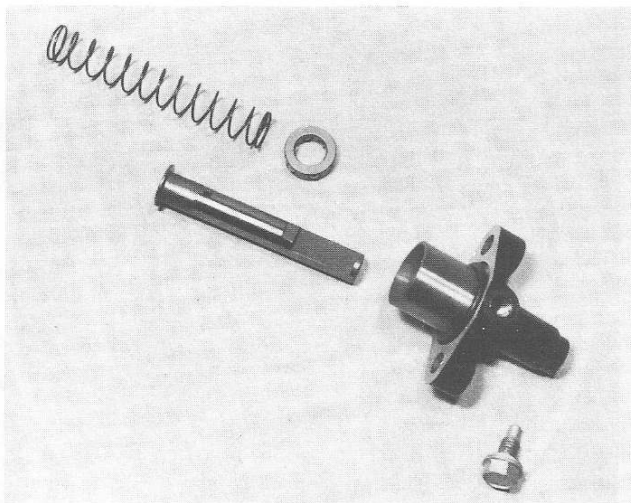


Fig. 2.2 Valve timing marks – KLT200 A and 250 A1 (other models similar). (Sec 6)

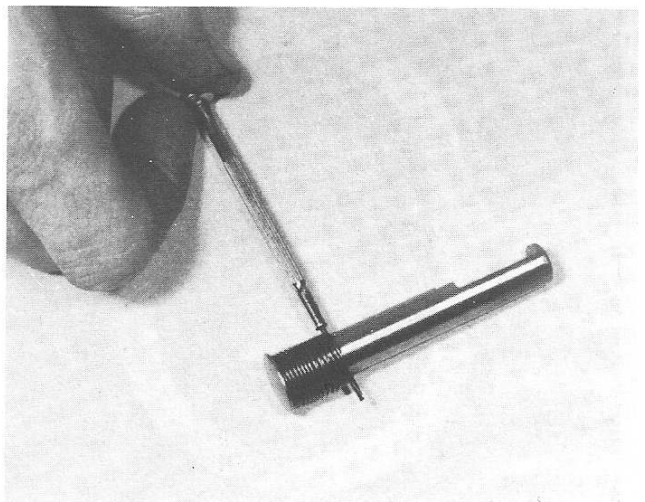
- | | |
|----------------------------------|---------------------------------|
| 1 Cylinder head projection | 3 Dynamo flywheel 'T' mark |
| 2 Camshaft sprocket 'KZ200' mark | 4 Left engine cover timing mark |

7 Cam chain tensioner – removal, inspection and installation

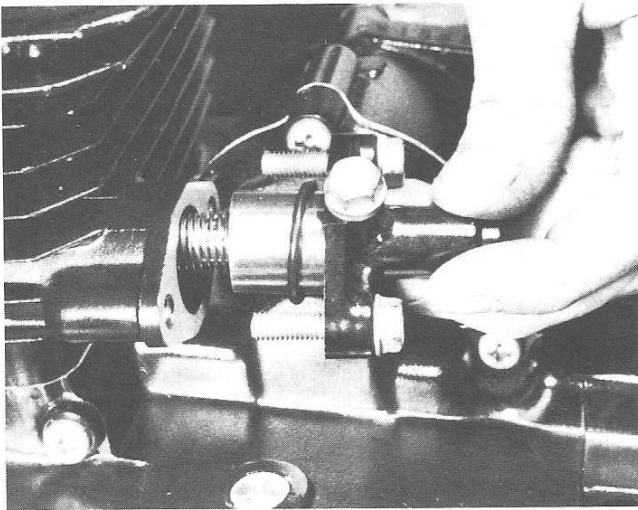
- 1 Remove the cam chain tensioner as described in Section 6.
- 2 Note: the tensioner is automatic in operation. If its mounting bolts are slackened (or found to be slack) it must be completely removed and reset. If this is not done, the pushrod will move out slightly and will press too hard against the chain when the tensioner mounting bolts are retightened. If not corrected, this will cause severe damage to the chain and tensioner.
- 3 On refitting, if the longer bolt substituted on removal has been removed or slackened or if any new camshaft drive components have been fitted, the tensioner must be completely dismantled and reassembled to reset it. It can then be refitted as follows:
- 4 Fit the tensioner to the cylinder barrel and tighten securely the mounting bolts. If the longer bolt is in use it should be removed and the correct lock bolt refitted; this will allow the tensioner pushrod to move out. If the tensioner has been disassembled and rebuilt, slacken the lock bolt through one or two full turns, then tighten it carefully; this will allow the pushrod to move out and tension the chain.
- 5 To disassemble the unit wrap it in clean rag and unscrew the lock bolt. Withdraw the pushrod, spring and ball and retainer assembly.
- 6 Wash all components and renew any that are obviously worn or damaged. Where a measurement is specified measure the spring free length and renew it if it has shortened to the service limit or less. If no measurement is given, the spring must be compared with a new item; renew the spring if there is any doubt about its condition.
- 7 The pushrod should slide smoothly in the tensioner body. Renew either component if necessary. Reassemble the ball and retainer on the pushrod and fit them to the body. The pushrod should be able to slide out smoothly but not inwards. Renew the ball and retainer if any fault is found.
- 8 Renew the sealing O-ring if flattened or damaged.
- 9 To reassemble the unit fit the spring to the pushrod and compress it against the pushrod head, then pass a piece of wire through the pushrod to hold the spring.
- 10 Aligning the pushrod groove with the lock bolt thread, push the pushrod assembly up into the body which must be held vertically. Hold the pushrod as far in as possible and screw in the lock bolt with its washer; the lock bolt should engage the machined step in the pushrod groove (see accompanying illustration) and should not be overtightened.
- 11 When the pushrod is held by the lockbolt, pull out the wire to release the spring. The tensioner is now reset and ready for refitting.



7.6 Clean all components of cam chain tensioner and check for wear



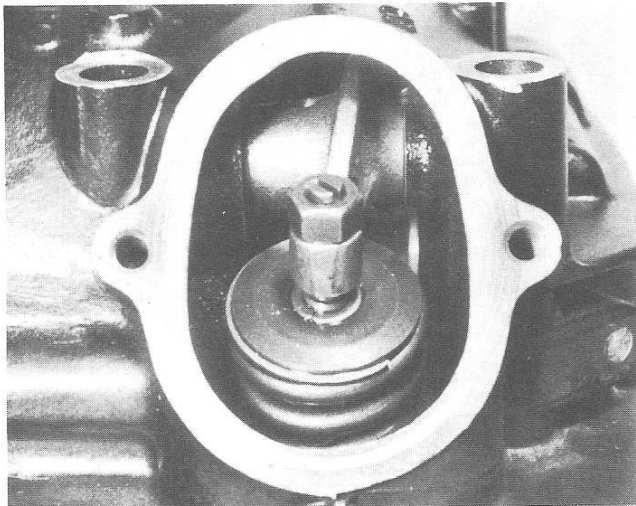
7.9 Compress tensioner spring and retain as shown on installation ...



7.10 ... lock tensioner plunger on fitting – do not release lock bolt until tensioner mounting bolts are securely tightened

8 Rocker shafts and rockers – removal, inspection and installation

- 1 Remove the camshaft sprocket. See Section 6. Remove the valve adjuster caps. Remove its retaining screw(s) and withdraw the rocker shaft retainer plate.
- 2 Slacken slightly all cylinder head retaining bolts. On KLT200, 250 models remove fully the left front retaining bolt.
- 3 If the shafts are threaded internally, a screw or bolt may be inserted to aid withdrawal, if not the shafts must be pulled out using a suitable pair of pliers. Note which way round each shaft is fitted and keep separate and clearly marked the inlet and exhaust components. Remove the rocker arms as soon as they are released.
- 4 Check the rocker arms for undue wear on their shafts and renew any that show excessive play. Examine each rocker arm where it bears on the cam and the opposite end which bears on the valve stem head.



8.1a Remove valve adjuster caps to expose rocker arm ends

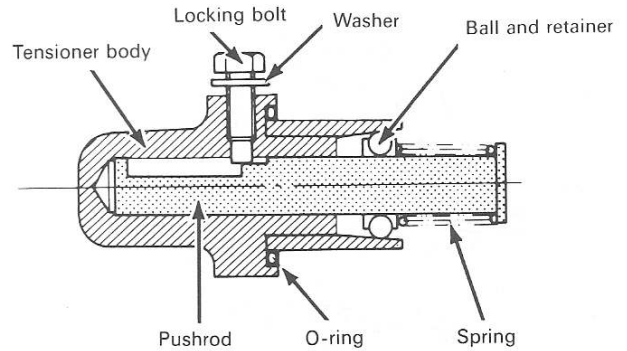
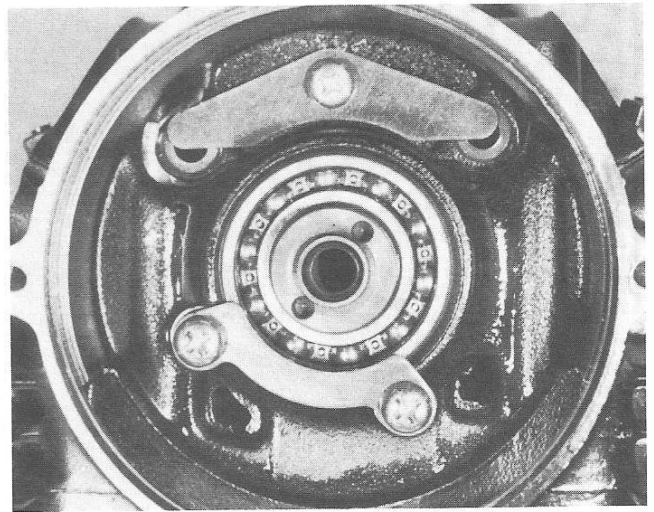


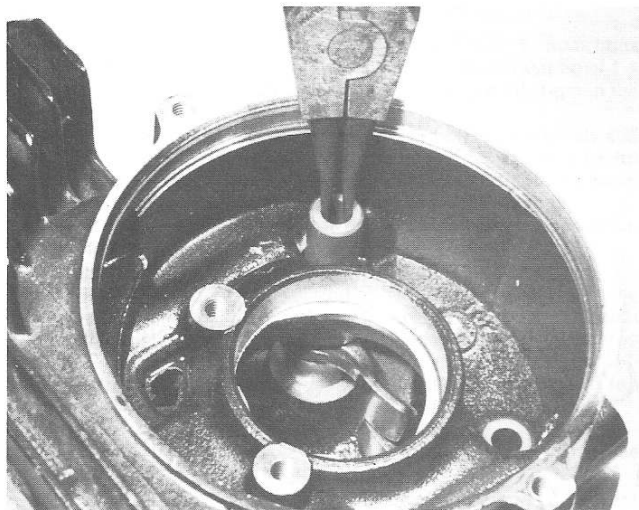
Fig. 2.3 Cam chain tensioner (Sec 7)

Arms that are badly hammered or worn should be renewed. Slight wear marks may be stoned out with an oil carborundum stone, but remember that if too much metal is removed it will not only weaken the component but may make correct adjustment of the valve clearances impossible.

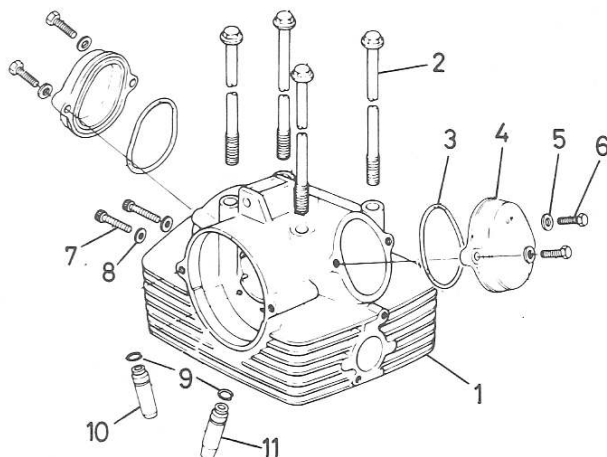
- 5 Renew the adjuster screws (and locknuts) if they are damaged or have distorted threads.
- 6 Measure the inside diameter of the rocker arms and the outside diameter of the shafts; renew any component found to be worn to the service limit or beyond at any point.
- 7 On installation be sure to refit both arms and shafts in their original locations only.
- 8 Oil the shaft, fit the arm in place and press the shaft in ensuring that it is fitted the correct way round. On KLT110 and 160 models each shaft has a cutout in its outer (left) end which must face inwards towards each other, to engage with the retainer.
- 9 Refit the retainer plate (on KLT110 and 160 models the chamfered edge faces to the front), apply thread locking compound to their threads and tighten securely the retaining screw(s).
- 10 Tighten to the specified torque setting the cylinder head bolts. See Section 9.
- 11 Refit the camshaft sprocket, set the valve timing and check the valve clearances. See Section 6.



8.1b Remove (upper) retainer plate to release rocker shafts – note also camshaft bearing retainer – KLT200 B, C, KLT250 A2, C, P only



8.3 Use a screw or bolt where possible, or pliers (as shown) to extract rocker shafts



9 Cylinder head – removal, inspection and installation

Note: KLT200 and 250 models – The engine must be taken out of the frame before the cylinder head can be removed – refer to Section 4. Proceed to paragraph 4.

1 KLT110 and 160 models – Referring to the Sections or Chapters listed in Section 4, remove the seat, the fuel tank, the carburetor and the exhaust pipe.

2 Disconnect the spark plug and dismantle the engine top mounting.
3 Disconnect at both ends the oil feed pipe from the cylinder head to the crankcase. Remove its mounting screws (KLT110) and remove the pipe.

4 Remove the camshaft sprocket. See Section 6. Remove the spark plug.

5 KLT200 and 250 models – Remove the single bolt at the left base of the cylinder barrel.

6 Working in a diagonal sequence progressively (by about $\frac{1}{4}$ turn at a time) slacken the cylinder head retaining bolts. There are six (4 x 8 mm, 2 x 6 mm) on the KLT110 and 160 models and four on the KLT200 and 250. Remove all the bolts.

7 Tap the head gently with a soft-faced mallet to break the joint and lift the head. Secure the cam chain so that it cannot drop into the crankcase and withdraw the head. Remove the gasket, locating dowels and sealing O-rings (where fitted).

8 Clean the cylinder head with solvent and dry it thoroughly. Compressed air will speed the drying process.

9 Inspect the head very carefully for cracks and other damage. If cracks are found, a new head will be required.

10 Using a straight-edge and a feeler gauge, check the head gasket mating surface for warpage. Lay the straight-edge across the head and try to slip a 0.05 mm (0.002 in) feeler gauge under the straight-edge. If the head is warped it must be replaced with a new one.

11 There is likely to be carbon deposits on the inside surface of the cylinder head. Remove these deposits from the combustion chamber using a blunt-ended scraper so that the surfaces are not damaged. To achieve a smooth, shiny surface, finish it with metal polish. Do not use a wire brush mounted in an electric drill.

12 Be sure the gasket mating surfaces on both the cylinder head and the cylinder are absolutely clean before installing a new head gasket.

13 Install the two locating dowels, KLT110 and 160 models – Fit the new gasket.

14 KLT200 and 250 models – Place new O-rings around the holes for the front left and the two rear retaining bolts, and the large O-ring in its groove around the cam chain tunnel. Press the two locating dowels into their recesses and fit a new gasket.

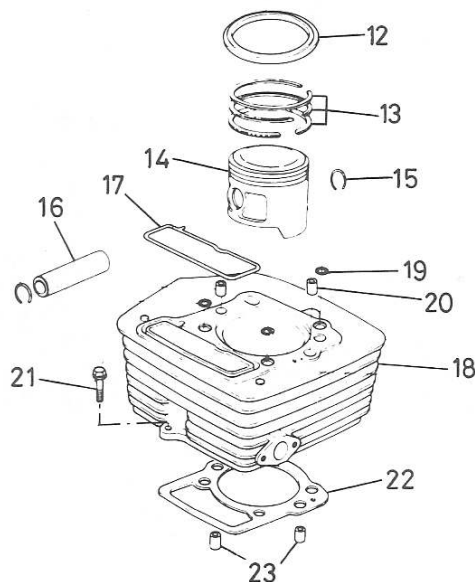


Fig. 2.4 Cylinder head and barrel – KLT200 B and C (other 200 and 250 models similar) (Sec 9)

- | | |
|------------------------|-----------------|
| 1 Cylinder head | 13 Piston rings |
| 2 Bolt | 14 Piston |
| 3 O-ring | 15 Circlip |
| 4 Inspection cover | 16 Piston pin |
| 5 Washer | 17 O-ring |
| 6 Bolt | 18 Barrel |
| 7 Screw | 19 O-ring |
| 8 Washer | 20 Dowel pin |
| 9 Clip | 21 Bolt |
| 10 Exhaust valve guide | 22 Base gasket |
| 11 Inlet valve guide | 23 Dowel pin |
| 12 Head gasket | |

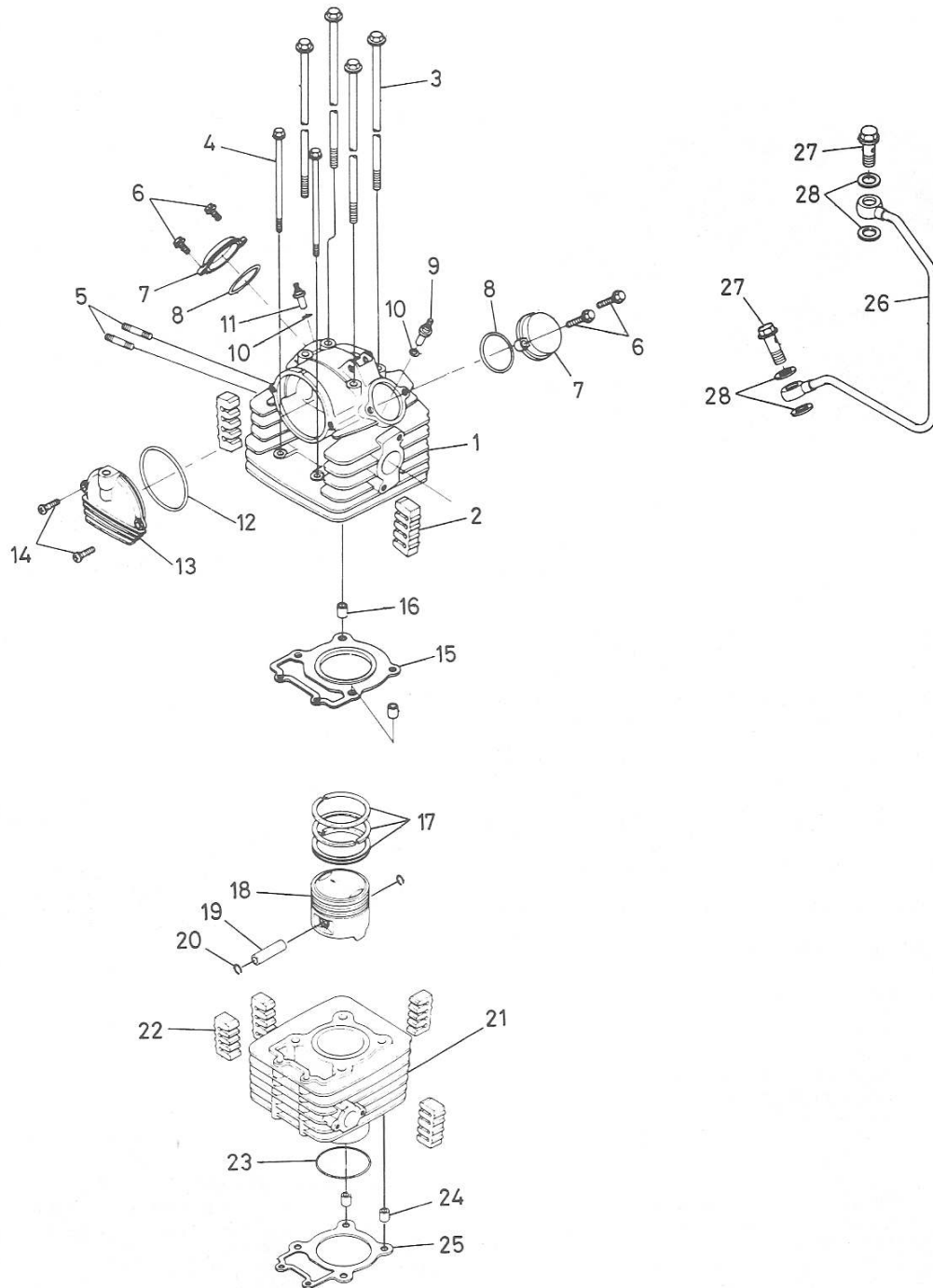


Fig. 2.5 Cylinder head and barrel – KLT160 (KLT110 similar) (Sec 9)

1 Cylinder head
2 Damper
3 Bolt
4 Bolt
5 Stud
6 Bolt
7 Inspection cover

8 O-ring
9 Inlet valve guide
10 Clip
11 Exhaust valve guide
12 O-ring
13 Cylinder head cover
14 Screw

15 Head gasket
16 Dowel pin
17 Piston rings
18 Piston
19 Piston pin
20 Circlip
21 Barrel

22 Damper
23 O-ring
24 Dowel pin
25 Base gasket
26 External oil feed pipe
27 Union bolts
28 Sealing washer

15 Lower the cylinder head into place, pass the cam chain up into the head and secure it. Refit the retaining bolts.

16 KLT110 and 160 models – Tighten the four 8 mm bolts progressively and in a diagonal sequence first to a torque setting of 1.1 kgf m (8.0 lbf ft), then to the final torque setting specified. Tighten the two 6 mm bolts to the specified torque setting.

17 KLT200 and 250 models – Tighten the four bolts progressively and in a diagonal sequence first to a torque setting of 1.5 kgf m (11.0 lbf ft), then to the final torque setting specified. Tighten the cylinder barrel retaining bolt to its specified torque setting. Refit the spark plug.

18 Refit the camshaft sprocket, set the valve timing and cam chain tension. See Section 6.

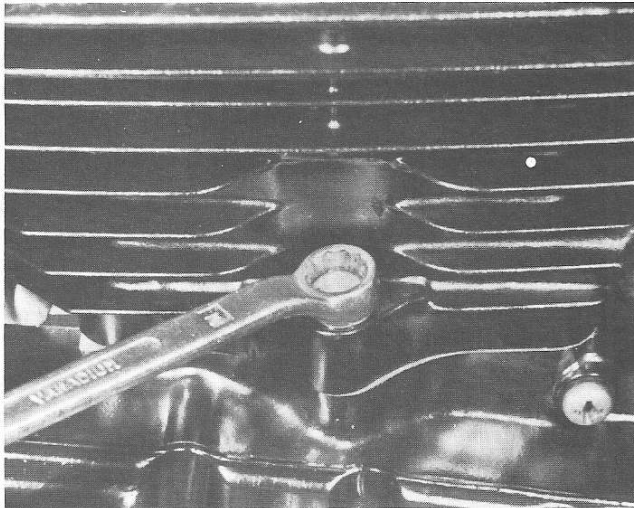
19 Adjust the valve clearances. See Chapter 1.

20 KLT 110 and 160 models – Using all new sealing washers, fit the oil feed pipe to the cylinder head and crankcase, tighten the union bolts to the specified torque settings and tighten the mounting screws carefully.

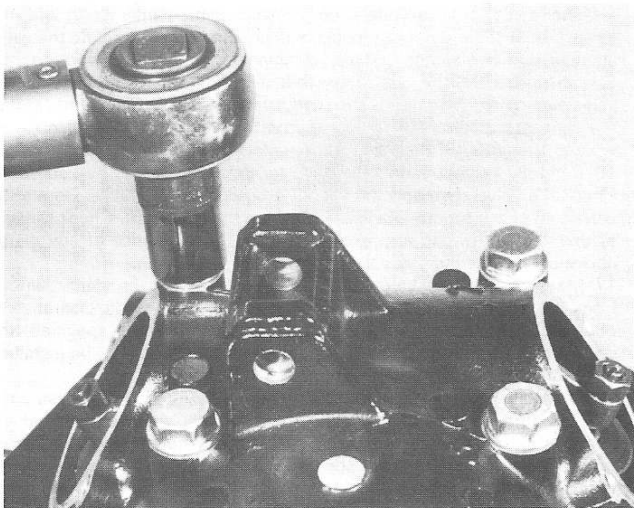
21 Refit the spark plug and connect its cap. Install the engine top mounting and tighten the bolts to the specified torque settings.

22 Refit the exhaust pipe, the fuel tank and the seat.

23 KLT 200 and 250 models – Replace the engine in the frame. See Section 4.



9.5 KLT200, 250 – remove bolt at cylinder base before slackening cylinder head bolts



9.17 Tighten cylinder head bolts to specified torque setting

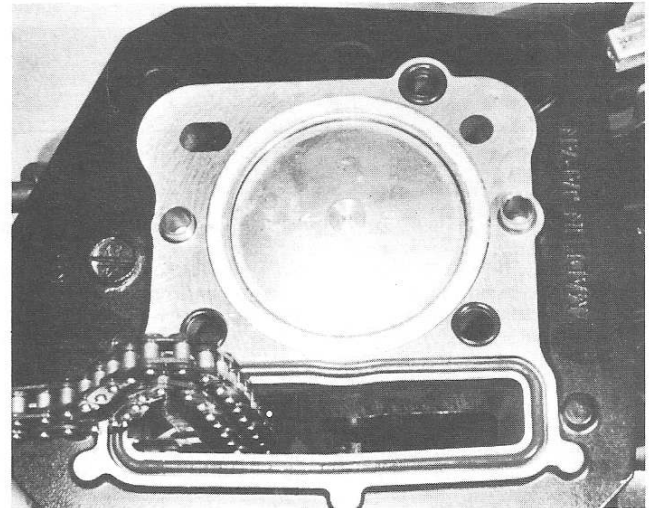
10 Valves, valve seats and valve guides – servicing

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

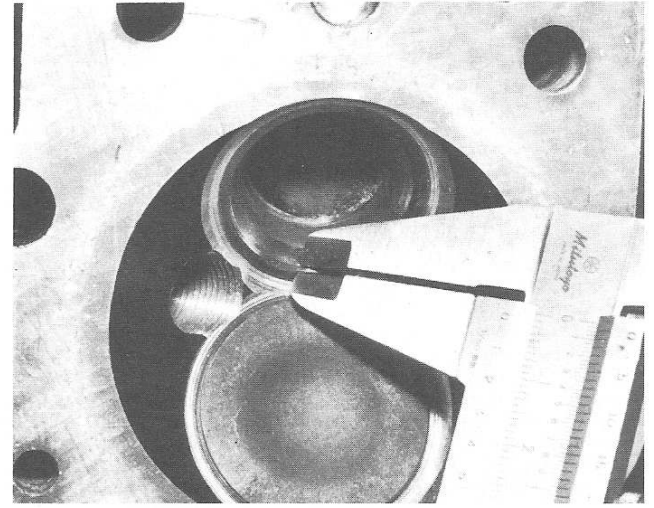
2 The home mechanic can, however, remove and disassemble the head, do the initial cleaning and inspection, then reassemble and deliver the head to a dealer service department or properly equipped motorcycle repair shop for the actual valve servicing. Refer to Sections 9 and 11 for those procedures.

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

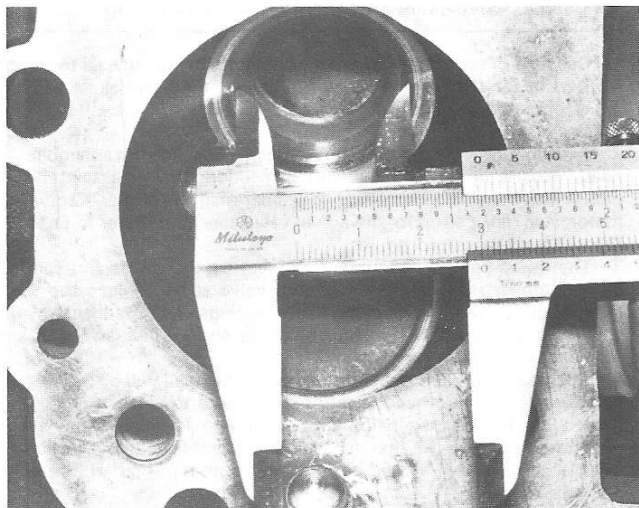
4 After the valve job has been performed, the head will be in like-new condition. When the head is returned, be sure to clean it again very thoroughly before installation on the engine to remove any metal particles or abrasive grit that may still be present from the valve service operations. Use compressed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



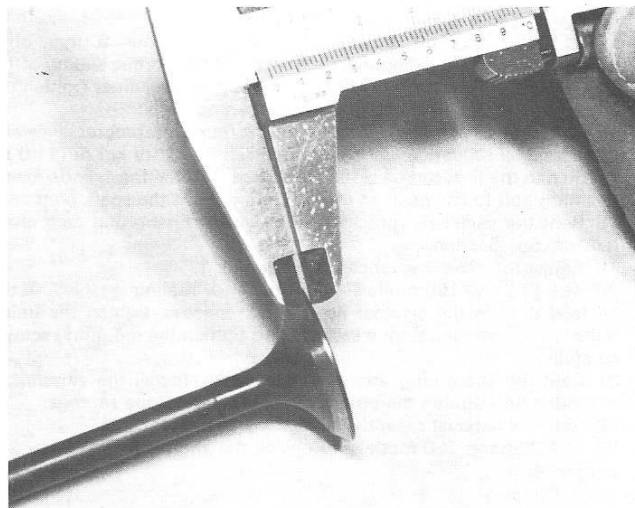
9.14 Install new head gasket over two locating dowels – do not omit O-rings



10.3a Measuring valve seat width



10.3b Measuring valve seat surface diameter



10.3c Measuring valve head thickness

11 Cylinder head and valves – disassembly, inspection and reassembly

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

2 To properly disassemble the valve components without the risk of damaging them, a valve spring compressor is absolutely necessary. If the special tool is not available, have a dealer service department or motorcycle repair shop handle the entire process of disassembly, inspection, service or repair (if required) and reassembly of the valves.

Disassembly

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

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

5 Before proceeding, arrange to label and store the valves along with their related components so they can be kept separate and reinstalled in the same valve guides they are removed from.

6 If not already removed, disassemble the rocker arms and shafts (Section 8) the camshaft (Section 6) and, on KLT160 only, the ACR unit (Section 12).

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

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

9 Once the valves have been removed and labeled, pull off the valve

stem seals with pliers and discard them (photo). The old seals should never be re-used.

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

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

12 Scrape off any deposits that may have formed on the valve, then use a motorized wire brush to remove deposits from the valve heads and stems. Again, make sure the valves do not get mixed up.

Inspection

13 Inspect the head very carefully for cracks and other damage. If cracks are found, a new head is in order.

14 Examine the valve seats. If they are pitted, cracked or burned, the head will require valve service that is beyond the scope of the home mechanic.

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

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

17 Measure the valve stem diameter. By subtracting the stem diameter from the valve guide diameter, the valve stem-to-guide clearance is obtained. If the stem-to-guide clearance is greater than specified, the guides will have to be replaced and new valves may have to be installed, depending on the condition of the old ones.

18 Check the end of each valve spring for wear and pitting. Measure the free length and compare it to the Specifications. Any springs that are shorter than specified have sagged and should not be re-used. Where free lengths are not given, the springs can only be checked by measuring their tension on special equipment. If this is not available the springs should be renewed if there is any doubt about their condition. Stand the spring on a flat surface and check it for squareness.

19 Check the spring retainers and keepers for obvious wear and cracks.

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

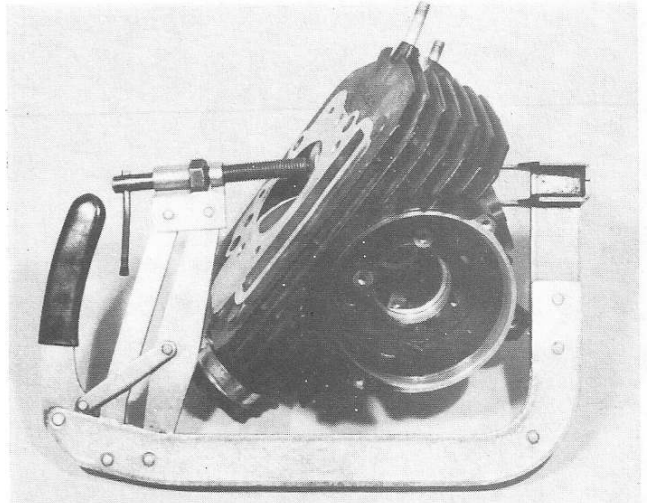
20 If the inspection indicates that no service work is required, the valve components can be reinstalled in the head.

Reassembly

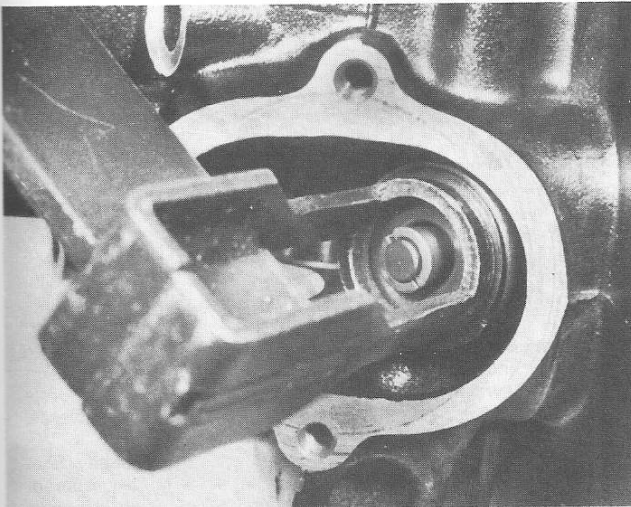
21 Lay the spring seats in place in the cylinder head, then install new valve stem seals on each of the guides. Use a hammer and an appropriate size deep socket to tap the seals into place until they are properly seated. Do not twist or cock them or they will not seal properly against the valve stems.

22 Next, install the valves (taking care not to damage the new seals), the springs, the retainers and the keepers. Coat the valve stems with grease (preferably molybdenum disulphide) before slipping them into the guides and install the springs with the tightly wound coils next to the cylinder head. When compressing the springs with the valve spring compressor, depress them only as far as is absolutely necessary to slip the keepers into place. Make certain that the keepers are securely locked in their retaining grooves.

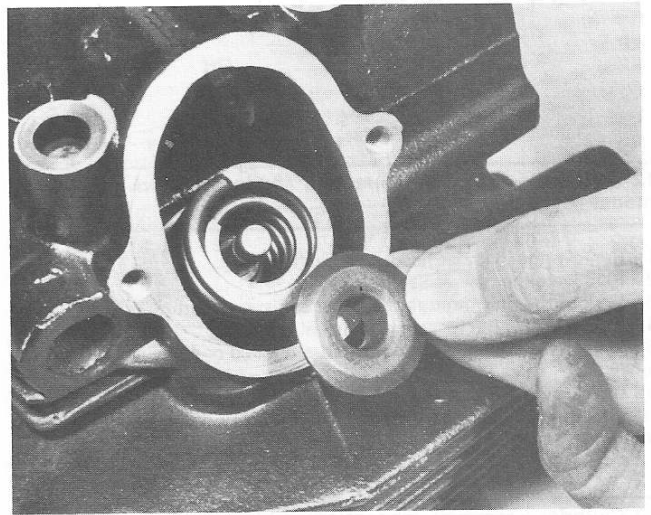
23 Support the cylinder head on blocks so the valves cannot contact the workbench top and gently tap each of the valve stems with a soft-faced hammer. This will help seat the keepers in their grooves.



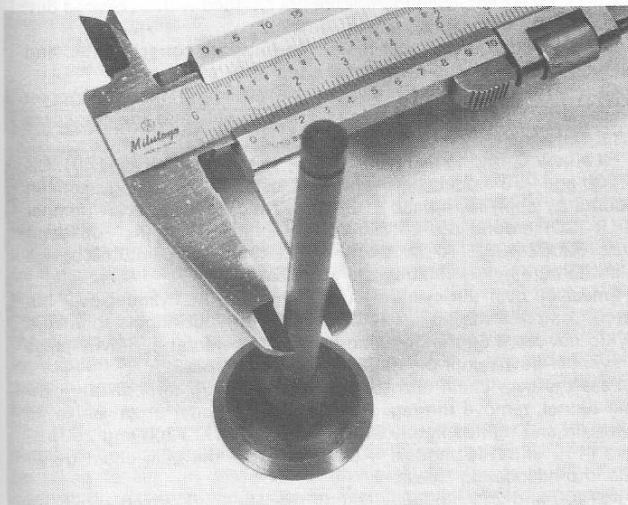
11.7a Use valve spring compressor of suitable type to compress springs ...



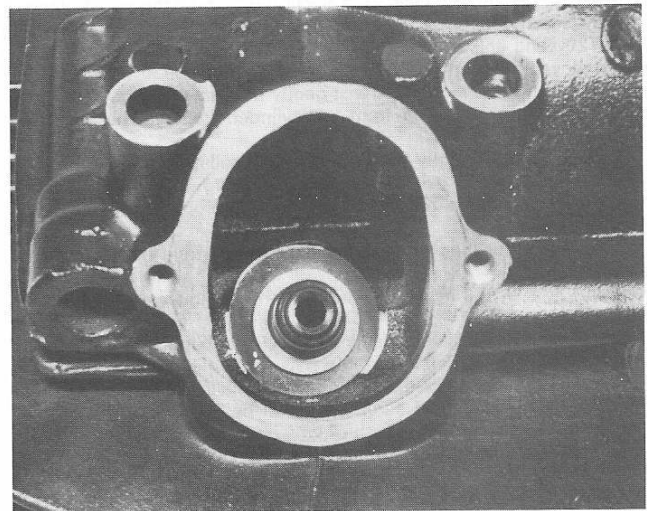
11.7b ... so that split keepers can be extracted ...



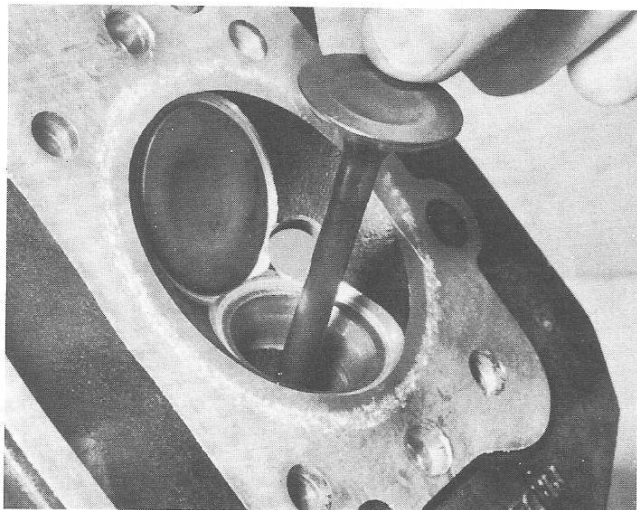
11.7c ... then slowly release spring compressor to withdraw retainer



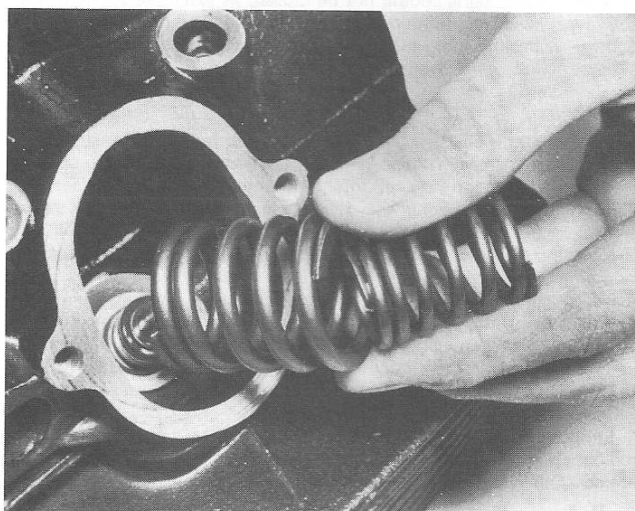
11.17 Measuring valve stem diameter



11.21 Install spring seats (where fitted) and new stem seals



11.22a Lubricate valve stems before installing valves



11.22b Note that spring tightly-wound coils are installed next to cylinder head

12 ACR unit – removal, inspection and installation – KLT160 model

- 1 Remove the cylinder head. See Section 9.
- 2 Remove either valve. See Section 11.
- 3 Lift out the unit through the valve adjusting aperture.
- 4 Installation is the reverse of removal.
- 5 Inspect the spring. If it is damaged, stretched or defective it must be renewed.
- 6 Check by hand that the unit weights move smoothly and that the release pin is not damaged. If any sign of wear or damage is found the unit must be renewed.

13 Cylinder – removal, inspection and installation

- 1 Remove the cylinder head. See Section 9. The piston should then be at the top of its stroke.
- 2 KLT200 and 250 models – Check that the single retaining bolt has been removed, then lift out the cam chain guide blade.
- 3 KLT110 and 160 models – Twist gently the cam chain guide blade to release its top mounting from the cylinder. Remove the blade – KLT160.
- 4 Tap the cylinder gently with a soft faced mallet to break the joint and lift it up. As soon as possible pack clean rag into the crankcase mouth and cam chain tunnel to prevent dirt dropping in. Lift the cylinder away.
- 5 Remove the locating dowels and base gasket from the crankcase top surface.
- 6 Remove the O-ring from around the cylinder base spigot (KLT160).
- 7 The usual indications of a badly worn cylinder barrel and piston are excessive oil consumption and piston slap, a metallic rattle that occurs when there is little or no load on the engine. If the top of the bore of the cylinder barrel is examined carefully, it will be found that there is a ridge on the thrust side, the depth of which will vary according to the amount of wear that has taken place. This marks the limit of travel of the uppermost piston ring.
- 8 An internal micrometer should be used to obtain an accurate measurement of the amount of wear which has taken place in the bore. Measurements should be made at various points within the bore, and the measurement across the most worn part of the bore compared with

that of an unworn portion, eg the lowest part of the bore. The difference between the two readings should not exceed 0.05 mm (0.002 in). If it is found to exceed this figure, it will be necessary to have the cylinder rebored and a new oversize piston fitted.

9 If, as is likely, an internal micrometer is not available, a rough check of the amount of bore wear can be made as follows. Insert the bare piston into the bore in its normal position ie, with the arrow facing the front of the cylinder. Using feeler gauges, measure the amount of clearance between the piston and bore about ½ in from the top of the cylinder liner, and at the front of the cylinder. If this measurement exceeds the allowable clearance range, it indicates that attention is required. If desired, the barrel and piston can be taken to a Kawasaki Service Agent for verification.

10 Check the surface of the cylinder bore for score marks or any other damage that may have resulted from an earlier engine seizure or displacement of the gudgeon pin. A rebores will be necessary to remove any deep indentations, irrespective of the amount of bore wear, otherwise a compression leak will occur.

11 Check the external cooling fins are not clogged with oil or road dirt; otherwise the engine will overheat.

12 On installation, check that the piston rings are correctly fitted and well lubricated, with the piston at the top of its stroke.

13 Check that the cylinder oilways are clear and that the gasket surfaces are clean. Press the two locating dowels into the crankcase gasket surface and fit a new base gasket.

14 Fit a new O-ring to the cylinder base spigot groove (KLT160). C.I. KLT200 and 250 models persistent oil leaks from the base gasket can be cured by applying a bead of 3-Bond No 10 sealant (part number 56019-120) around the bottom of the spigot, using the applicator nozzle 92062-1052. Allow 24 hours at room temperature for the sealant to cure before refitting the cylinder.

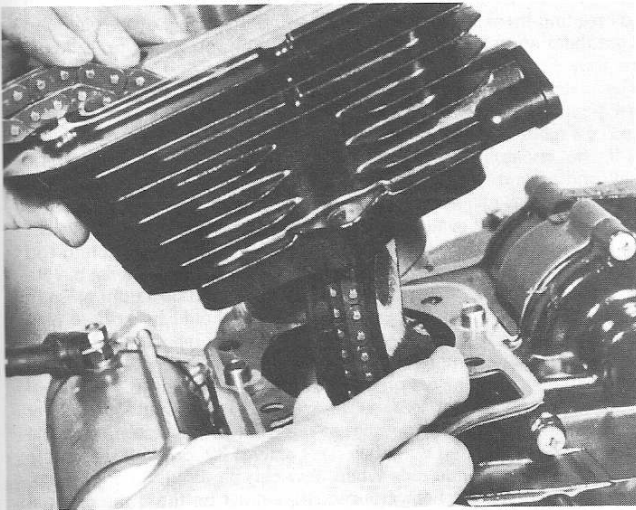
15 Smear oil over the cylinder bore and lower the cylinder over the piston. Compress the rings one at a time with your fingers to ensure they do not catch on the bore and break as they enter it. Slowly press the cylinder down until the rings are fully in the bore.

16 Pass the cam chain and tensioner blade(s) up through the cam chain tunnel, remove the rag, and press the cylinder down on to its gasket. Fit and tighten lightly the retaining bolt (KLT200 and 250).

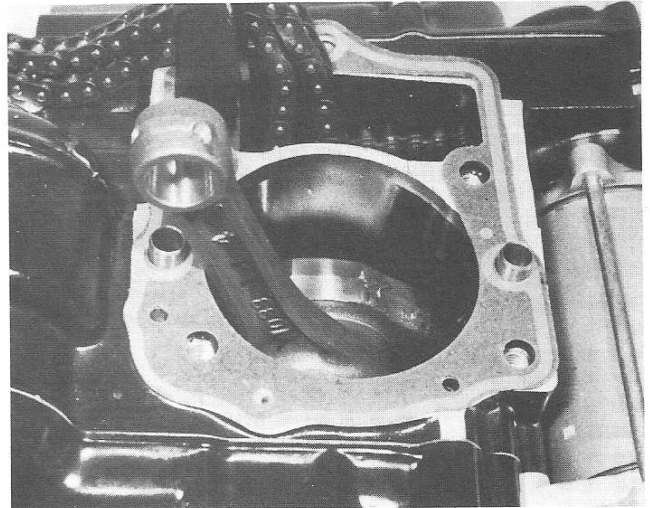
17 KLT110 and 160 models – Carefully twist the cam chain guide blade into its locating recess.

18 KLT200 and 250 models – Noting the 'Up' mark which shows its upper end, fit the cam chain guide blade, ensuring that it locates correctly in its top and bottom recesses (see illustration).

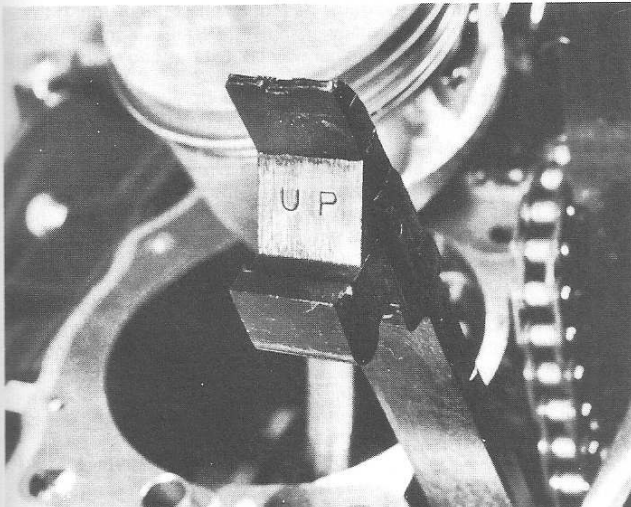
19 Replace the cylinder head. See Section 9.



13.4 Pack clean rag into crankcase mouth as soon as cylinder is sufficiently raised



13.13 Fit a new base gasket over two locating dowels



13.18 KLT200, 250 – note UP marking identifying top end of cam chain guide blade

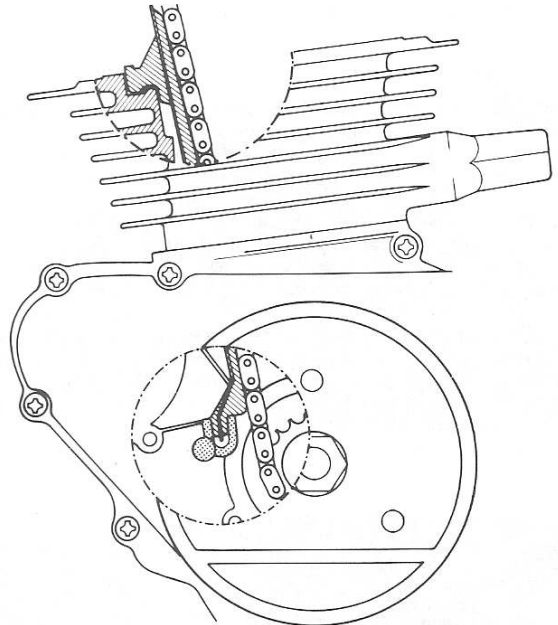


Fig. 2.6 Cam chain guide blade installation – KLT200 and 250 (Sec 13)

14 Piston and rings – removal, inspection and installation

- 1 Remove the cylinder. See Section 13.
- 2 Prise one of the wrist pin circlips out of position, then press the wrist pin out of the small end bearing, through the piston boss. If the pin is a tight fit, it may be necessary to warm the piston so that the grip on the wrist pin is released. A rag soaked in warm water will suffice, if it is placed on the piston crown. When the piston is free of the connecting rod, remove the wrist pin completely and mark the inside of the piston skirt with an 'F' to denote front, so that the piston is later replaced in an identical position. Place the piston, rings and wrist pin aside for further attention, but discard the circlips. They should never be re-used.
- 3 If the wrist pin still proves stubborn, it is permissible to use a suitably sized drift to enable the pin to be tapped out. Great care must be taken to support the piston, otherwise damage to it or to the connecting rod may occur. On no account must excessive force be used.
- 4 Remove the piston rings by holding the piston in both hands and gently prising apart the ring ends with the thumbnails until the rings

can be lifted out of their grooves and onto the piston lands, one side at a time. The rings can then be slipped off the piston and put to one side, noting carefully which way round and in what order they are fitted. If the rings are stuck in their grooves, use three strips of thin metal sheet to remove them, as shown in the accompanying illustration.

5 If a rebore is necessary, the existing piston and rings can be disregarded because they will be replaced with their oversize equivalents as a matter of course.

6 Remove all traces of carbon from the piston crown, using a soft scraper to ensure the surface is not marked. Finish off by polishing the crown with metal polish so that carbon does not adhere so easily in the future. Never use emery cloth.

7 Piston wear usually occurs at the skirt or lower end of the piston

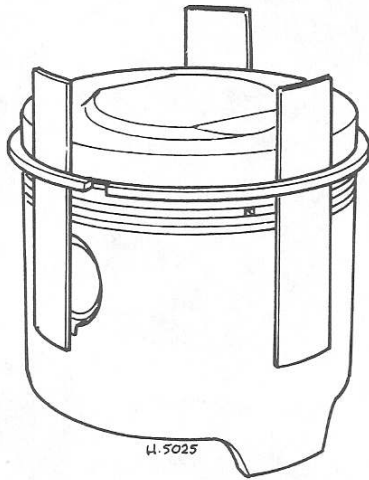


Fig. 2.7 Method of freeing gummed piston rings (Sec 14)

and takes the form of vertical streaks or score marks on the thrust side. There may also be some variation in the thickness of the skirt. Measure the piston diameter at right angles to the wrist pin axis, at a point 5 mm (0.20 in) above the base of the skirt. If the piston is worn to the specified service limit or less, it must be renewed.

8 The piston ring grooves may also become enlarged in use, allowing the piston rings to have greater side float. If the clearance exceeds the piston ring to groove clearance wear limit figures given in the Specifications Section, the piston will require renewal, complete with rings.

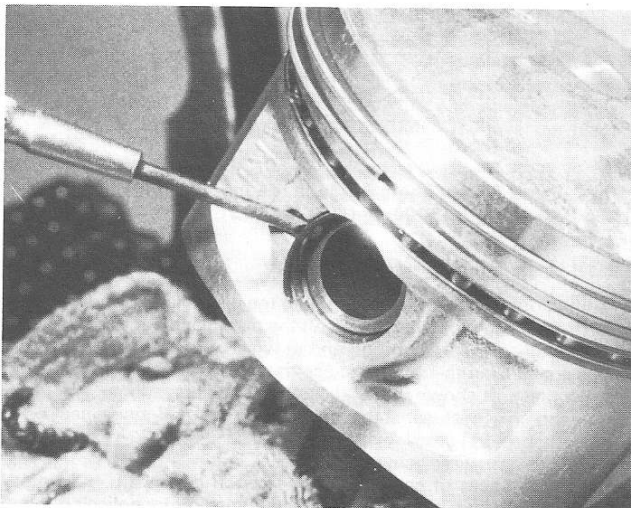
9 The piston rings will tend to lose their elasticity over a period of time. It is recommended that the free end gap of the rings be measured and compared with the figures given in the Specifications Section. The rings should be renewed as a set if the free end gap is less than the service limit specified (KLT200/250 only)

10 Piston ring wear is measured by removing the rings from the piston and inserting them in the cylinder bore using the crown of the piston to locate them approximately 1½ inches from the top of the bore. Make sure they rest square with the bore. Measure the ring end gap using feeler gauges, and compare this reading with that given in the Specifications section. Note that it is assumed that the cylinder is not in need of a rebore, as a worn bore would produce an inaccurate reading.

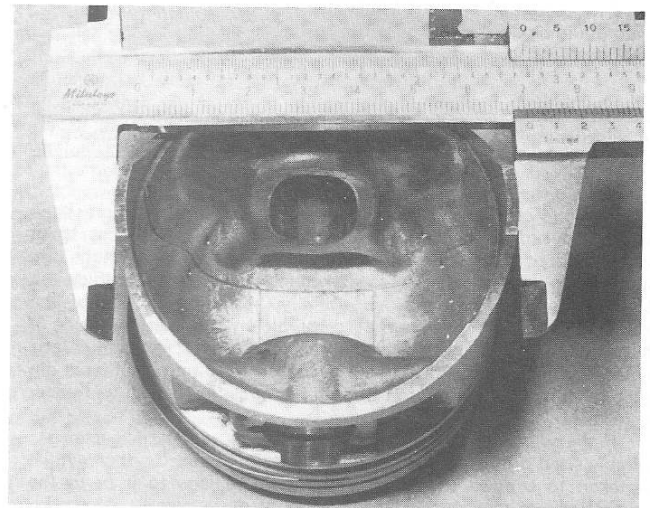
11 If the necessary equipment is available, the condition of the small-end assembly can be checked by direct measurement, referring to the tolerances given in the Specifications Section of this Chapter. If the equipment is not available, or where measurements are not given, it will suffice to ensure that the bearing surfaces in the connecting rod small-end bearing, in the piston bosses and over the entire wrist pin are smooth and unmarked by wear. The wrist pin should be a tight press fit in both connecting rod and piston, and there should be no free play discernible when the components are temporarily reassembled. If any wear is found, the component concerned should be renewed.

12 Refit the rings to the piston using the method employed on removal and positioning them as follows. The oil scraper ring is fitted expander first, so that its ends butt together at the front of the piston, then the side rails which are fitted with their gaps at least 30° on each side of the expander ends. The side rails when new can be fitted either way up, but if the originals are being reused, they must be fitted the original way up, this being revealed by wear marks. Use the accompanying illustration to identify the compression rings, which have a different cross-section. The second compression ring will have one surface marked near the end gap with the letter 'N', 'T' or 'RN', this surface must face upwards and the gap must be to the rear of the piston. If the top ring has one surface similarly marked, this surface must face upwards; if not it can be refitted either way up, with its gap to the front of the piston.

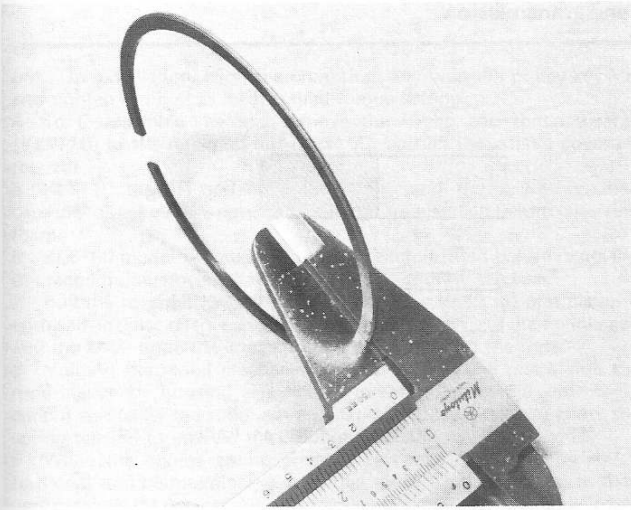
13 All circlips that were disturbed on dismantling must be renewed; never reuse them. Check that the piston has one circlip fitted and insert the wrist pin from the opposite side; if it is a tight fit, the piston should be warmed as described above. Note that an arrow mark cast in the piston crown shows the front face of the piston. Lubricate the wrist pin, piston bosses and small-end eye, lower the piston over the connecting rod and push the wrist pin through both piston bosses and the small-end eye. Take great care not to cause any damage if a hammer and drift are required. Secure the wrist pin with its second, new, circlip, ensuring that the circlip is correctly seated in its groove. Make a final check that all rings and the piston and circlips are correctly and securely refitted, then smear a small quantity of molybdenum disulphide engine assembly grease over the piston skirt and over the surface of the cylinder bores. Failing this, a copious amount of clean engine oil should provide sufficient lubrication as the engine is re-started.



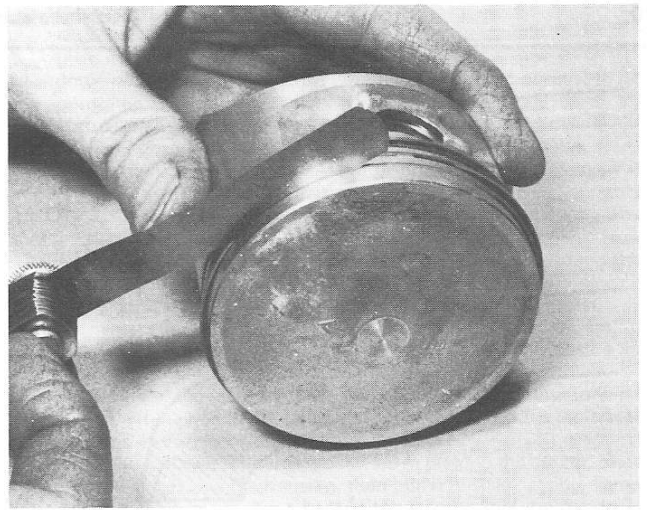
14.2 Use pointed instrument as shown to pry out wrist pin circlip



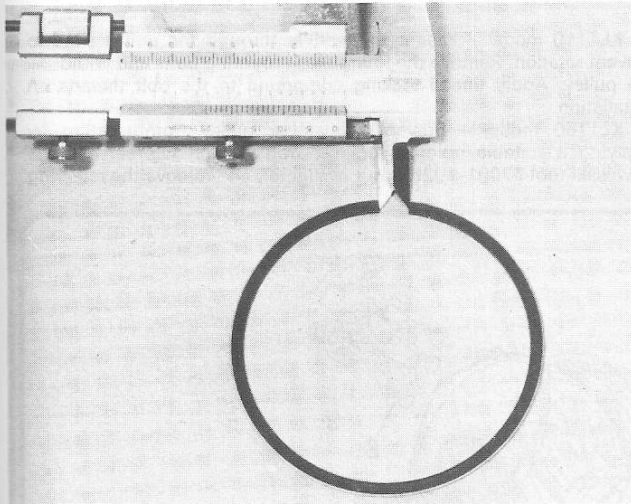
14.7 Measuring piston diameter



14.8a When thickness of piston rings has been measured and is known to be within tolerances ...



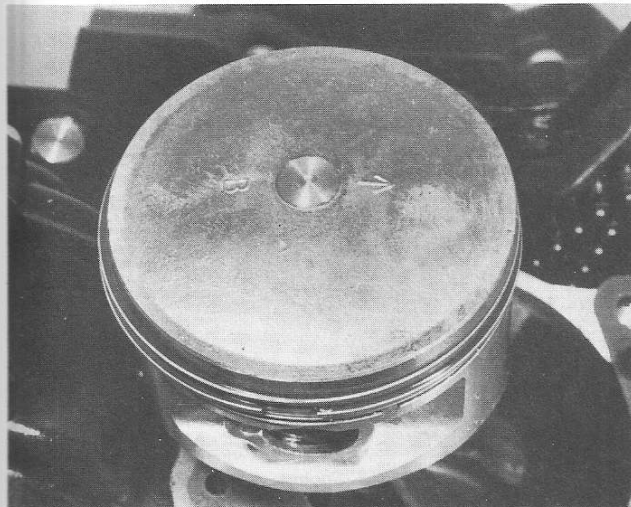
14.8b ... piston ring groove wear can be measured as shown



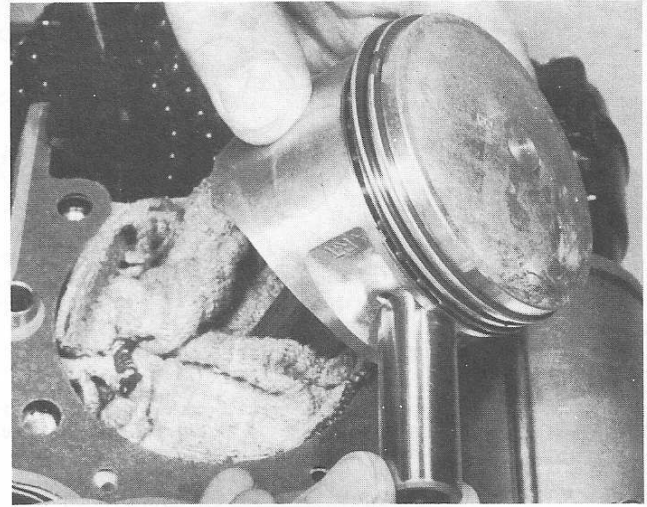
14.9 Measuring piston ring free end gap



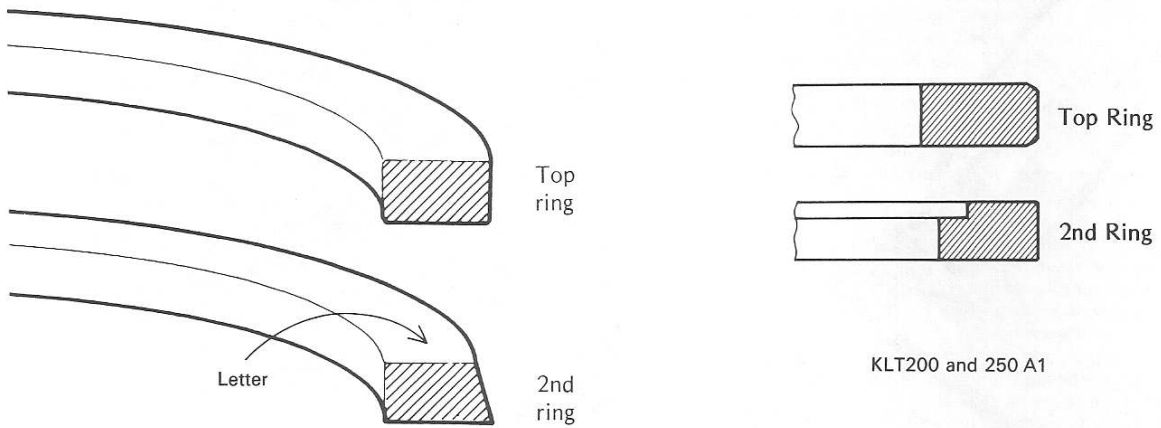
14.10 Measuring piston ring fitted end gap – use unworn part of bore



14.13a Arrow mark cast on piston crown should point to front of engine



14.13b Press wrist pin into piston and retain with new circlips



KLT 110, 160, 250 A2, C and P

KLT200 and 250 A1

Fig. 2.8 Cross-section of compression rings (Sec 14)

15 Recoil starter – removal, inspection and installation – KLT110 and 160 models

1 Remove the three screws (KLT110) or six screws (KLT160) securing the starter assembly to the crankcase left cover. Withdraw the assembly.

2 KLT110 model – Pass a screwdriver through the pulley slots to prevent rotation. Remove the four pulley mounting bolts and withdraw the pulley. Apply thread locking compound to the bolt threads on installation.

3 KLT160 model – Prevent the starter pulley from rotating by applying a suitable holding tool (a strap wrench will serve if the Kawasaki tool 57001-1025 is not available), and remove the retaining

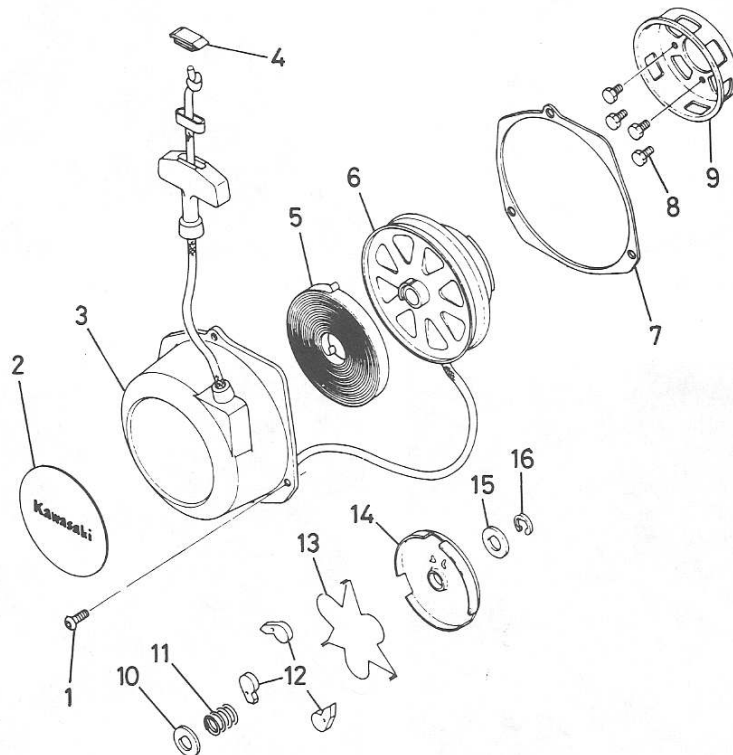


Fig. 2.9 Recoil starter – KLT110 (Sec 15)

- | | | | |
|----------------|-----------------|------------------|------------------|
| 1 Screw | 5 Recoil spring | 9 Starter pulley | 13 Springs |
| 2 Emblem | 6 Rope assembly | 10 Thrust washer | 14 Ratchet cover |
| 3 Cover | 7 Gasket | 11 Spring | 15 Thrust washer |
| 4 Plastic plug | 8 Bolt | 12 Pawls | 16 Circlip |

bolt. On installation, align the crankshaft key with the pulley keyway and tighten the bolt to its specified torque setting.

4 To disassemble the unit remove the circlip and thrust washer (KLT110) or the retaining nut (KLT160) and lift the ratchet cover off the reel.

5 KLT110 model – Remove the spring and thrust washer, then carefully note how the pawls and springs are installed before removing them.

6 KLT160 model – Note carefully how each is fitted before removing the recoil guide, cover, shaft and spring. Withdraw the pawl.

7 Pull the rope out 400 – 500 mm (15.75 – 19.69 in) and clamp it with self-locking pliers so that it cannot return. Dig out the handle cap and the knot, untie the knot and pull the handle off the rope.

8 Holding the recoil mechanism firmly, remove the pliers, pull the rope inside the housing and hold it in the notch in the reel. Being careful not to let the rope jam against the housing, slowly allow the spring tension to unwind the recoil mechanism.

9 When the engine spring pressure has relaxed, rotate the reel a further ¼ turn counterclockwise so that there is no tension on it, then very carefully lift the reel out of the housing. If any spring tension is felt, push the reel back in and wiggle it until tension is relaxed and it can be removed.

10 The only safe way of removing the spring is to place the housing

face down on a bench and to strike the bench (not the housing) to jar the spring free.

11 Clean all metal components in a high flash-point solvent; do not allow solvent onto non-metallic parts as they may be damaged.

12 Renew the rope if it is frayed, worn or broken, and the spring if it shows any signs of damage or loss of tension.

13 Check the pawl(s) springs and other components, renewing any that are damaged or worn.

14 Reassembly is the reverse of the dismantling procedure, noting the following points:

15 Lightly grease the spring on refitting. As considerable pressure is required, wear gloves to prevent the risk of injury. Hook the spring outer end to its locating tab and wind the spring into the housing so that it is flat with the hooked end innermost.

16 Fit the rope to the reel and rotate the reel counterclockwise to wind on the rope. Fit the reel to the housing so that the tab on the reel's rear face engages in the spring hooked end.

17 Rotate the reel two full turns clockwise to preload the spring, mark the rope where it leaves the housing, then pull it further out and clamp it with self-locking pliers. Tie a knot in the rope so that the handle is aligned with the mark on the rope. Check that the starter is working properly before cutting off any surplus rope and fitting the handle cap.

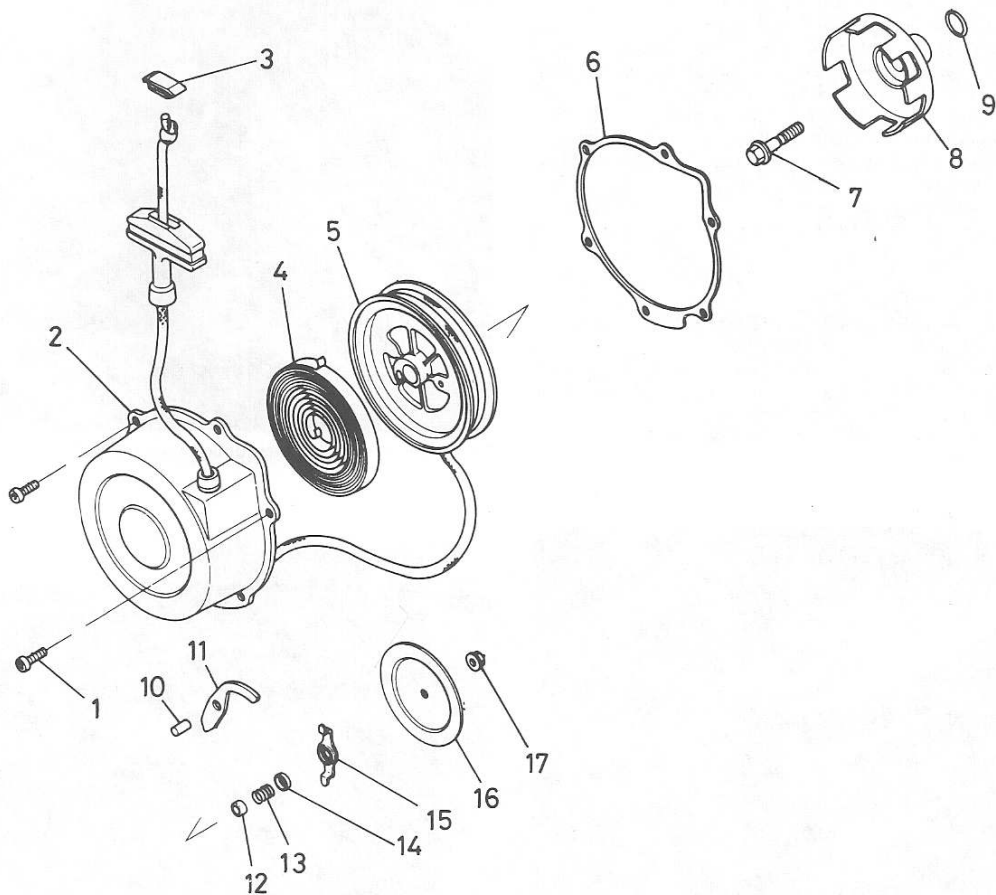


Fig. 2.10 Recoil starter – KLT160 (Sec 15)

1 Screw
2 Cover
3 Plastic plug
4 Recoil spring
5 Rope assembly

6 Gasket
7 Bolt
8 Starter pulley
9 O-ring

10 Pin
11 Pawl
12 Recoil shaft
13 Spring

14 Recoil cover
15 Recoil guide
16 Ratchet cover
17 Nut

16 Generator components – removal and installation

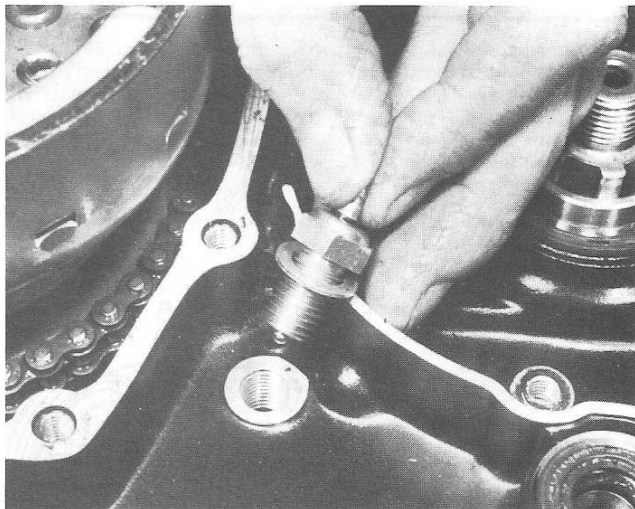
KLT110 and 160 models

- 1 Remove the recoil starter and pulley. See Section 15.
- 2 Place a container underneath the crankcase to catch any spilt oil.
- 3 Remove its mounting screw and lockwasher, then withdraw the neutral indicator.
- 4 KLT160 – Remove the front gear case cover. Unscrew its pivot bolt and remove the reverse lever and spring, then pull the shift drum stopper and dowel pin from the end of the shift drum.
- 5 KLT110 – Remove the shift pedal pinch bolt, mark the shaft so that the pedal can be refitted in the same position and pull off the pedal.
- 6 Remove the crankcase left cover retaining screws and pull off the cover noting the gasket and the two locating dowels.
- 7 Remove the generator rotor using only the specified tools. No other method of removal is recommended.
- 8 KLT110 – Holding the rotor stationary with the rotor holder 57001-306 remove the retaining bolt. Screw the puller 57001-252 into the rotor, tighten its centre bolt and draw the rotor off. If it is necessary to tap the assembly to jar free the rotor, be careful to tap the puller only, **not** the rotor. Remove the locating dowel pin, disconnect the generator wiring, remove the three retaining screws and pull out the stator plate. Note the oil seal in the centre of the stator, the O-ring around it and the gasket behind it.
- 9 On installation, smear the oil seal lips and O-ring with oil when refitting the stator and thoroughly clean the crankshaft taper and rotor bore when refitting the rotor. Ensure its keyway aligns with the crankshaft key and tighten the bolt to the specified torque setting.
- 10 KLT160 – Screw the flywheel puller 57001-1191 on to the rotor centre boss, apply an open-ended spanner to hold it stationary and thread in the rotor puller 57001-1099. Tighten the rotor puller to draw off the rotor. If it is necessary to tap the assembly to jar free the rotor, be careful to tap the puller only, **not** the rotor. Remove the Woodruff key from the crankshaft keyway.
- 11 On installation, thoroughly clean the crankshaft taper and rotor bore. Refit the key and ensure the rotor keyway aligns with it as the rotor is refitted. Tighten the bolt to the specified torque setting.

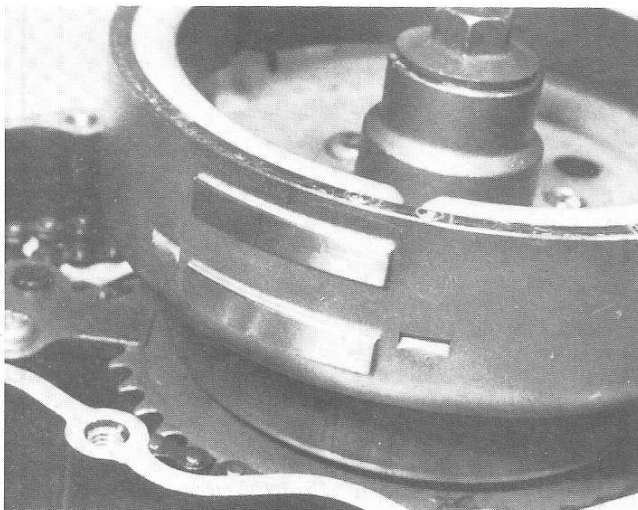
KLT200 and 250 models

- 12 KLT200 A1 – Remove the chaincase outer cover. See Chapter 6.
- 13 All other models – Remove the front chaincase.
- 14 If the exhaust pipe will prevent the removal of screws or of the cover itself, it must be removed. See Chapter 3. If the shift pedal cannot be pressed down to clear the cover, it must be removed.
- 15 Disconnect the clutch cable – KLT200 A. See Section 20.

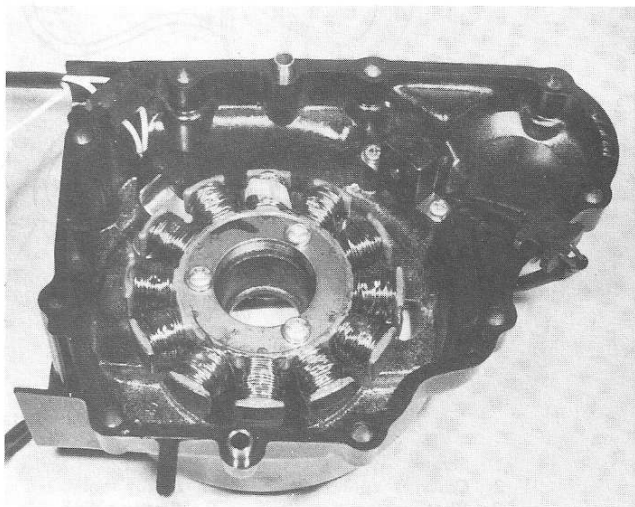
- 16 Drain the engine oil. See Chapter 1.
- 17 Disconnect the neutral switch wire from the switch and disconnect all generator wiring. Unscrew the switch if required.
- 18 Remove its retaining screws and withdraw the crankcase left cover noting its gasket and two locating dowels.
- 19 Remove the generator rotor using only the specified tools. No other method of removal is recommended.
- 20 Apply a holding tool to prevent rotation and remove the rotor retaining bolt. If anything other than the Kawasaki tool, part number 57001-308, is used be careful not to damage the magnets on the outside of the rotor.
- 21 Screw in the rotor puller 57001-1099 tightening it to draw off the rotor. If it is necessary to tap the assembly to jar the rotor free, be careful to tap the pulley only, **not** the rotor.
- 22 On installation thoroughly clean the crankshaft taper and rotor bore, then check that the key is in place in the crankshaft. Ensure the rotor keyway aligns with the key as it is refitted. Tighten the bolt to the specified torque setting. Reverse the removal procedure to install all other disturbed components.



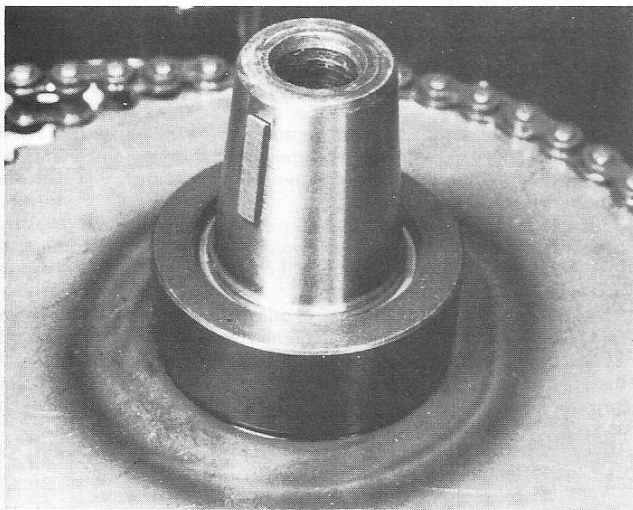
16.17 Neutral switch need only be removed if required



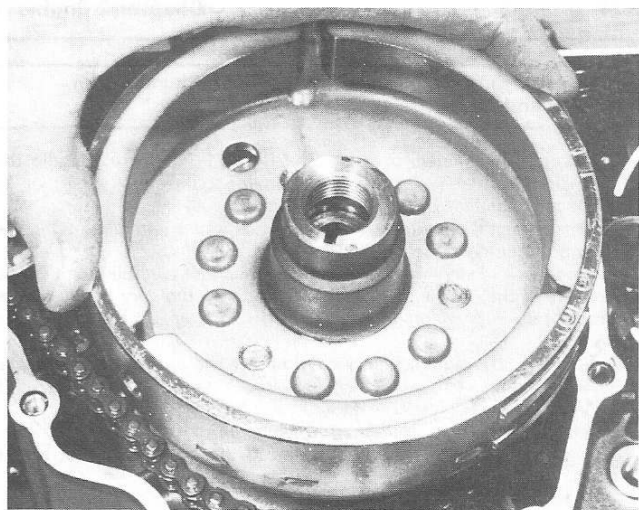
16.20 Be careful not to damage external magnets when handling rotor



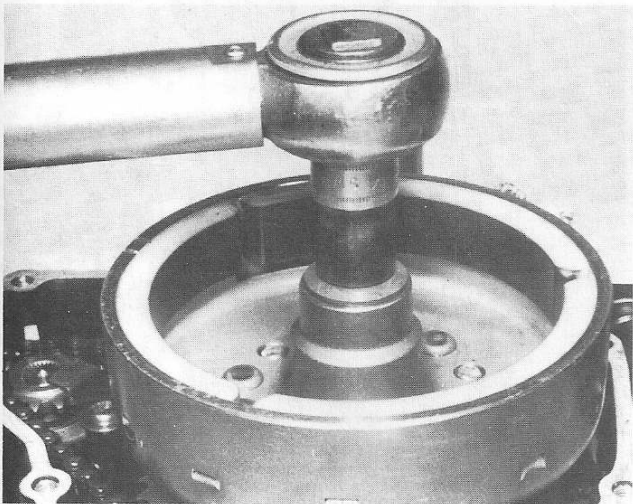
16.22a Generator stator is retained by three screws to crankcase left cover



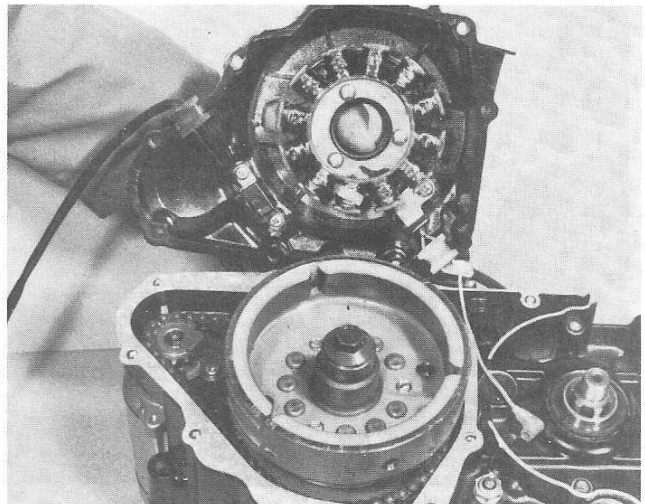
16.22b Press Woodruff key into crankshaft keyway ...



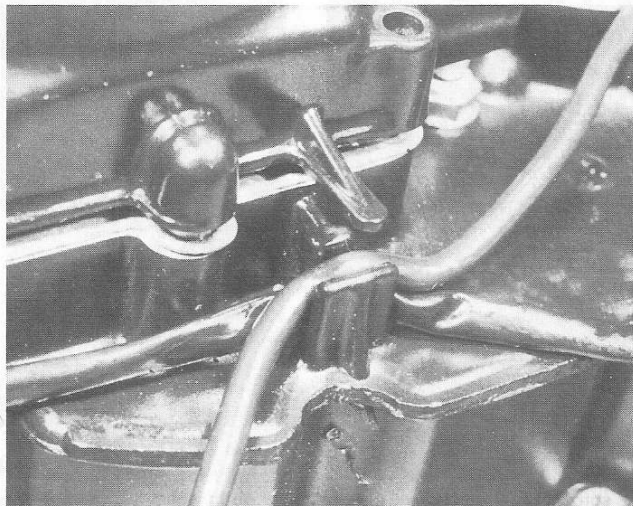
16.22c ... and align rotor keyway when installing rotor



16.22d Tighten rotor bolt to specified torque setting



16.22e Place new gasket over two dowels when refitting crankcase left cover ...



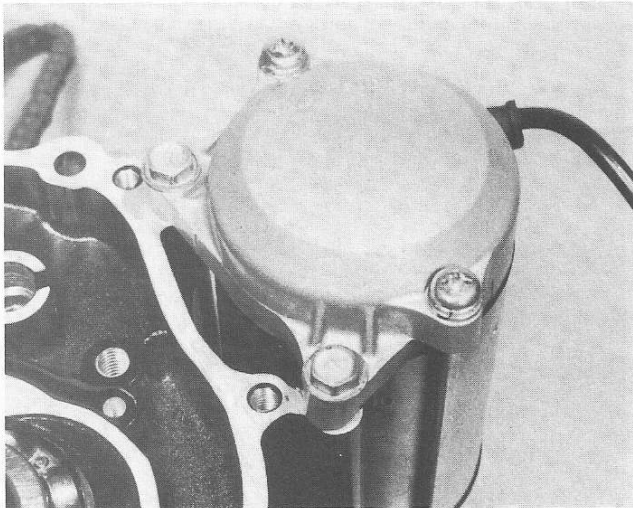
16.22f ... and ensure electrical leads are correctly routed before fastening screws

17 Starter motor and drive – removal and installation – KLT200 and 250 models

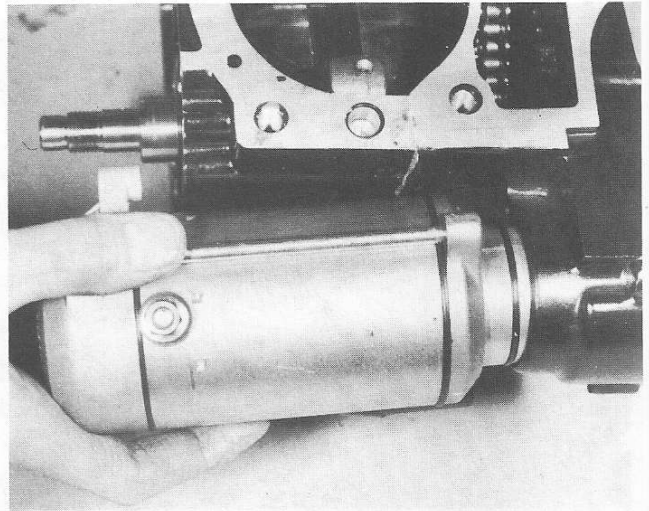
- 1 Remove the generator rotor. See Section 16. **Note:** handle the rotor carefully at all times to prevent damage to the starter clutch on its rear face or the loss of any components.
- 2 Disconnect the starter motor lead at the motor terminal, noting the order and number of washers.
- 3 Remove the starter motor retaining bolts and carefully remove the motor from the engine. If tapping is necessary, tap very gently on the motor body with a soft-faced mallet; **do not** tap on the end of the motor shaft.
- 4 Remove its single screw and withdraw the sprocket guide plate. Remove the starter motor chain and sprockets, noting that the drive sprocket shoulder faces the starter motor.
- 5 Installation is the reverse of the removal procedure.
- 6 Inspect the starter clutch by refitting the driven sprocket to the

clutch. When seen from the left side, the rotor should turn freely clockwise but not counterclockwise. If not, dismantle the clutch as follows.

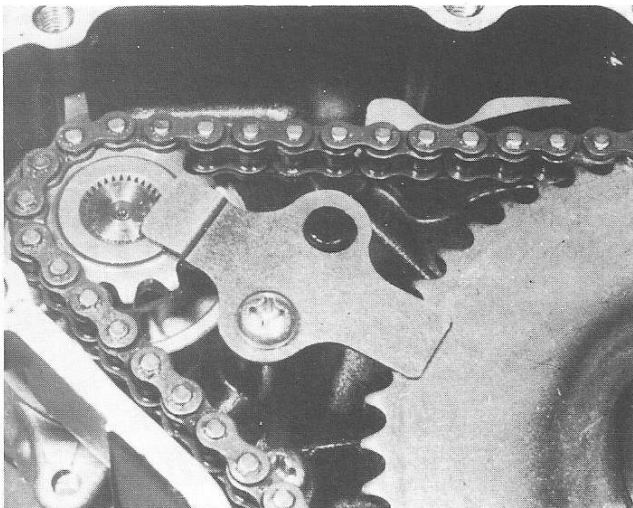
- 7 Carefully pry out the three rollers and withdraw the spring cap and spring behind each. Renew any component that is seen to be worn or damaged; these are most likely to be the items which will cause a clutch malfunction.
- 8 If necessary, the clutch body can be removed from the rotor by removing the three Allen screws. Apply thread-locking compound to their threads and tighten them to the specified torque setting on reassembly.
- 9 Measure the starter chain by anchoring one end and pulling with a force of at least 5 kg (10 lbs) on the other. Mark any one pin, count off 21 and measure the distance between the two (ie, a 20 link length). If the chain has worn to the service limit specified (see Chapter 8) or beyond, it must be renewed; also if it shows any signs of damage such as split or missing rollers or sideplates.
- 10 Examine the sprockets and renew them if they are worn or damaged.



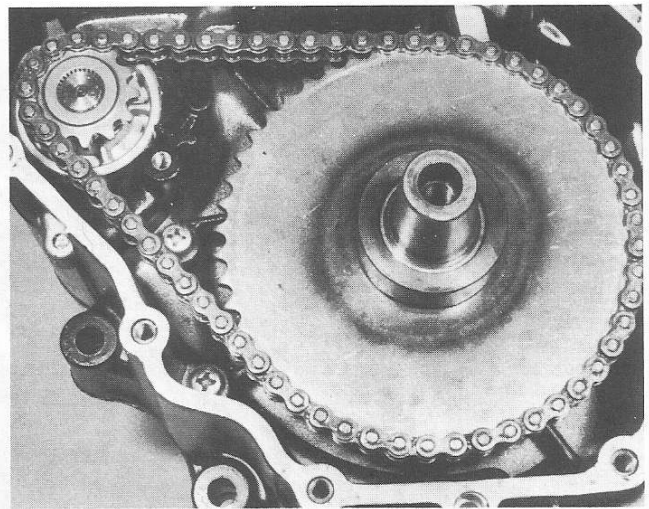
17.3a Remove two mounting bolts to release starter motor ...



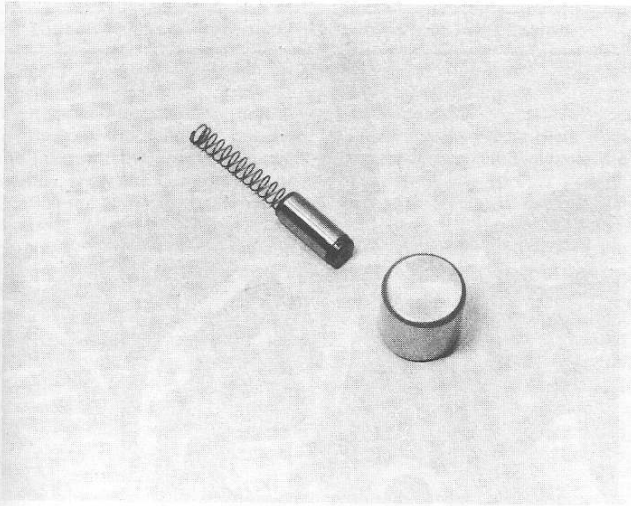
17.3b ... and pull motor from crankcase



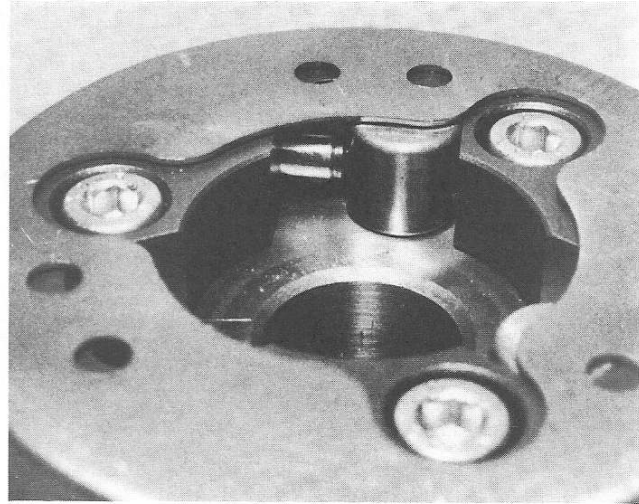
17.4a Remove single screw to release sprocket guide plate ...



17.4b ... and note which way round sprockets are fitted before removal



17.7a Check starter clutch rollers, spring caps and springs for wear ...



17.7b ... and install as shown in clutch body

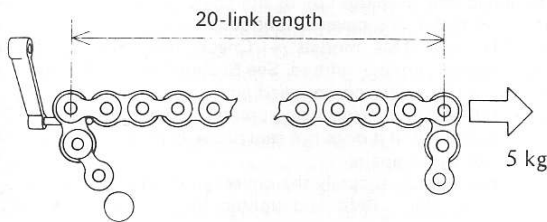


Fig. 2.11 Measuring starter drive chain – KLT200 and 250 (Sec 17)

18 Cam chain and guides – removal, examination and installation

- 1 To remove the cam chain proceed as follows:
- 2 Remove the camshaft sprocket. See Section 6. Remove the camshaft – KLT200 A1.
- 3 Remove the generator components. See Section 16.
- 4 KLT200 and 250 models – Remove the starter motor drive components.
- 5 Remove the screw(s) securing the chain guard just below the crankshaft sprocket and withdraw the guard. KLT110 model – Remove the tensioner blade pivot screw.
- 6 Drop the chain into the crankcase and withdraw it.
- 7 Measure the chain by anchoring one end and pulling with a force of at least 5 kg (10 lbs) on the other. Mark off any one pin, count off 21 pins and measure the distance between the two (ie, a 20 link length). Repeat the test at several points along the chain's length. If the chain has worn at any point to the service limit specified or beyond, it must be renewed. Check it for stiffness at any point, or for signs of obvious damage which will mean it must be renewed.
- 8 If the sprockets are chipped or worn in any way, they should be renewed.
- 9 To install the chain, pass a hooked length of wire down through the chain tunnel from the cylinder head and draw the chain up into place. Engage it on the crankshaft sprocket.
- 10 Refit the chain guard. On KLT200 and 250 models it is located by two projections on the crankcase which engage with holes in the guard. Apply thread locking compound to the threads and tighten the screw(s) securely. KLT110 model – Apply thread locking compound to its threads and refit the tensioner blade pivot screw.

- 11 To remove the chain (front) guide blade, proceed as follows:
- 12 Remove the cylinder head. See Section 9.
- 13 KLT160, 200 and 250 models – Carefully twist the guide blade out of its top mounting and withdraw it.
- 14 On installation, insert the blade into its bottom mounting notch; note the 'UP' mark identifying its upper end (KLT200 and 250 models). Twist the blade carefully to seat it in its top mounting; note the illustration accompanying Section 13.
- 15 KLT110 model – Remove the generator components. See Section 16.
- 16 Remove the guide blade bottom mounting screw and pull the guide out of the chain tunnel.
- 16 Apply thread locking compound to its threads and tighten the screw securely on installation.
- 17 To remove the chain (rear) tensioner blade proceed as follows.
- 18 Remove the cylinder head. See Section 9.
- 19 Remove the generator. See Section 16.
- 20 KLT200 and 250 models – Remove the starter motor drive components. See Section 17.
- 21 Remove the pivot screw and lift out the tensioner blade.
- 22 Apply thread locking compound to its threads and tighten the screw securely on installation.
- 23 Check the blades for wear. If any sign of damage is seen such as deep grooves exposing the metal backing or if the rubber is splitting up, the blades must be renewed.
- 24 Referring to the accompanying illustration, measure the depth of the grooves in each blade and renew them if the grooves are deeper than the specified service limit. Although limits are not specified for KLT110 and 160 models, a similar limit should be applied.

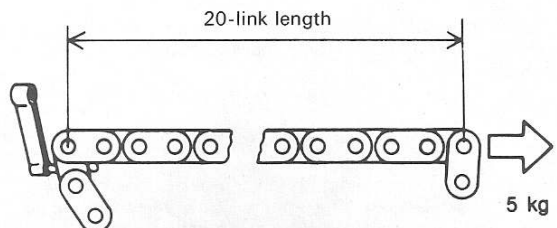
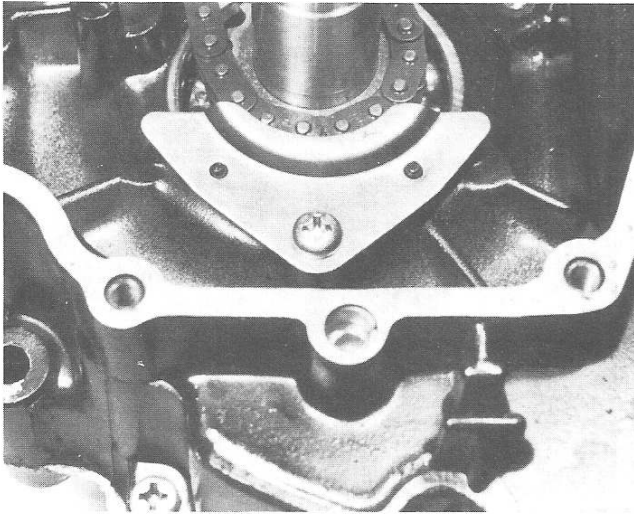
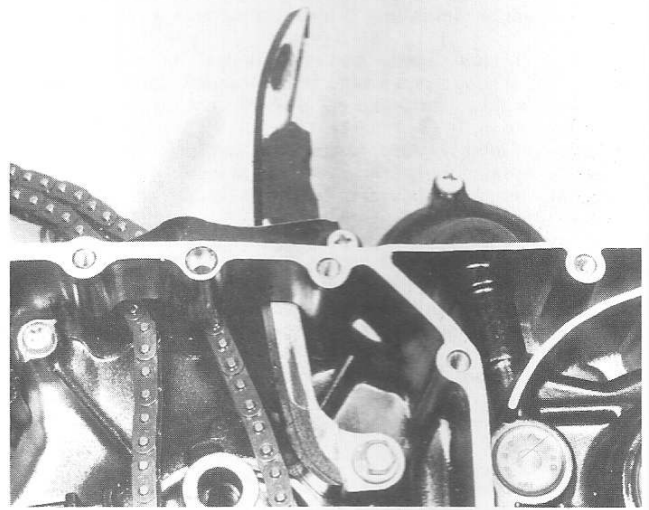


Fig. 2.12 Measuring the cam chain (Sec 18)



18.10 KLT200, 250 – cam chain guard is retained by single screw and located by two crankcase projections



18.21 Cam chain tensioner blade is retained by a single pivot screw

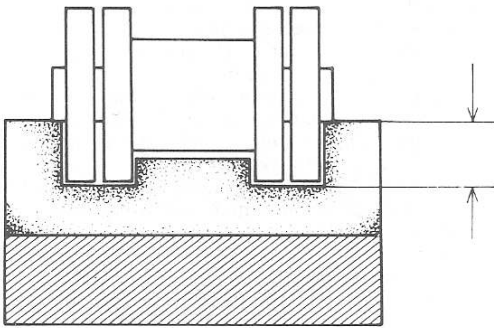


Fig. 2.13 Checking cam chain tensioner and guide blades (Sec 18)

19 Crankcase right cover – removal and installation

- 1 Drain engine oil. See Chapter 1.
- 2 KLT200, 250 – Remove oil filter element. See Chapter 1.
- 3 If the brake pedal will prevent the removal of any screws or of the cover itself, slacken off the brake adjuster and use the pedal height adjusting bolt to depress the pedal clear of the cover. Do not forget to reset the required pedal height and to adjust the rear brake on reassembly.
- 4 KLT200 A model – Remove the six footpeg mounting bolts and washers, remove the mounting brackets and remove the footpeg assembly.
- 5 KLT200 B, C and 250 models – Remove the clutch release. See Section 20.
- 6 KLT110 model – Remove the screw securing the external oil feed pipe to the crankcase cover.
- 7 Remove the cover retaining screws. Tap the cover with a soft-faced mallet to break the joint and lift the cover away. Take care not to dislodge any component. Note the two locating dowels.
- 8 On installation, check that the cover and crankcase gasket surfaces are completely clean. Press the two locating dowels into their crankcase recesses and fit a new cover gasket over them. Check that all components have been refitted.
- 9 KLT200 A1, A2, and A3 models – Smear grease over the kickstart

shaft splines and over the lips of the shaft oil seal. Take care not to damage the seal as the cover is refitted.

10 KLT110 and 160 models – Check that the clutch release components are correctly refitted. See Section 20. Check that the cover oilways are clear, using compressed air.

11 Lower the cover into place and press it down on the gasket. Do not use excessive force. If it does not seat properly remove it and rectify the cause before trying again.

12 Refit and tighten securely the cover retaining bolts.

13 KLT110 model – Refit and tighten the oil feed pipe mounting screw.

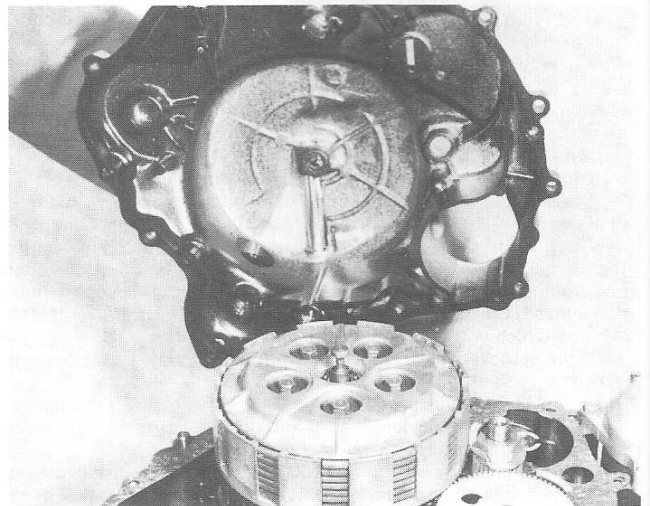
14 KLT200 B, C and 250 models – Refit the clutch release. See Section 20.

15 KLT200 A model – Refit the footpeg assembly.

16 KLT200 and 250 models – Fit the oil filter element. See Chapter 1.

17 Fill the engine with oil and check the level. See Chapter 1.

18 KLT110 and 160 models – Adjust the clutch. See Chapter 1.



19.8 Always use a new gasket and check that all components are in place before installing crankcase right cover

20 Clutch release – removal, inspection and installation

KLT110 model

- 1 Remove the crankcase right cover. See Section 19.
- 2 Remove the clutch release cam, ball assembly and lever plate from the inside of the cover, unscrew the adjuster locknut and remove the washer, shaft and O-ring from the cover.
- 3 Pull the clutch release lever off the shift shaft splines.
- 4 Unscrew the three screws and their washers, pull the pusher plate, complete with a ball bearing, off the clutch housing and remove the three bushings, collars and pusher pins.
- 5 Clean all components and renew any that are damaged or worn. Check particularly all points of contact such as the ball assembly and cam and lever plate tracks. Renew the O-ring if it is damaged, deteriorated, compressed or hardened.
- 6 Installation is the reverse of the removal procedure. Note that the pusher plate ball bearing is fitted with its shielded face to the inside.
- 7 Fit the clutch release lever to the shift shaft splines so that the peg on its upper end faces outwards and is in line with the centers of the shift shaft and crankshaft.
- 8 When refitting the release lever plate note that its large notch must be in line with the boss machined in the cover to take the end of the shift shaft.
- 9 On refitting the cover, the peg on the release lever must engage with the notch in the lever plate.

KLT160 model

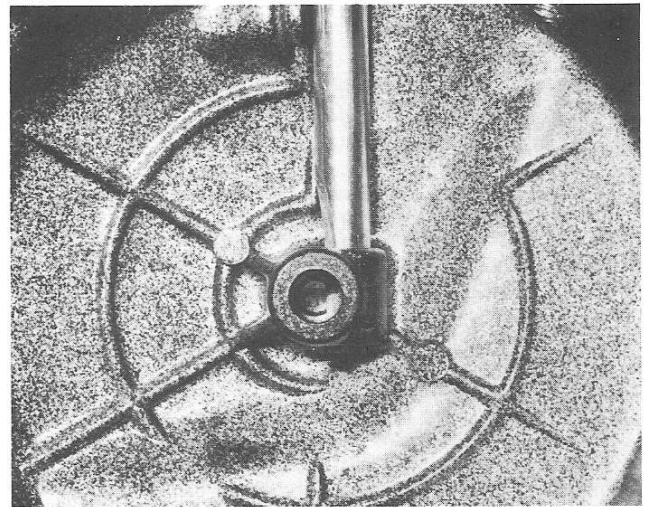
- 10 Remove the crankcase right cover. See Section 19.
- 11 Remove the adjuster cover, unscrew the adjuster locknut and release screw then remove the washer and O-ring.
- 12 Pull the release lever and spring out of the cover. Carefully pry out the E-ring, remove the clevis pin and separate the holder from the release lever. Remove the release cams and ball assembly from the shift shaft and the release pin and ball bearing from the housing.
- 13 Clean all components and renew any that are damaged or worn. Check particularly all points of contact such as the ball assembly and cam tracks and the lever bearing points and spring. Renew the O-ring if it is damaged, deteriorated, compressed or hardened.
- 14 Installation is the reverse of the removal procedure. Fit the ball bearing and release pin to the secondary clutch housing (lifter plate). Apply a thin coat of molybdenum disulphide grease to the release pin. When refitting the release cams note that the notch on each must engage with the torque on the shift shaft and that the ball assembly is fitted between the cams with its inner projecting lip facing inwards.

KLT200 A

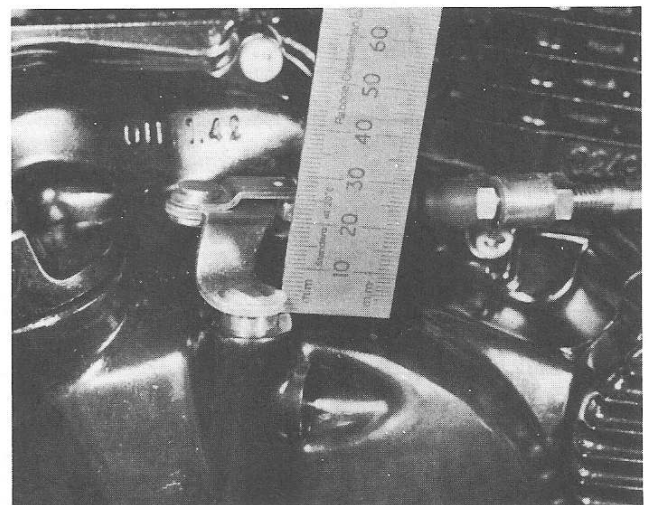
- 15 KLT200 A1 model – Remove the outer chaincase. See Chapter 6.
- 16 Slacken fully the adjuster locknuts and screw in fully the adjusters to gain the maximum cable free play, then unhook the cable lower end nipple from the release lever and pull the cable out of its bracket in the crankcase left cover.
- 17 KLT200 A2, A3, A4 and A4A models – remove the outer front chain case.
- 18 Remove fully its pinch bolt and pull the release lever off the release shaft splines. Rotate the shaft counterclockwise (seen from below) to push out the release rack and its rubber cap; refit the lever to the shaft to gain sufficient purchase for this to be done.
- 19 Remove the release shaft guide bolt which is hidden behind the shaft boss and pull out the shaft.
- 20 The clutch pushrod and lifter cannot be removed until the clutch spring plate has been removed. See Section 21.
- 21 Clean all components and renew any that are damaged or worn. Always renew the shaft O-ring whenever it is disturbed.
- 22 Installation is the reverse of the removal procedure. Grease the shaft and fit the new O-ring, insert the shaft into the cover then refit and tighten securely the guide bolt. Check that the shaft rotates easily.
- 23 Grease the rack and push it into place while rotating the shaft. Press lightly on the rack and rotate the shaft as far as possible clockwise until it becomes hard to turn. Refit the release lever so that the lever raised edge aligns with that of the cover. Refit and tighten securely the lever pinch bolt and press the rack rubber plug into its recess.
- 24 Adjust the clutch. See Chapter 1.
- 25 Refit the chaincase.

KLT200 B, C and 250 models

- 26 Slacken fully the adjuster locknuts and screw in fully the handlebar adjuster to gain maximum cable free play. Unhook the cable lower end nipple from the release lever and pull the cable out of the adjuster bracket. If the crankcase right cover is to be removed, unscrew its retaining screw and remove the bracket.
- 27 Rotate the release lever counterclockwise to the rear until it can be pulled upwards out of the cover.
- 28 The pull rod can be removed only after the clutch spring plate has been removed. See Section 21.
- 29 Clean all components and renew any that are damaged or worn. Check particularly for wear between the release lever and the pullrod and between the release lever and its bearing surface in the crankcase right cover. Renew the O-ring if it is damaged, deteriorated, compressed or hardened.
- 30 Installation is the reverse of the removal procedure. Grease the release lever before refitting it. Note that there should be 2 – 3 mm clearance between the lever and the clutch cover when the lever is fully installed.



20.29 Clutch release, KLT200 B, C, KLT250 – check for wear at release lever bearing surfaces ...



20.30 ... on installation, check for correct clearance between release lever and cover

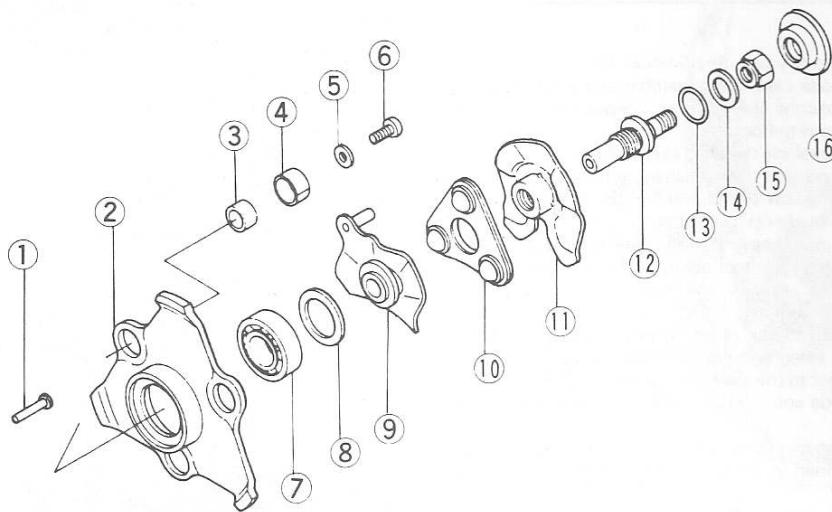


Fig. 2.14 Clutch release mechanism – KLT110 (Sec 20)

- | | | | |
|----------------|-----------|------------------|---------------|
| 1 Pusher pins | 5 Washers | 9 Cam | 13 O-ring |
| 2 Pusher plate | 6 Screws | 10 Ball assembly | 14 Washer |
| 3 Bushings | 7 Bearing | 11 Lever plate | 15 Locknut |
| 4 Collars | 8 Spacer | 12 Shaft | 16 Rubber cap |

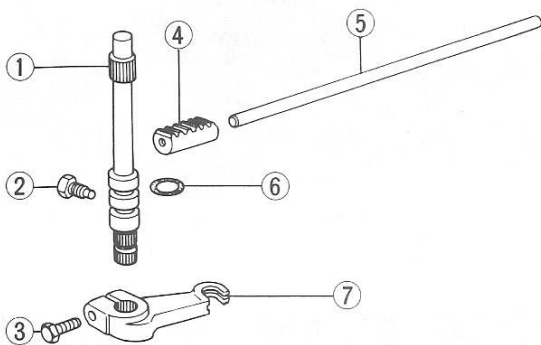


Fig. 2.15 Clutch release mechanism – KLT200 A (Sec 20)

- | | |
|----------|-----------------|
| 1 Pinion | 5 Pushrod |
| 2 Bolt | 6 O-ring |
| 3 Bolt | 7 Release lever |
| 4 Rack | |

21 Clutch and primary drive – removal, inspection and installation

Removal and installation – KLT110 model

- 1 Remove the clutch release mechanism. See Section 20.
- 2 Prevent rotation by wedging a tightly-folded piece of rag between the teeth of the primary and secondary gears, then remove the clutch retaining nut and washer. Do not forget to unscrew the secondary gear retaining nut if the gear is to be removed.
- 3 Pull the clutch off the crankshaft as a single unit and withdraw the primary gear collar, if separated, and the oil pump drive gear.

4 Pull the secondary gear off the input (drive) shaft and remove the collar behind it.

5 Installation is the reverse of the removal procedure. Tighten the retaining nuts to their specified torque settings. The oil pump drive gear is fitted with its marked surface outwards.

6 Dismantle the clutch as follows, noting carefully how each component is installed:

7 Note how the teeth of the spring are engaged with the raised teeth of the rearmost steel plate. Wrap the clutch in thick rag to prevent the risk of personal injury and carefully pry out the large retainer circlip to release spring pressure.

8 With spring pressure fully released, unwrap the clutch and withdraw the retainer, the spring and the first two steel plates. Note the difference between the two plates and the three holes in their outer tangs which engage with three pins.

9 Withdraw the first friction plate, the next steel plate and the second friction plate. Noting the springs on its projecting pins and the way it is fitted into the clutch housing, withdraw the middle steel plate. Remove the last friction plate and the last steel plate. All friction plates are the same and can be refitted either way round but the steel plates must be kept in their exact positions and the right way round so that they can be refitted easily.

10 Remove the clutch hub and primary gear assembly. These can be separated by removing the large circlip. Finally remove the spacer and the centrifugal spring.

11 Installation is the reverse of disassembly. Apply a coat of engine oil to all clutch plates before refitting. When compressing the spring to fit the retainer, take great care to prevent the risk of personal injury and check that the retainer is fully seated before fitting the clutch.

Removal and installation – KLT160 model

- 12 Remove the crankcase right cover. See Section 19.
- 13 Remove the recoil starter. See Section 15.
- 14 Apply a holding tool to the starter pulley to prevent crankshaft rotation (a strap wrench will do if the Kawasaki tool part number 57001-1025 is not available) remove the primary clutch retaining nut. Slacken the secondary clutch spring bolts.
- 15 Draw off the primary clutch assembly using a legged puller of

suitable size. Take care not to distort the clutch housing or the crankshaft end if the clutch is a tight fit. Remove the oil pump drive gear.

16 Remove the primary clutch hub assembly and inner race from the clutch housing. Rotate the inner race clockwise to release it from the one-way clutch, which can then be withdrawn.

17 Remove the release pin and ball bearing from the secondary clutch bearing housing. Slacken progressively and in a diagonal sequence the spring bolts until they can be removed, followed by the bearing housing and the clutch springs.

18 If the Kawasaki tool part number 57001-1192 is not available to prevent the clutch from rotating while the retaining nut is removed, if the engine is in the frame select top gear and apply the rear brake to lock the transmission. If the engine is out of the frame fit two of the springs over their (diagonally opposite) posts then tighten down the two spring bolts with large plain washers replacing the bearing housing. Refit temporarily the primary clutch housing and wedge a tightly-folded piece of rag between the teeth of the primary drive gears.

19 Remove the clutch retaining nut. Remove the springs (if used to lock the clutch). Withdraw as a single unit the clutch hub and operating plate with the friction and steel plates.

20 Withdraw the first thrust washer, the clutch housing, its bearing collar and the second thrust washer.

21 On installation, apply a coat of engine oil to all clutch friction and steel plates. Build them up on the clutch hub starting with a friction plate then alternating steel and friction plates. Fit the operating plate to the rear of the assembly, noting that a mark on its rear surface must be aligned with a mark on the rear of the hub.

22 Temporarily insert the assembly into the housing, aligning the tongues of the friction plates. Remove the housing and fit the first thrust washer to the input (drive) shaft followed by the bearing collar, the housing and the second thrust washer.

23 Select first gear. Holding the plate assembly by two spring posts, offer it up to the housing so that the friction plate tongues enter the housing grooves. As the hub starts to engage the input shaft rotate, with a finger through the aperture in the crankcase wall, the output shaft first gear pinion so that the input shaft rotates until the hub splines align with it and the plate assembly can be pushed fully into place. Lightly oil the retaining nut before fitting it.

24 Lock the clutch by the method used on removal and tighten the retaining nut to its specified torque setting. Refit the springs and bearing housing, then tighten the bolts evenly and progressively to the specified torque setting. Refit the ball bearing and release pin, applying a coat of molybdenum disulphide grease to it.

25 Check that the clutch is correctly reassembled. If the operating plate is correctly installed on the hub there will be a gap between the operating plate and the clutch housing and the clutch plates will have no free play.

26 On installing the primary clutch, note that a projection on the one-way clutch cage should be inserted first into the housing groove, then the clutch is installed completely. Fit the oil pump drive gear with its groove engaging with the crankshaft pin.

27 Press the primary clutch hub as far as possible into place by hand only, then refit the retaining nut (lightly oiled) and screw it down until the hub seats. Lock the crankshaft and tighten the nut to its specified torque setting.

Removal and installation – KLT200 and 250 models

28 Remove the crankcase right cover. See Section 19.

29 Remove the oil pump if the primary drive gear is to be removed. See Section 23.

30 Flatten back the raised section of the primary drive gear retaining nut lock washer. Wedge a tightly-folded piece of rag between the primary drive gear teeth and remove the retaining nut.

31 Remove the lock washer, the oil pump drive gear and pin, the plain washer and the primary drive gear.

32 To remove the clutch slacken progressively and in a diagonal sequence the clutch spring bolts until they can be removed with their washers and the springs. Early KLT200 A1 models are fitted with separate spring seats which should also be removed.

33 Lift off the spring plate and press out the push rod/pull rod and ball bearing. The clutch push rod can now be extracted from the input (drive) shaft (KLT200 A). Remove the friction and plain plates.

34 Remove the circlip and the flat washer, then pull off the clutch hub. Some early KLT200 A models may have a thrust washer fitted behind it. Pull the clutch housing off the input shaft.

35 Installation is the reverse of the removal procedure, noting the following points.

36 On KLT200 B, C and 250 A2, C and P models the balancer timing must be set as the clutch housing is refitted. Refer to Section 24.

37 Having refitted the clutch housing, thrust washer (where fitted), and clutch hub, apply a coat of engine oil to both friction and steel plates. Fit a friction plate first, noting from the accompanying illustration the way in which friction plates fitted to later models should be fitted, then build up the plates alternating steel plates with friction plates.

38 Do not forget to fit the clutch pushrod (KLT200 A). Coat the smaller diameter end of the pushrod/pull rod with molybdenum disulphide grease and insert it into the input shaft.

39 As the spring plate is refitted, align the arrow mark on its outer surface with the punch mark on the hub. Tighten the spring bolts evenly and in a diagonal sequence to the specified torque setting.

40 The primary drive gear is refitted with its bevelled side towards the crankshaft so that the flat punch-marked face is outwards. Align the gear keyway with the key.

41 Do not forget to fit the oil pump drive pin. The pump drive gear is fitted with its notched face outwards. Refit the retaining nut lock washer so that the projecting ear engages in the pump drive gear notch. Tighten the retaining nut to the specified torque setting and bend up part of the lock washer against one of its flats (photo).

Inspection – all models

42 If the lining material of the friction plates smells burnt or if it is glazed or damaged at any point, new parts are required. If the metal clutch plates are scored or discoloured, they must be replaced with new ones. Measure the thickness of each friction plate (photo) and compare the results to the Specifications. Replace any severely worn plates with new ones.

43 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 plate. Do this at several places around the plate circumference. If the feeler gauge can be slipped under the plate it is warped and should be replaced with a new one.

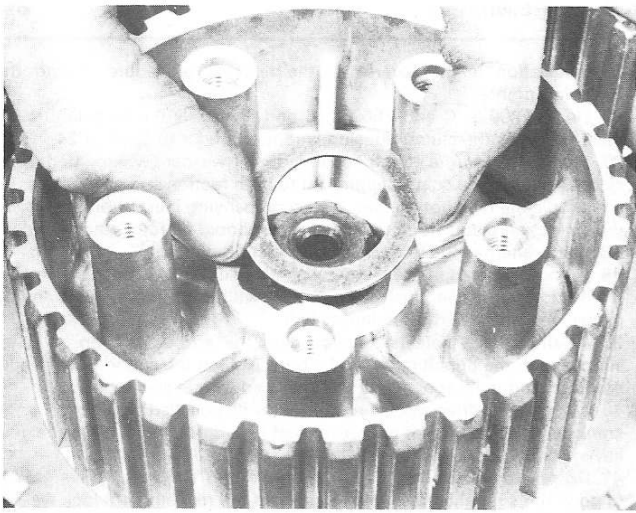
44 Check the tongues on the friction plates for excessive wear and mushroomed edges. They can be cleaned up with a file if the deformation is not severe. Check the edges of the slots in the clutch outer for indentations made by the friction plate tongues. If the indentations are deep, they can prevent clutch release, so the outer 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 provided that this does not enlarge the friction plate/clutch housing clearance beyond the limit specified (see accompanying illustration). Similarly check the fit of the steel plates in the housing or hub splines, again the careful use of a fine file may remove any notches that have formed. Also, check the primary gear teeth for cracks, chips and excessive wear. If the gear is worn or damaged, the clutch outer must be replaced with a new one, but light damage may be removed by an oilstone.

45 Where the clutch or secondary gear rotates on a shaft, measure the clutch or gear internal diameter and the outside diameter of the shaft or bearing collar on which it rotates. Compare the measurements obtained with those specified and renew any component which has worn to the limit specified or beyond. Check also for signs of scoring, galling and other wear or damage.

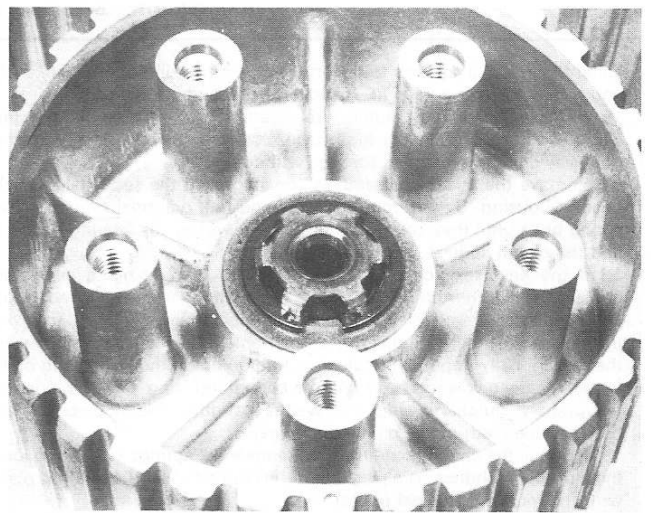
46 Where spring free lengths are specified, the springs should be measured and renewed if shortened excessively. Where free lengths are not given, the manufacturers recommend that the spring tension be checked, and for owners having the means of checking this, the specified nominal and service limit pressures are given in the Specifications section. In practice, however, few owners will have suitable equipment to perform this test, and if clutch slip has been evident, and the clutch friction plates are not worn, it can safely be assumed that the springs require renewal. Alternatively, suspect springs can be taken to a Kawasaki Service Agent for checking.

47 KLT160 model – Renew the primary clutch hub assembly if it shows any sign of wear or damage or if the grooves in the friction material have worn away to the specified limit or less.

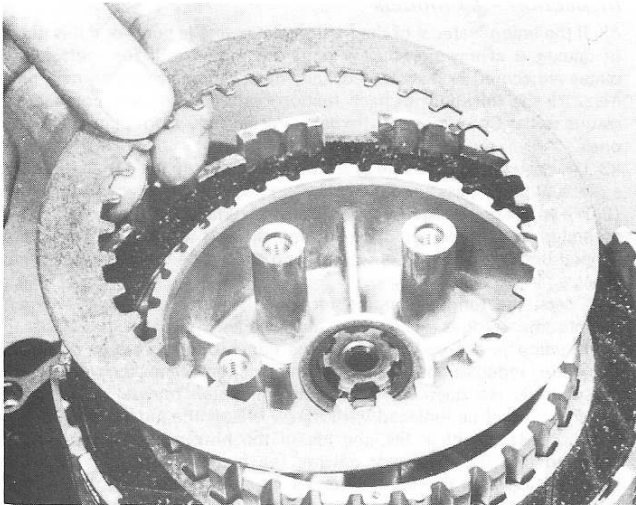
48 The one-way clutch is tested by reassembling it temporarily and refitting to the crankshaft. If the housing can be rotated easily counterclockwise but locks when rotated clockwise the clutch is functioning properly. If not, or if it shows signs of wear or damage, it must be renewed.



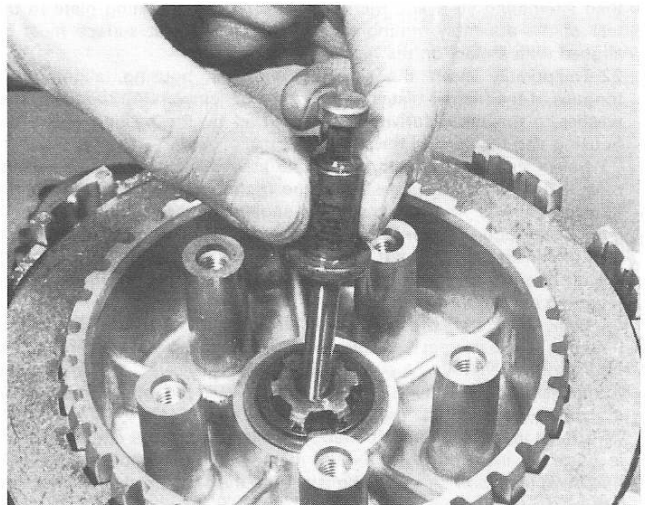
21.37a Fit clutch hub to input shaft, followed by the flat washer ...



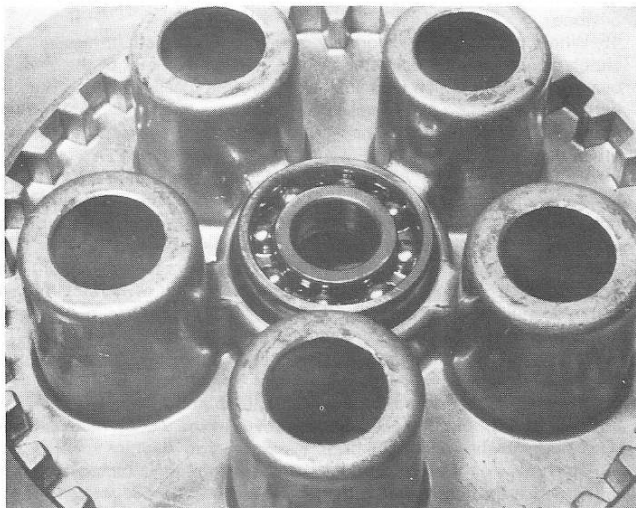
21.37b ... and secure by installing circlip, as shown



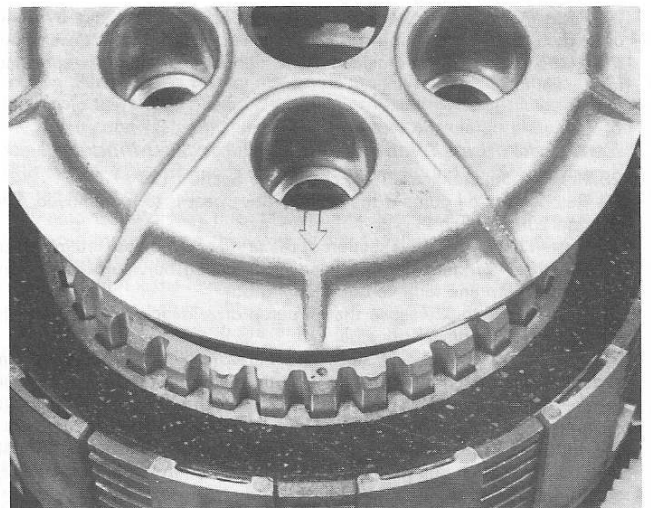
21.37c Install friction and plain plates alternately, noting correct fitting of later type of friction plate



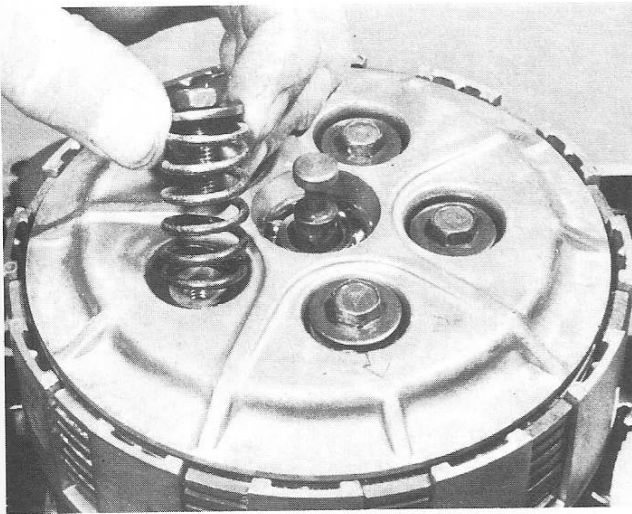
21.38a Apply specified grease to pull rod smaller end before installing ...



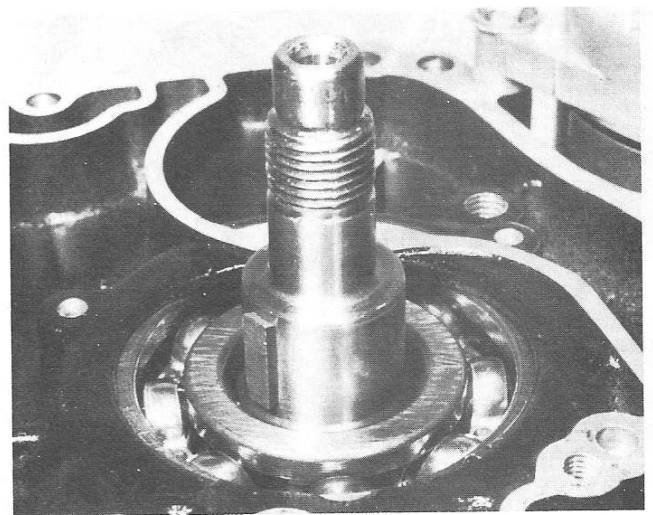
21.38b ... do not omit to install thrust bearing in spring plate



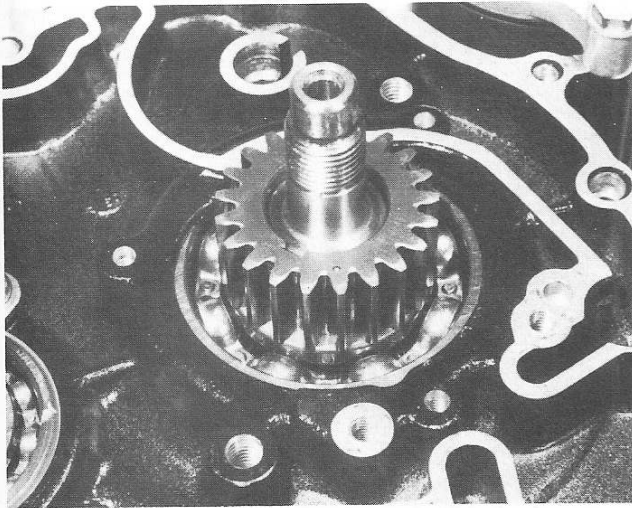
21.39a Install spring plate so that arrow mark aligns with hub punch mark



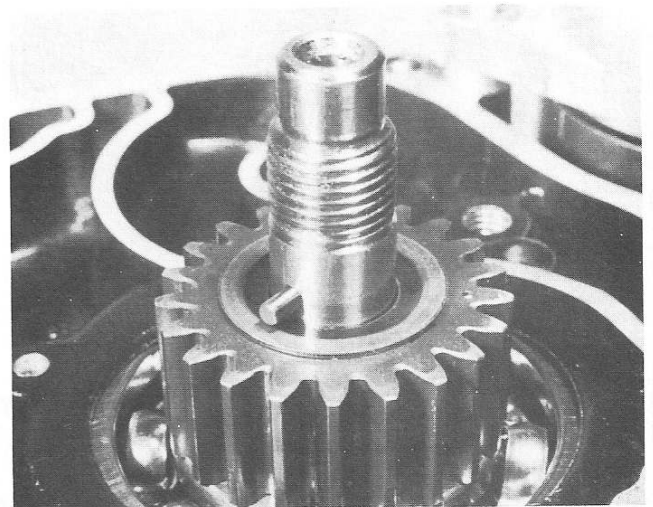
21.39b Tighten spring bolts evenly and to specified torque setting



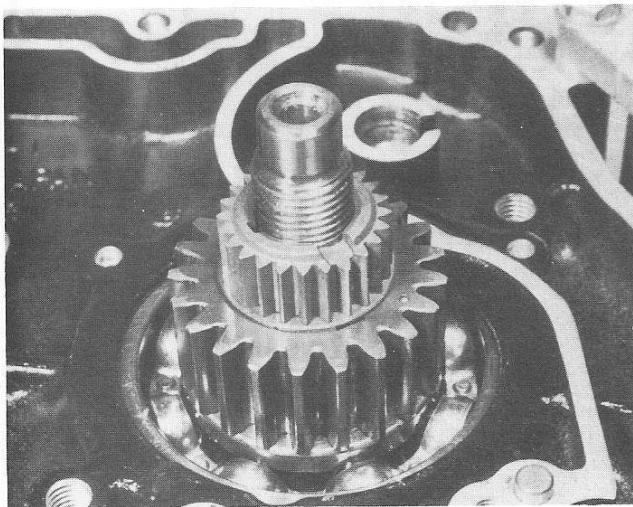
21.40a Fit Woodruff key into crankshaft keyway ...



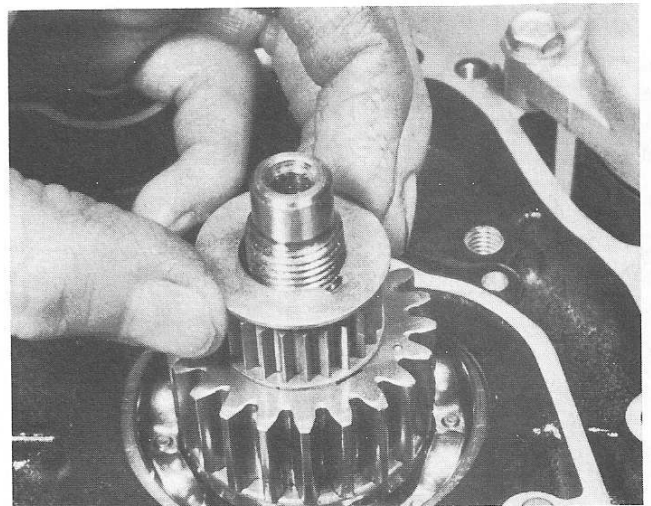
21.40b Fit primary drive gear with flat, punch-marked face outwards ...



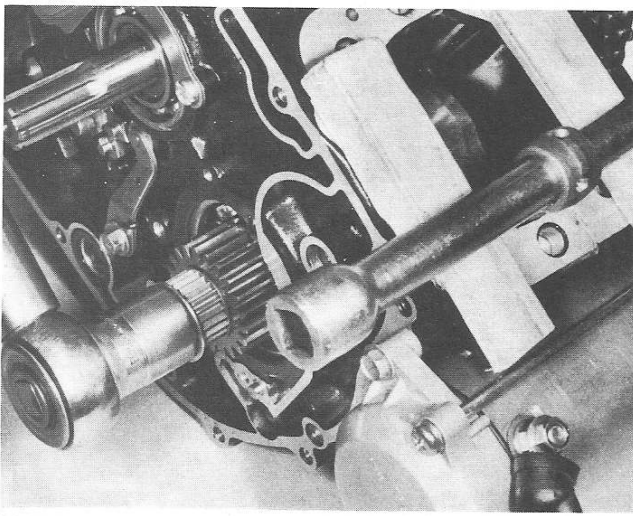
21.41a ... followed by the plain washer and oil pump drive pin



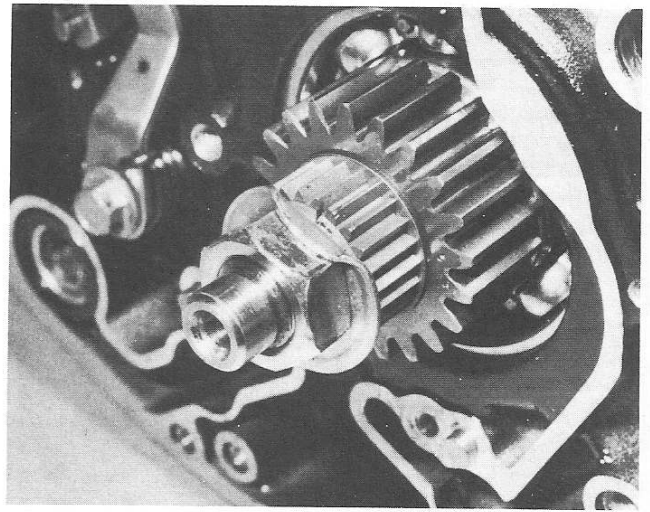
21.41b Note notch in one face of oil pump drive gear. This must face outwards ...



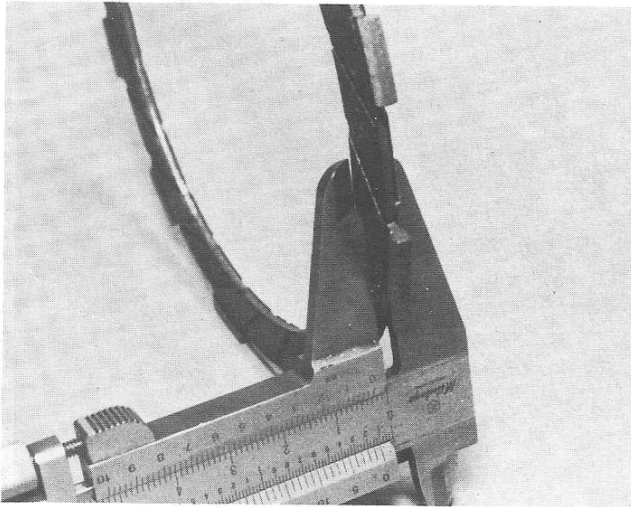
21.41c ... to engage with raised ear of retaining nut lock washer



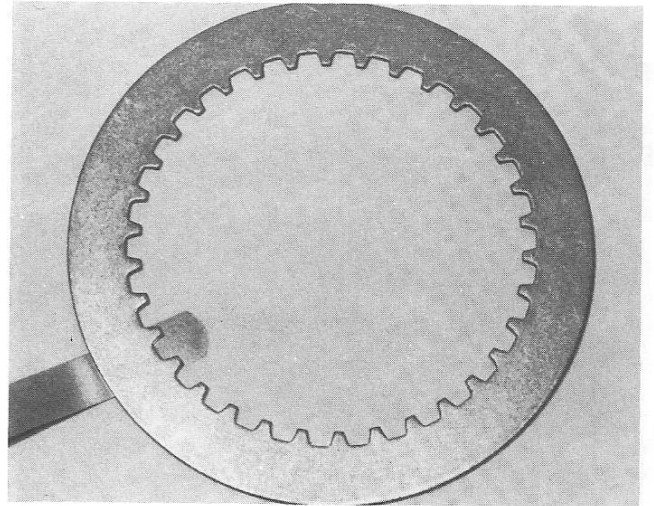
21.41d Tighten retaining nut to specified torque setting – note method used to lock crankshaft



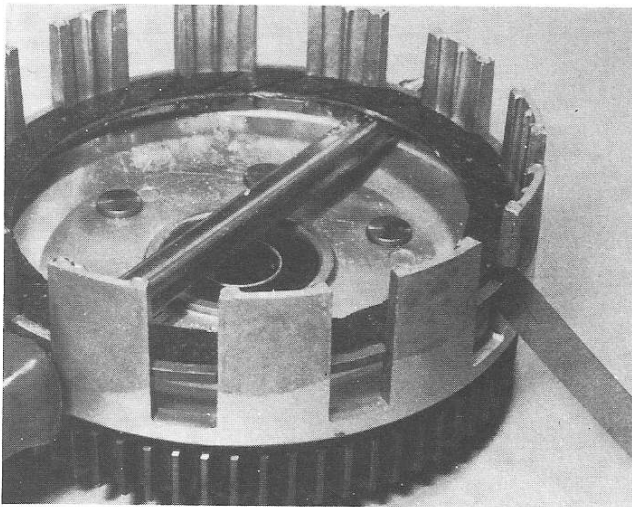
21.41e Secure nut by bending up one part of lock washer as shown



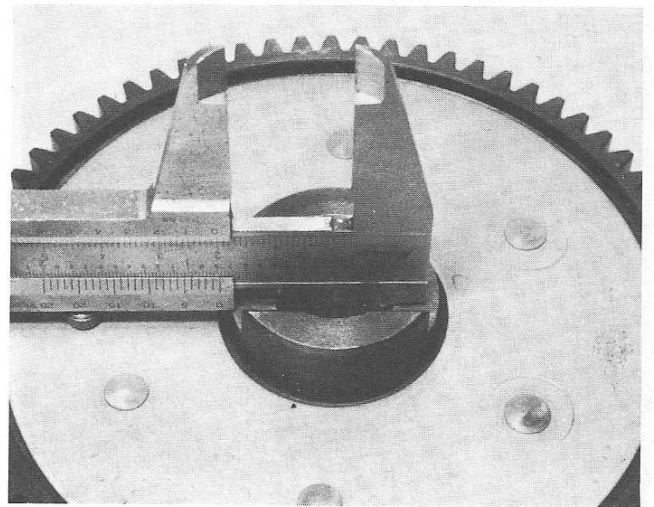
21.42 Measuring thickness of clutch friction plates



21.43 Checking for warpage of clutch plain plates



21.44 Checking the clearance between friction plate tangs and clutch housing



21.45 Measuring internal diameter of clutch housing centre bore

Fig. 2.16 Clutch components – KLT110 (Sec 21)

- 1 Retainer
- 2 Clutch spring
- 3 Steel plate
- 4 Steel plate
- 5 Steel plate
- 6 Springs
- 7 Steel plate
- 8 Friction plates
- 9 Circlip
- 10 Clutch hub
- 11 Primary gear
- 12 Steel plate
- 13 Spacer
- 14 Centrifugal spring
- 15 Clutch housing

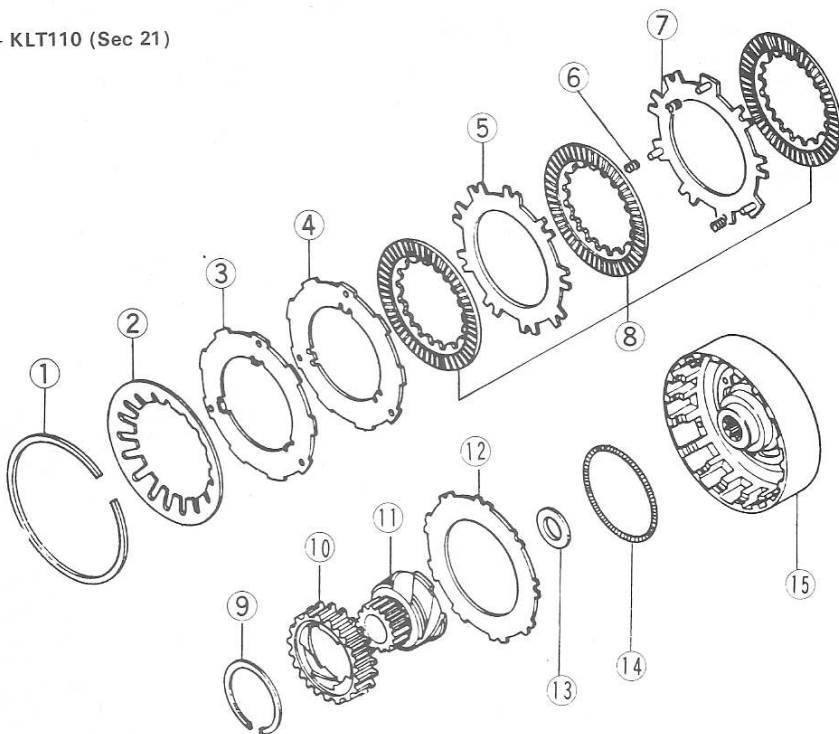
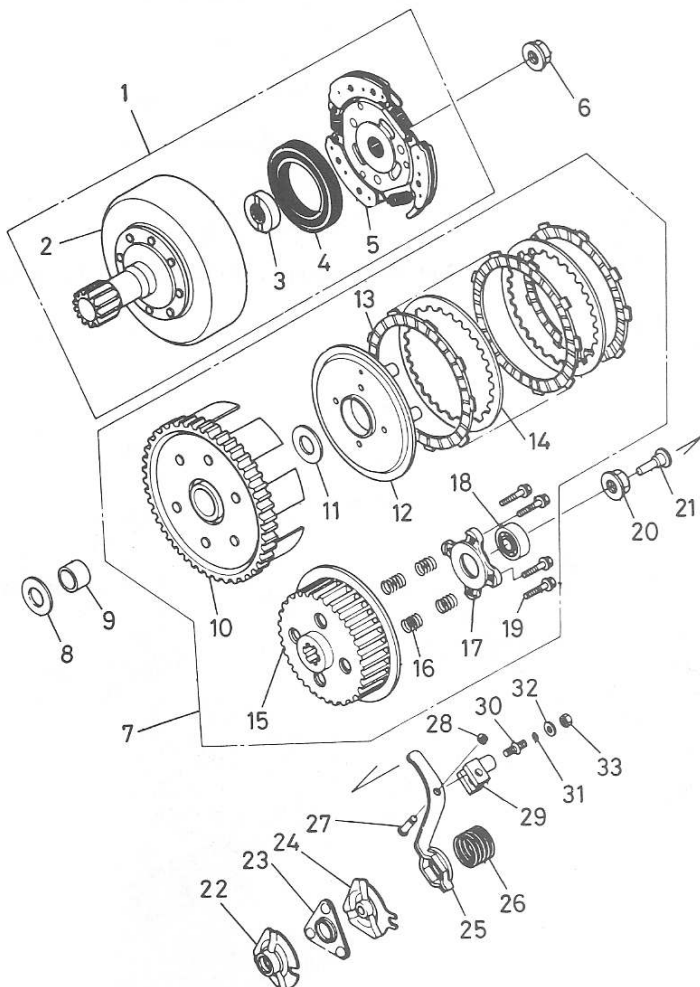


Fig. 2.17 Clutch components – KLT160 (Sec 21)



- 1 Primary clutch assembly
- 2 Clutch housing
- 3 Inner race
- 4 One-way clutch
- 5 Shoe assembly
- 6 Nut
- 7 Secondary clutch
- 8 Thrust washer
- 9 Sleeve
- 10 Clutch housing
- 11 Thrust washer
- 12 Clutch hub
- 13 Friction plate
- 14 Steel plate
- 15 Spring plate
- 16 Spring
- 17 Bearing holder
- 18 Bearing
- 19 Bolt
- 20 Nut
- 21 Release pin
- 22 Inner release cover
- 23 Ball assembly
- 24 Outer release cam
- 25 Clutch release lever
- 26 Spring
- 27 Clevis pin
- 28 Circlip
- 29 Holder
- 30 Adjuster screw
- 31 O-ring
- 32 Washer
- 33 Locknut

Fig. 2.18 Clutch components – KLT200 A (Sec 21)

- 1 Clutch housing
- 2 Thrust washer
- 3 Clutch hub
- 4 Friction plate
- 5 Steel plate
- 6 Washer
- 7 Circlip
- 8 Spring plate pusher
- 9 Spring plate
- 10 Spring seat – early models only
- 11 Spring
- 12 Bolt
- 13 Washer

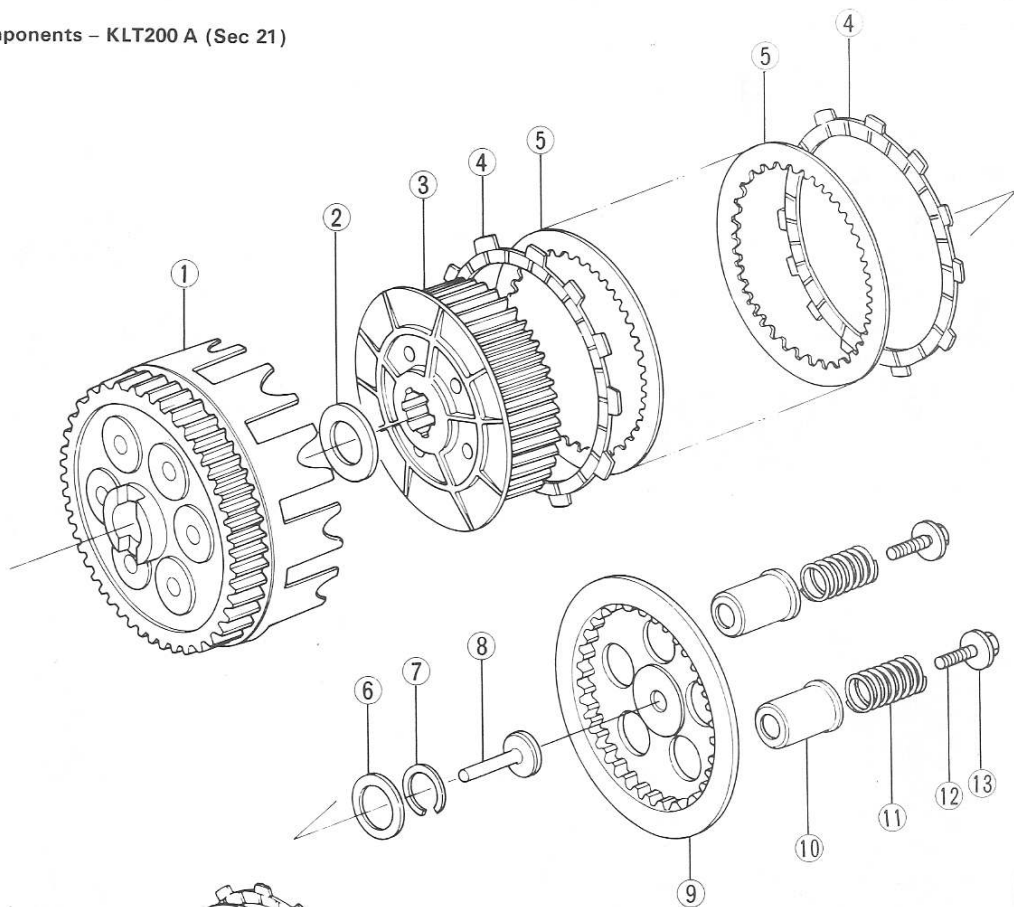
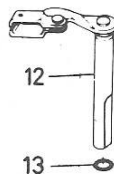
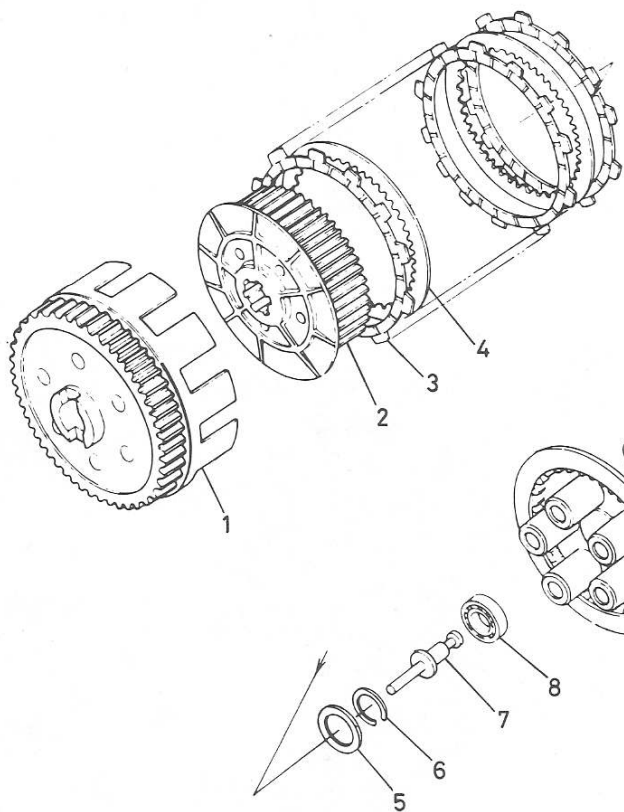


Fig. 2.19 Clutch components – KLT200 B, C and 250 (Sec 21)



- 1 Clutch housing
- 2 Hub
- 3 Friction plate
- 4 Steel plate
- 5 Thrust washer
- 6 Circlip
- 7 Pusher
- 8 Bearing
- 9 Spring plate
- 10 Spring
- 11 Bolt
- 12 Release lever
- 13 O-ring

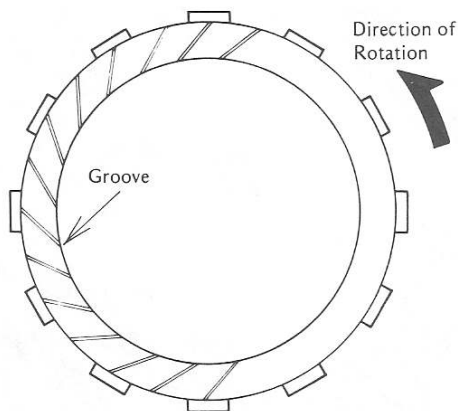


Fig. 2.20 Clutch friction plate installation – later KLT200 and 250 models (Sec 21)

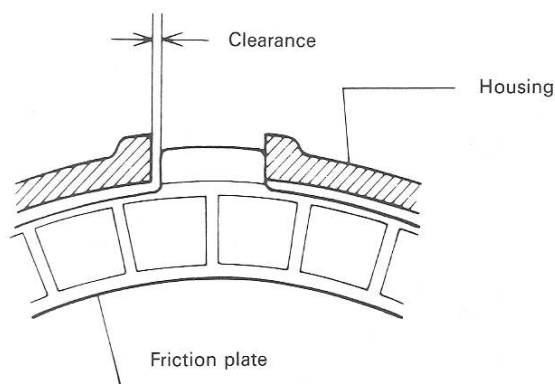


Fig. 2.21 Clutch friction plate/housing clearance – KLT200 and 250 (Sec 21)

22 Kickstart assembly – removal, inspection and installation – KLT200 A1, A2 and A3 models

- 1 Remove the crankcase right cover. See Section 19.
- 2 Release return spring tension by grasping the anchoring end of the spring with pliers. The spring end can then be disengaged from the casing and allowed to unwind in a controlled fashion. The spring, its internal guide and the thrust washer, can now be removed from the kickstart shaft.
- 3 The remaining components can be removed from the casing by gently pulling the shaft and simultaneously turning it in an anticlock-

wise direction. There is no need to dismantle the assembly at this stage. The ratchet stop plate may be left in position in the casing, unless specific attention is required.

4 Check the condition of the kickstart components. If slipping has been encountered, a worn ratchet and gear will invariably be traced as the cause. Any other damage or wear to the components will be self evident. If either the ratchet or gear is found to be faulty, both components must be replaced as a pair. Examine the kickstart return spring which should be renewed if there is any doubt about its condition.

5 Check that the kickstart ratchet stop and guide are installed in the casing, and that the securing bolts are tightened. If using a torque

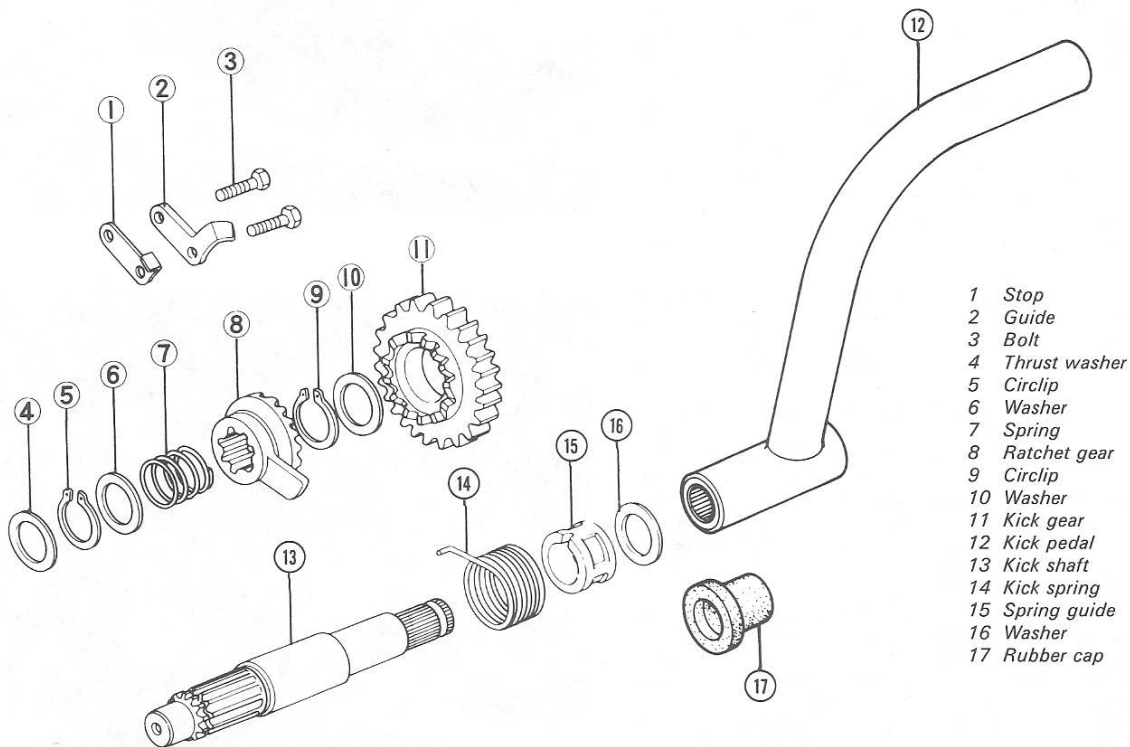
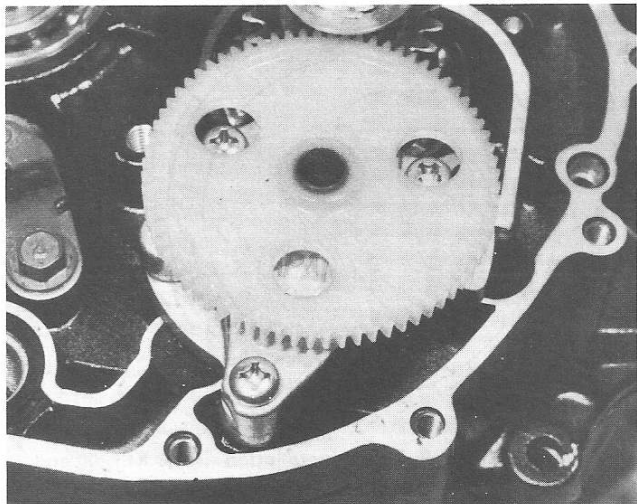


Fig. 2.22 Kickstart mechanism – KLT200 A1, A2 and A3 (Sec 22)

wrench, it should be set at 0.90 kgf m. If the kickstart shaft components have been removed for renovation or examination, these should be refitted in the order shown in the accompanying illustration. Slide the gear into position, and fit the thrust washer and circlip. The ratchet is fitted next, this being secured by a spring, a plain washer and a circlip. Note that a second washer is fitted after the circlip.

6 It is important to note the index marks on the ratchet boss and on the shaft end. These **must** align to ensure that the correct spring preload is achieved. Misalignment can cause spring breakage or ratchet slippage. The assembled mechanism can then be installed in the casing. Check the operation of the mechanism by turning the spindle counterclockwise. The ratchet will be engaged, and should turn the kickstart idler gear until the ratchet reaches the stop. Turning the spindle clockwise should result in the ratchet operating until its lug engages on the cam blade. Further rotation will lift the ratchet segment clear of the kickstart pinion, thus compressing the ratchet spring.

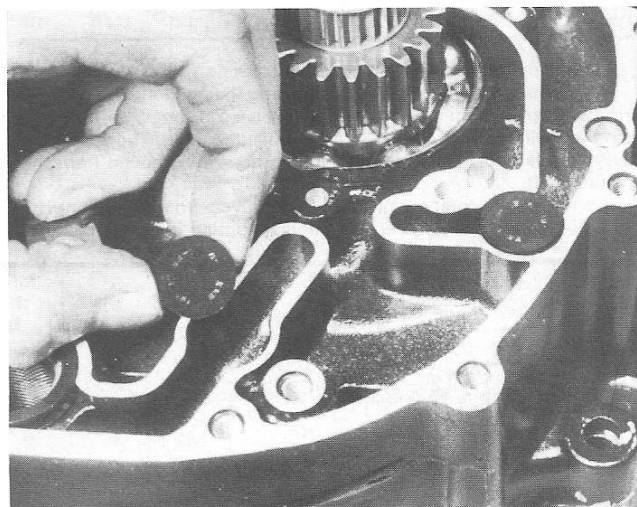
7 Turn the kickstart spindle fully clockwise to set it in its fully returned position. Fit the return spring over the spindle, and anchor the inner end in the hole through the spindle. Slide the white plastic spring guide into place to hold the spring in position, then grasp the free end of the spring with a pair of pointed-nosed pliers. The spring end can then be turned and inserted in the hole in the casing.



23.4 Rotate pump driven gear until all three retaining screws are accessible

23 Oil pump – removal and installation

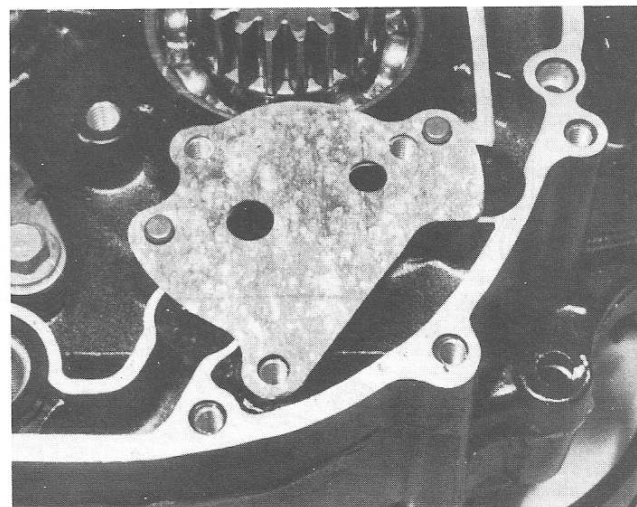
- 1 Remove the crankcase right cover. See Section 19.
- 2 KLT110 model – Remove the clutch and pump drive gear. See Section 21.
- 3 KLT160 model – Remove the primary clutch and pump drive gear. See Section 21.
- 4 Rotate the pump until the holes in the nylon driven gear align with the three screws. Remove the three mounting screws and withdraw the pump. Note the locating dowel(s).
- 5 On installation prime the pump with oil before refitting it.
- 6 KLT110 and 160 models – Fit the locating dowel and two new O-rings to their crankcase locations.
- 7 KLT200 and 250 models – Fit the two locating dowels to their crankcase locations, check that the rubber plugs are installed and fit a new pump gasket.
- 8 Fit the pump and tighten the screws securely. Check that the drive gears mesh correctly and that the pump is free to rotate.



23.7a Do not forget to install rubber plugs ...

24 Balancer drive components – removal, inspection and installation – KLT200 B, C 250 A2, C and P models

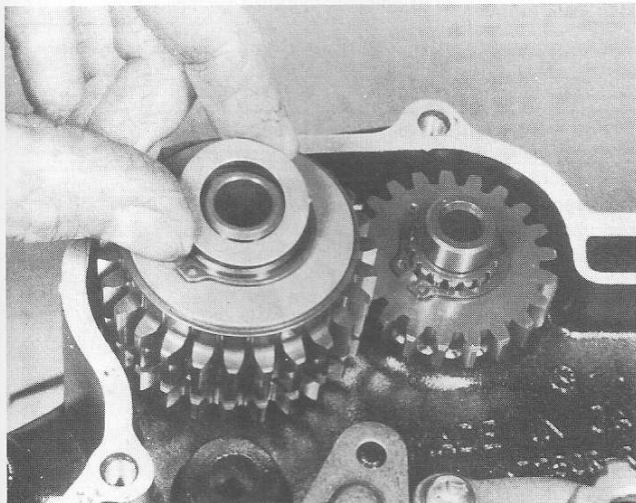
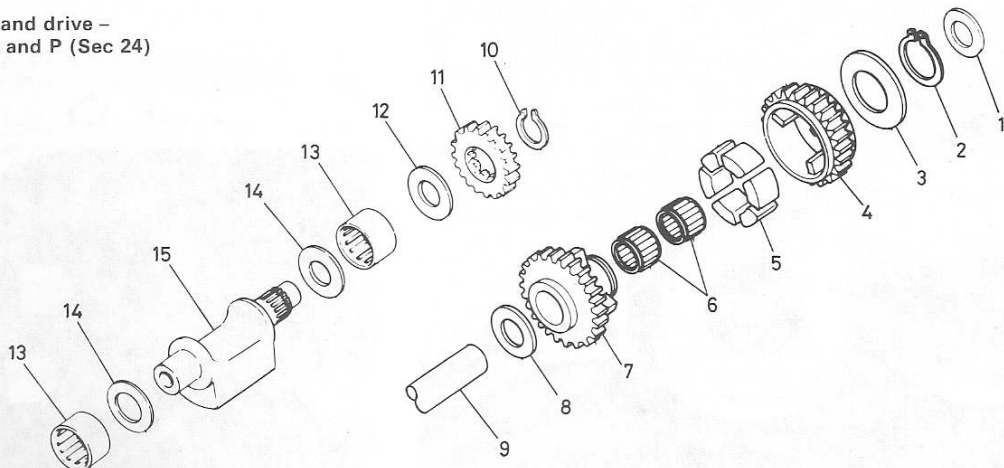
- 1 Remove the clutch. See Section 21.
- 2 Remove the thrust washer from the idler gear shaft, then pull off the gear assembly, followed by the two needle roller bearings and the second thrust washer.
- 3 Remove from the balancer shaft end the circlip, the gear and a thrust washer.
- 4 Disassemble the idler gear assembly by removing its circlip and by pulling the gears apart. The dampers will fall out. Renew any component that is worn or damaged. Check the bearings carefully, renewing them if they are damaged or discolored. If the idler gear shaft is damaged, discolored or pitted, the crankcase must be renewed.
- 5 To reassemble the idle gear use grease to stick the dampers on the inner gear, then refit the outer gear, being careful to align the punch marks in the outer face of each gear. Refit the large washer and the circlip.
- 6 Installation is the reverse of the dismantling procedure. Note that the punch mark in the outer face of the balancer gear must align with the punch mark in the shaft end. Refit the circlip to secure the gear.
- 7 When refitting the clutch housing the balancer timing must be set. Proceed as follows:
 - 8 Rotate the crankshaft so that the punch mark on the primary drive gear aligns with the timing mark cast in the crankcase.
 - 9 Rotate the balancer shaft so that the punch mark on the gear outer face aligns with the pointer on the crankcase gasket surface.
 - 10 Fit the clutch housing so that both sets of marks remain in alignment. If necessary, pull the housing off and start over again.



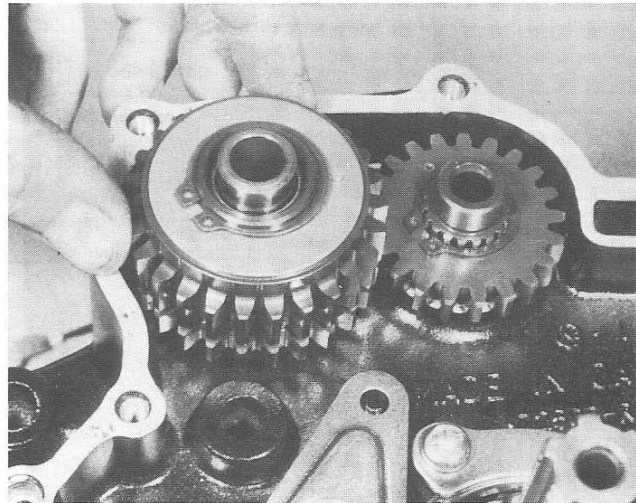
23.7b ... and fit a new gasket over two locating dowels – KLT200, 250

**Fig. 2.23 Balancer and drive –
KLT200 B, C, 250 A2, C and P (Sec 24)**

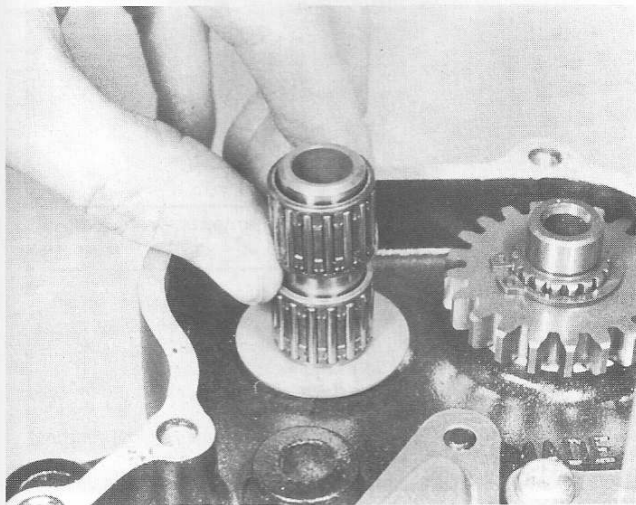
- 1 Washer
- 2 Circlip
- 3 Washer
- 4 Damper body
- 5 Dampers
- 6 Needle bearings
- 7 Damper centre
- 8 Washer
- 9 Shaft
- 10 Circlip
- 11 Drive gear
- 12 Washer
- 13 Needle bearing
- 14 Washer
- 15 Balancer



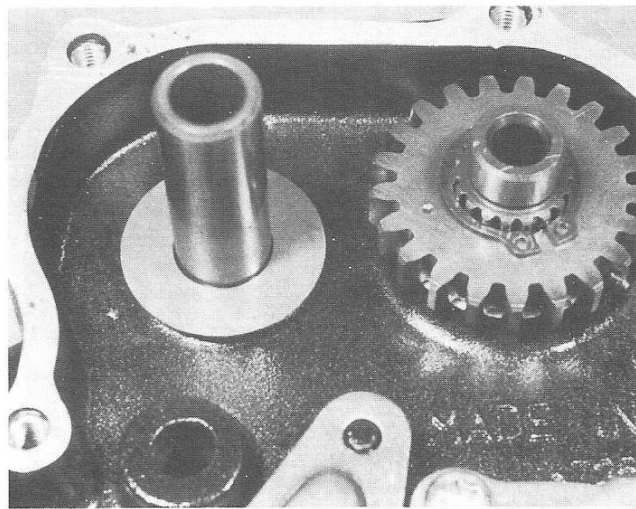
24.2a Remove thrust washer from balancer idler gear shaft ...



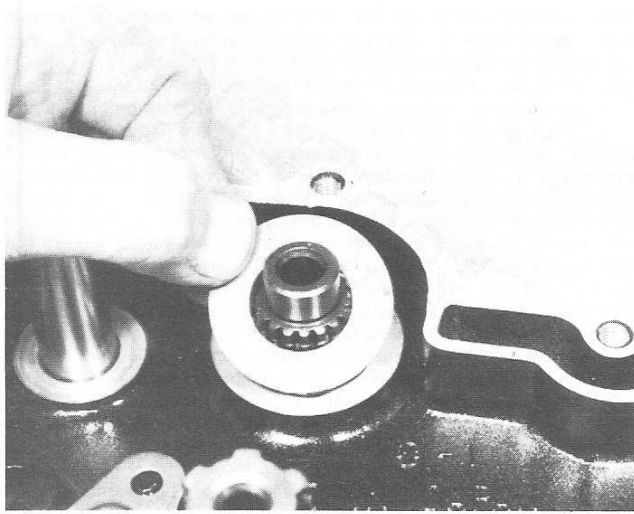
24.2b ... followed by the idler gear assembly ...



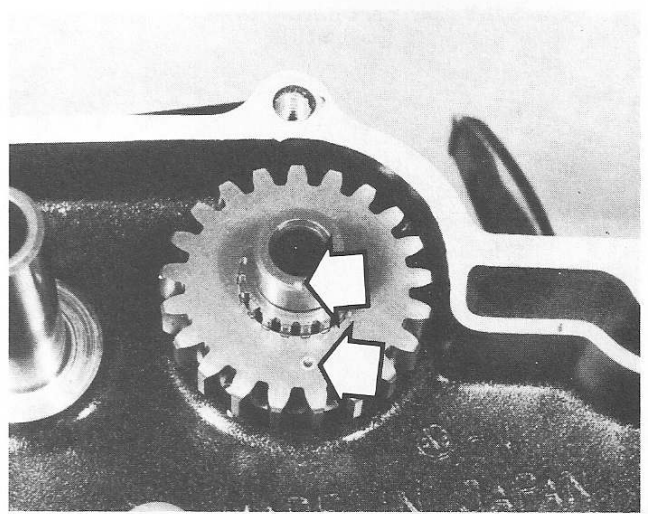
24.2c ... and the two needle roller bearings



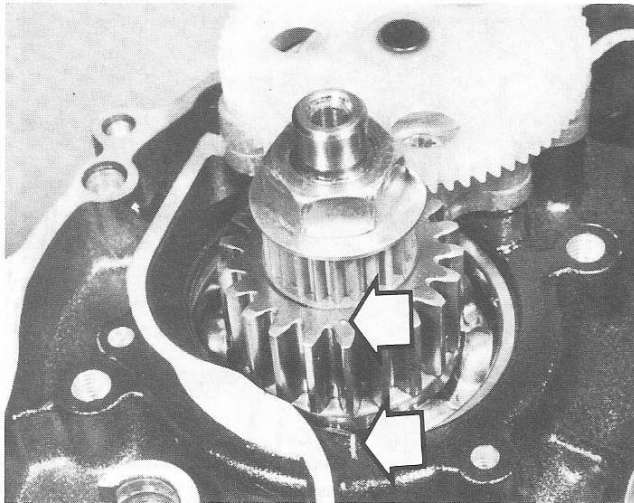
24.2d Do not forget second thrust washer on idler gear shaft – remove circlip to release balancer gear from shaft



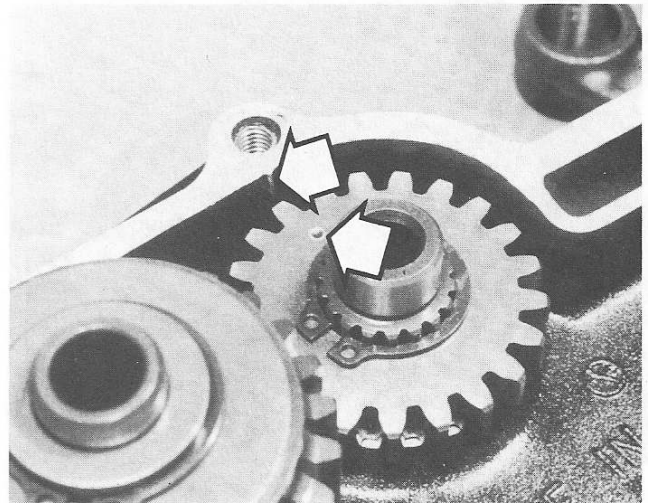
24.3 Do not forget thrust washer behind balancer gear



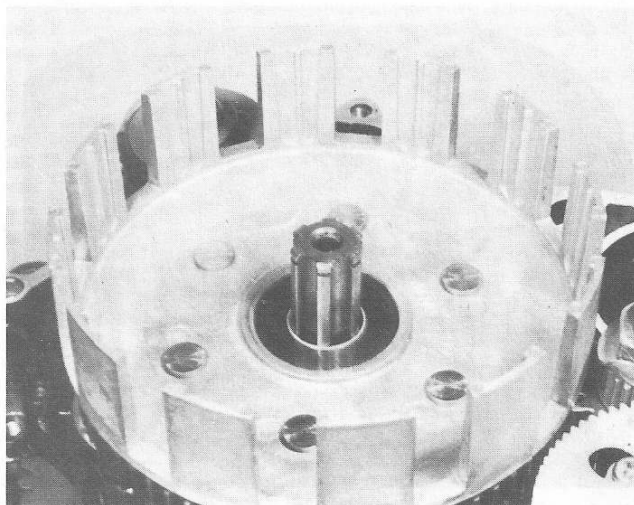
24.6 Installing balancer gear – align gear punch mark with shaft punch mark (arrows)



24.8 To set balancer timing, rotate crankshaft to align marks shown (arrows) ...



24.9 ... and balancer shaft to align marks shown (arrows) ...



24.10 ... then refit clutch housing so that marks are not disturbed

25 Gearshift mechanism external components – removal, inspection and installation

- 1 Remove the clutch. See Section 21.
- 2 KLT110 model – Remove the secondary gear. See Section 21. Remove the footpeg bar. Remove the neutral indicator. See Section 16.
- 3 KLT160 model – Remove the clutch release cams and ball assembly. See Section 20. Remove the reverse lever and spring and the shift drum stopper and dowel pin. See Section 16.
- 4 Marking the shaft so that it can be refitted in the original position, remove its pinch bolt and pull the shift pedal off the shaft.
- 5 Disengaging it from the shift drum end, pull out the shift shaft as a complete assembly.
- 6 All models except KLT200 A and 250 A1 – Remove its pivot bolt, unhook the spring and withdraw the shift drum position lever.
- 7 KLT200 A and 250 A1 models – Unscrew from the left crankcase

underside the shift drum position bolt and withdraw the spring and pin.

8 Check the shift shaft for straightness and damage. It may be straightened if bent but wear or damage of any sort will mean that it must be renewed.

9 If any of the springs or circlips are fatigued or damaged, they must be renewed. If gear selection problems have been experienced the springs are most likely to be at fault.

10 Check that the position lever (where fitted) is straight and that its wheel revolves easily.

11 Where a drum position bolt is fitted, renew the spring if in doubt about its strength and check that the pin slides easily in the drum.

12 KLT160 model – if the return spring pin is loose in the crankcase unscrew it, apply thread locking compound to its threads and refit it, tightening it securely.

13 Installation is the reverse of the removal procedure, noting the following points. Reassemble the shift shaft following the accompanying illustrations.

14 All models except KLT200 A and 250 A1 – Apply thread locking compound to its thread and tighten securely the position lever pivot bolt. Check the lever pivots easily on the bolt shoulder before hooking up the spring.

15 On refitting the shift shaft, ensure that the return spring ends engage correctly on each side of the crankcase lug or pin.

16 Check gear shifting before proceeding to refit any other disturbed components.

26 Crankcases – disassembly and reassembly

1 Remove the engine from the frame.

2 Remove all components as described in Sections 6, 9, 13-25.

3 Make a final check that all components are removed which might prevent crankcase separation.

4 KLT160 model – Remove the union bolts at both ends of the external oil pipe, remove the mounting screw and withdraw the pipe.

5 Support the crankcase on wooden blocks and remove all the fastening screws.

6 On KLT110 models, lift off the right crankcase half to leave all components in the left half. On all other models lift off the left crankcase half to leave all components in the right half. Pry points are provided at front and rear on KLT110 models; insert a screwdriver and carefully lever the cases apart to achieve initial separation.

7 On KLT200 and 250 models a jacking point is provided at the rear. Screw in a 6 mm screw or bolt and tighten it carefully while levering with a screwdriver blade in the pry point at the front.

8 KLT160 models – Tap all around the joint area with a soft-faced mallet to break the joint and tap on the shaft ends to separate the cases.

9 **Note:** never use excessive force and do not lever against a machined gasket surface. Use only the reinforced pry points (where provided) to lever the cases apart.

10 KLT200 B, C, 250 A2, C and P models – Lift out the balancer shaft, noting the thrust washer on each end.

11 Rotate the crankshaft so that the cutout portion clears the transmission components.

12 KLT200 and 250 models – Remove its two screws and lift out the shift drum stop plate.

13 **Note:** before removing the shift forks, make a written note of which fork is fitted to the respective shift rods and gear pinions, and of which way round each fork is fitted. Use a felt marker to identify the upper surface of each fork as it is removed.

14 Remove in turn the shift rods, withdrawing each fork and refitting it to the rod in its original location as a further aid to reassembly.

15 Tapping on the shaft ends with a soft faced mallet, remove the gearbox shafts as a single unit.

16 KLT110 and 160 models – Removing its two screws and withdrawing its stopper plate (KLT160) lift out the shift drum.

17 Remove the crankshaft, tapping it gently out with a soft faced mallet while pulling it with your other hand. Do not use excessive force.

18 Installation is the reverse of the removal procedure. Lubricate all components before refitting them and check that all shafts are free to rotate easily. Check that all gears can be selected and set the shift drum to the neutral position. Check that nothing has been left out.

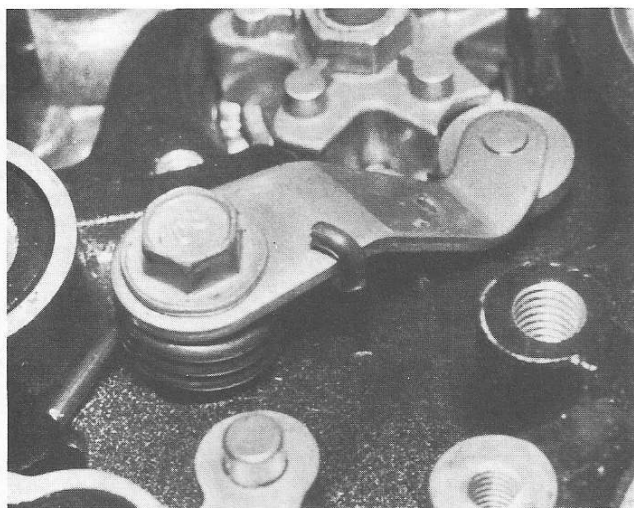
19 Thoroughly clean the gasket surfaces, wipe them with a high flash-point solvent and wipe dry. Apply a thin bead of liquid gasket to the lower crankcase gasket surface.

20 Lower the crankcase half into place and tap it gently down on to the lower half. Do not use excessive force. Remove the case and find out what is causing the problem if any stiffness is encountered.

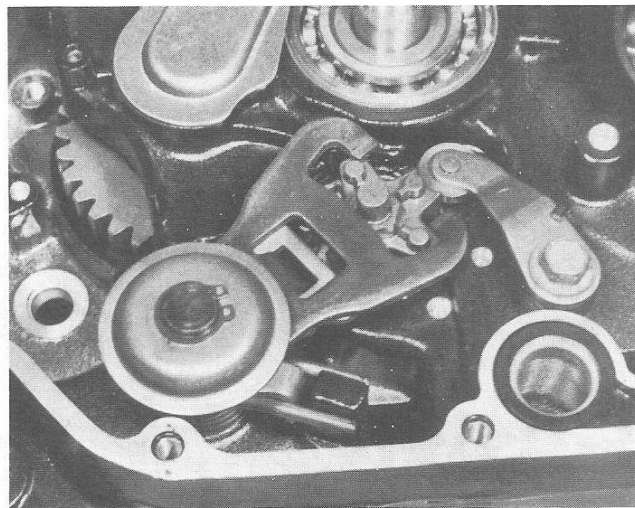
21 When the crankcases are fully seated, rotate all shafts to check that they are free and rotate the shift drum to check that the transmission shifts smoothly.

22 If all is well, replace and tighten securely the crankcase screws. Re-check the shafts. If a shaft is stiff, a sharp tap on each end from a soft-faced mallet will centralise it in its bearings so that it can rotate easily.

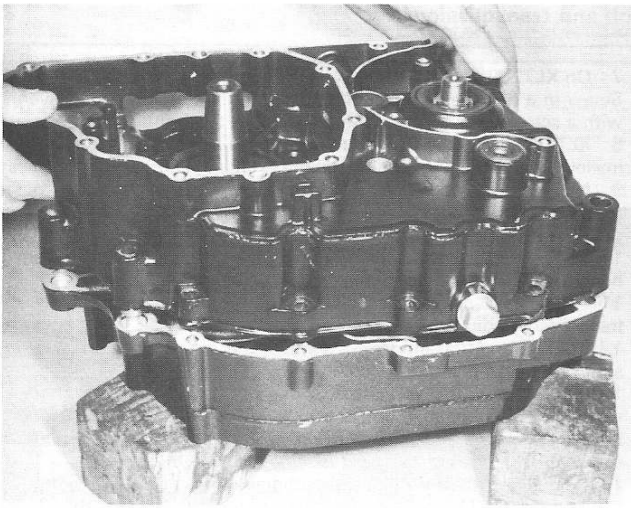
23 Continue reassembling the engine in the reverse of disassembly.



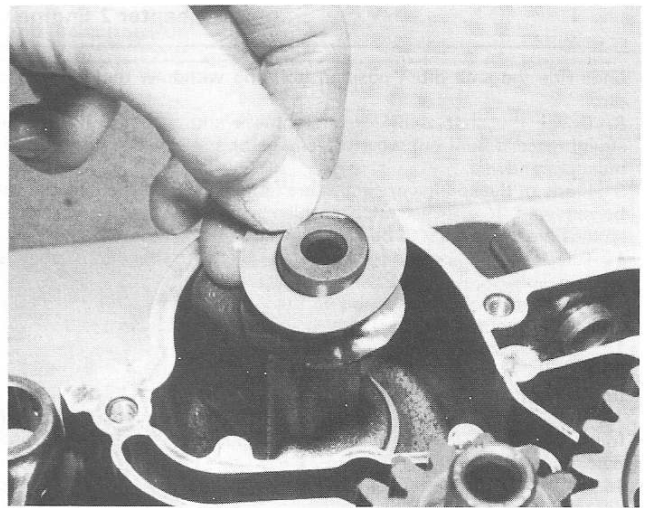
25.14 Check that shift drum position lever pivots easily against spring pressure when pivot bolt is tightened



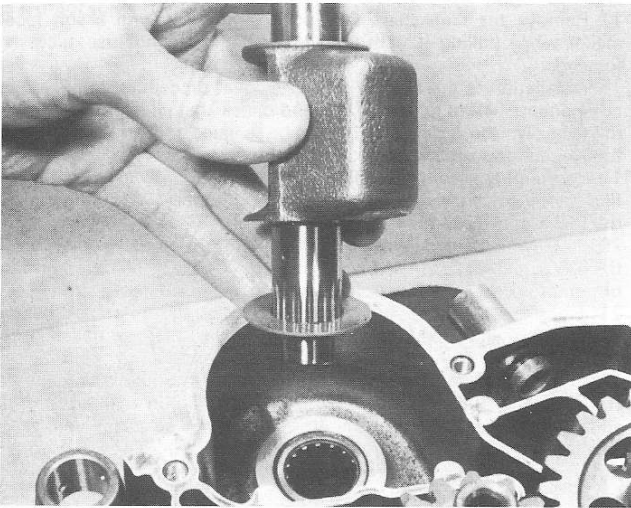
25.15 Ensure shift shaft return spring free ends engage with crankcase lug as shown



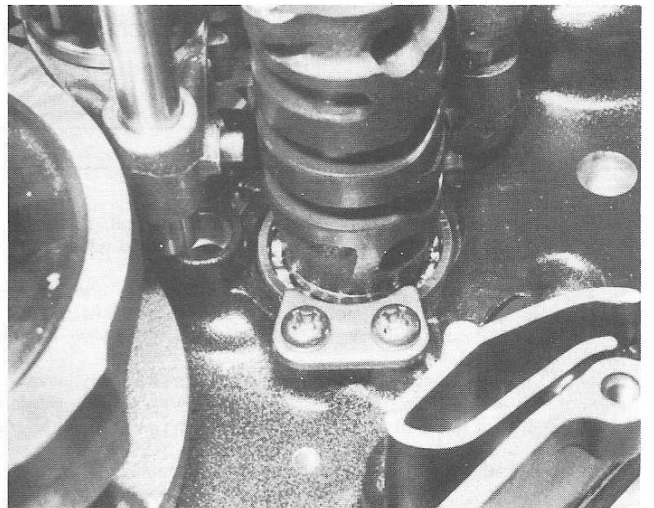
26.6 Except KLT110 – lift left crankcase half away to leave all components in right half



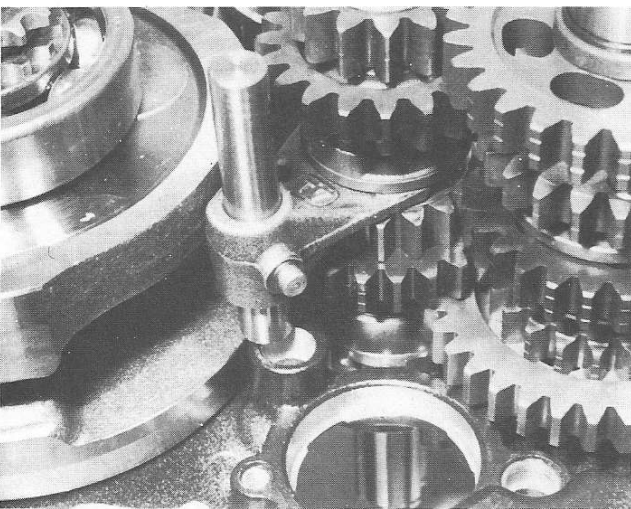
26.10a Note thrust washer on each end when balancer shaft is removed ...



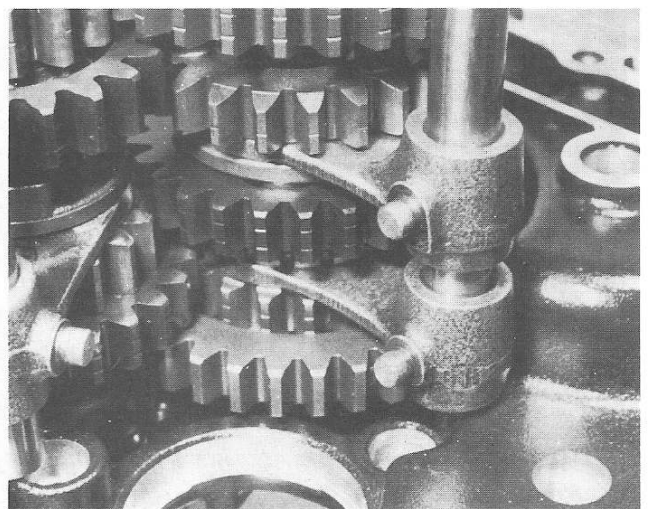
26.10b ... and installed – KLT200 B, C, KLT250 A2, C, P



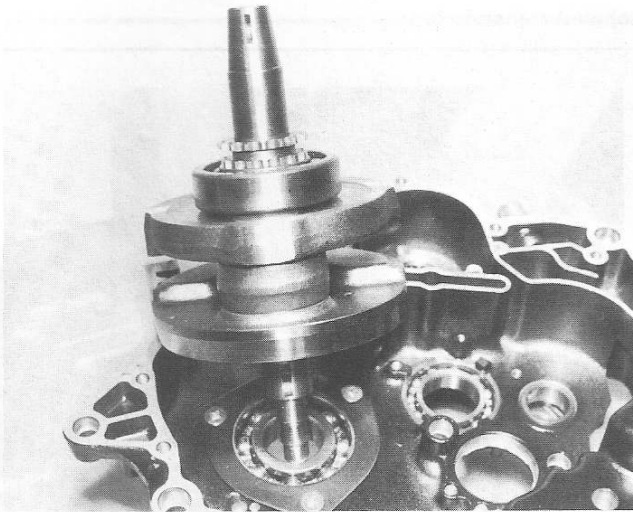
26.12 KLT200, 250 – remove shift drum stop plate (two screws) – note cutaway portion of crankshaft



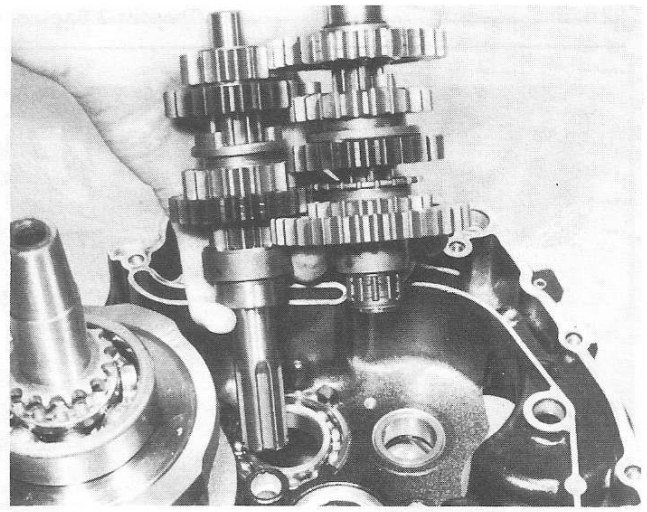
26.13a Before removing shift forks note how each is installed ...



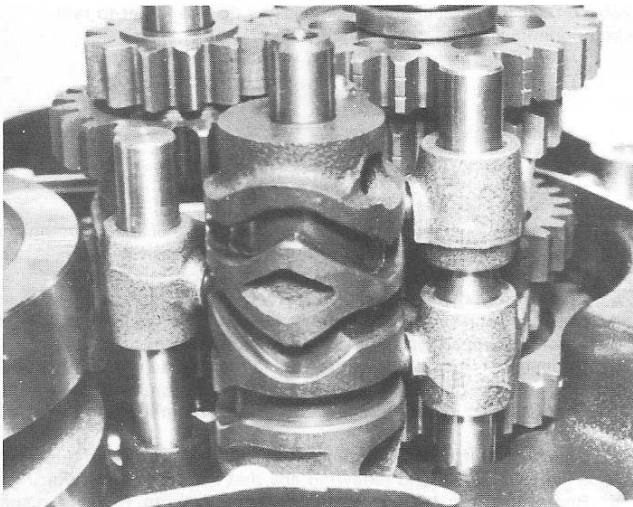
26.13b ... and mark forks so that each can be refitted correctly



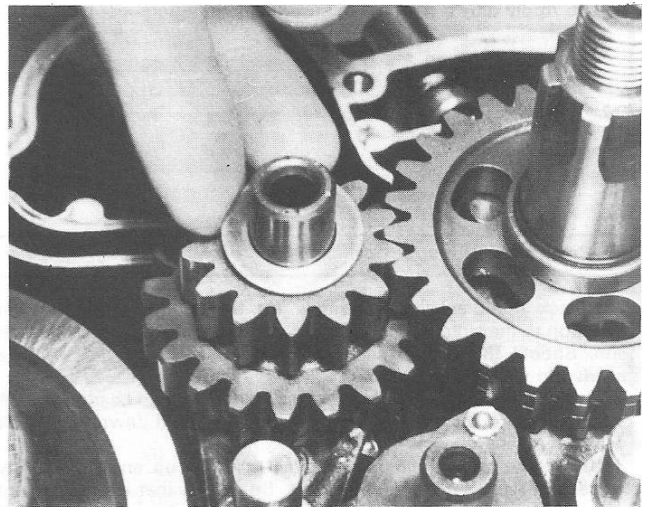
26.18a Insert crankshaft into main bearing and check for smooth rotation



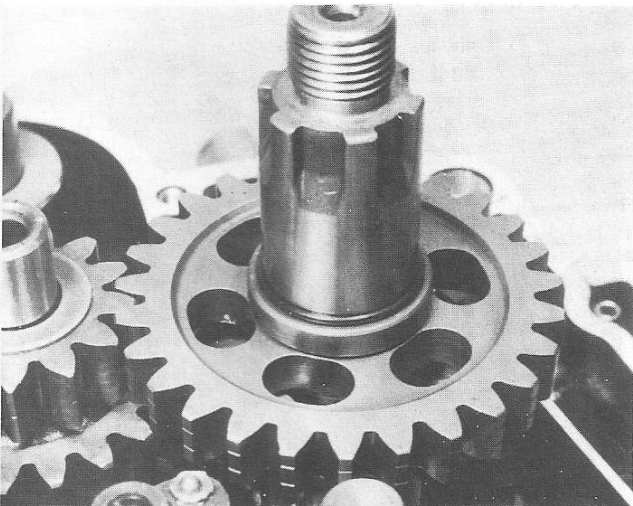
26.18b Install gearbox shafts as a single unit



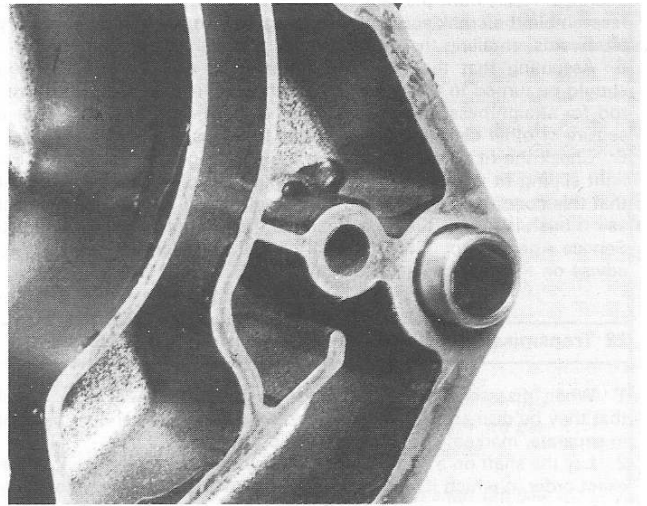
26.18c Check that all gears can be selected when shift drum and forks are fitted



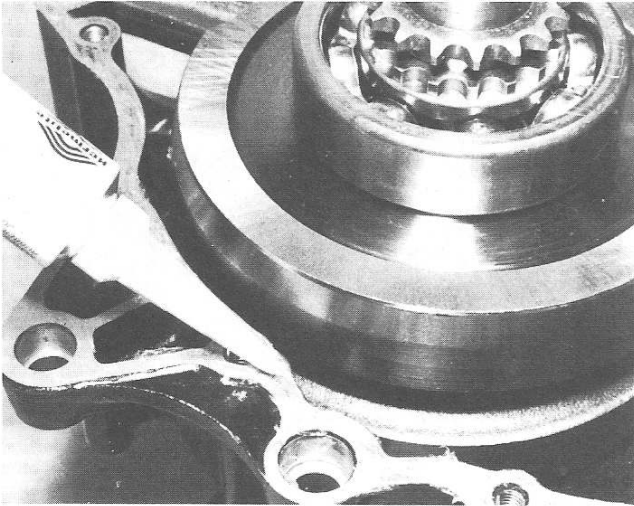
26.18d Before refitting upper crankcase check that all thrust washers are in place



26.18e Do not omit output shaft O-ring (where fitted)



26.19a Press crankcase locating dowels (where fitted) into recesses



26.19b Apply only a thin film of specified jointing compound



26.21 Check that all shafts rotate easily – do not forget to refit components such as output shaft collar

27 Crankshaft – inspection

1 Check the crankshaft assembly for damage, paying particular attention to the slots for the Woodruff keys, and to the threads at each end. Should these have become damaged, specialist help will be needed to reclaim them.

2 The connecting rod should be checked for big-end bearing play. A small amount of end float is normal, but any up and down movement will necessitate renewal.

3 Grasp the connecting rod and pull it firmly up and down. Any movement will soon become evident. Be careful that endfloat is not mistaken for wear. Should the big-end bearing be worn, it will be necessary to take the complete crankshaft assembly to a Kawasaki Service Agent for repair.

4 It is beyond the scope of the average owner to renew big-end bearings. Apart from the fact that a press is needed to dismantle and reassemble the crank assembly, very accurate truing will be necessary afterwards, entailing the use of specialist equipment.

5 Assuming that the big-end bearing is in good order, attention should be turned to the rest of the connecting rod. Visually check the rod for straightness, particularly if the engine is being rebuilt after a seizure or other catastrophe. Look also for signs of cracking.

6 Check the fit of the wrist pin in the small-end eye. It should be a light sliding fit with no evidence of radial play. In the unlikely event that this condition is evident, the connecting rod will require renewal as no bush is fitted. It is recommended that the advice of a Kawasaki Service Agent is sought, as he will have the necessary experience to advise on the best course of action.

28 Transmission – disassembly, inspection and reassembly

1 When disassembling the gearbox shaft assemblies it is essential that they be dismantled one at a time. All components should be kept in separate, marked, containers to avoid confusion.

2 Lay the shaft on a clean surface and lay out each component in the exact order in which it was removed. Wash all parts in solvent and dry them thoroughly. Clean out any oilways.

3 Check the gear teeth, the gear dogs, the shift fork grooves and the splines for cracks and excessive wear. If the gear dogs are rounded off, renew the gears.

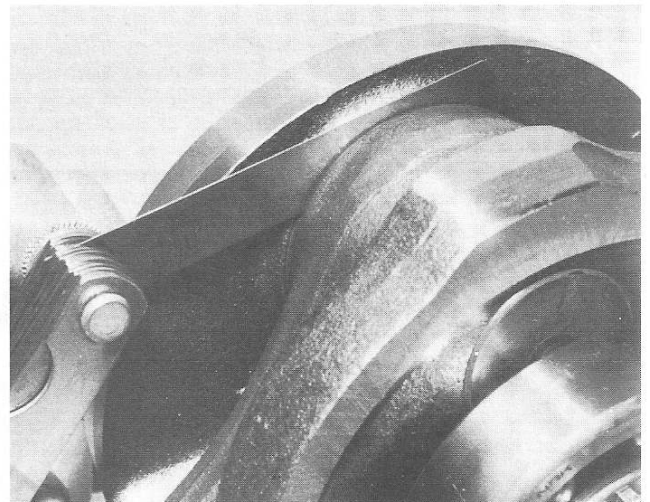
4 Where measurements are given, check the fit of the gears on the shafts and renew any component found to be excessively worn. Where no measurements are given, obtain expert advice if in doubt.

5 Check the shafts for score marks, cracks, and bending. Renew them if damage is found. Check the thrust washers and circlips for wear or distortion and renew any that are damaged or worn.

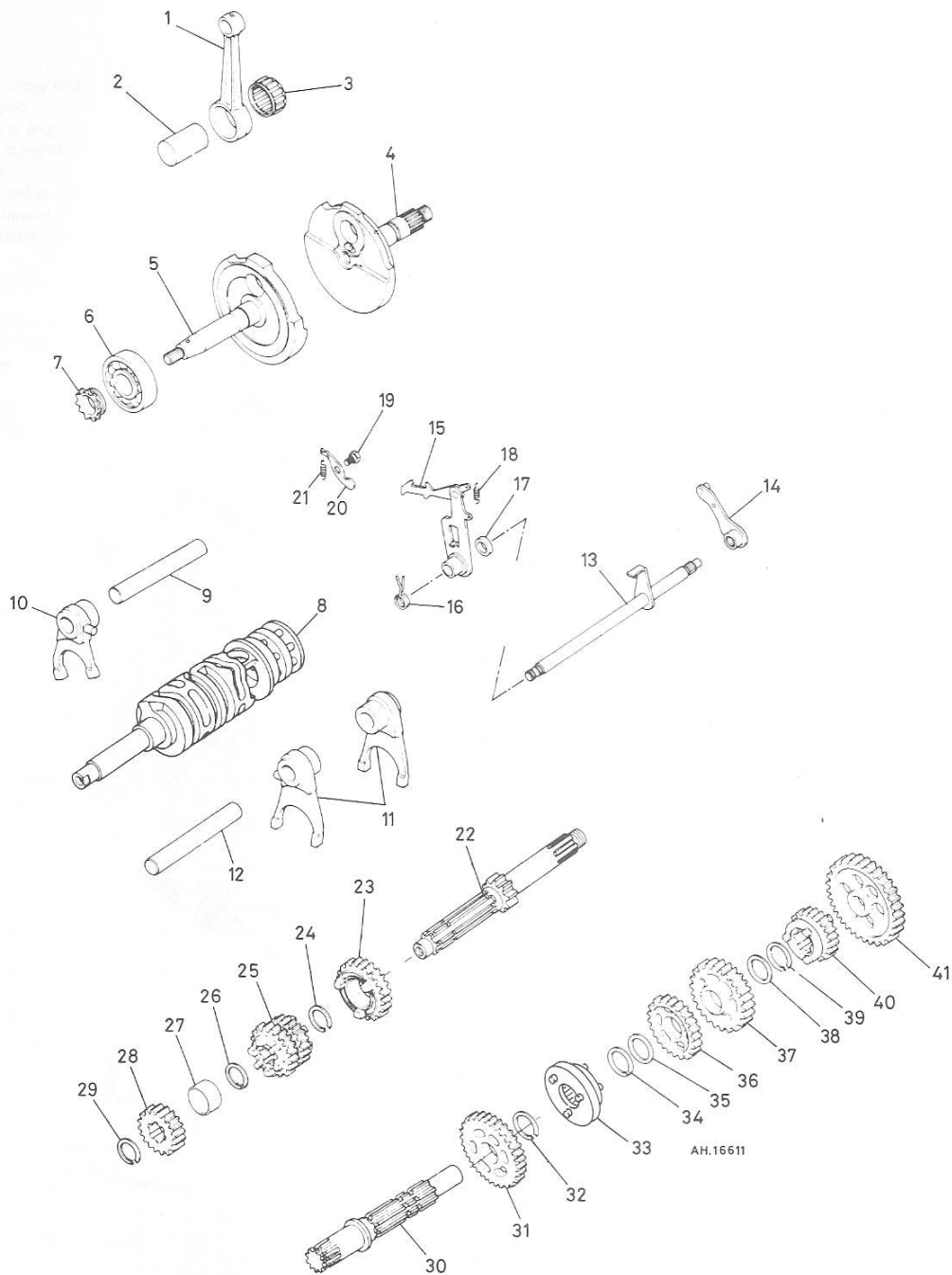
6 On installation refit all components in the reverse order of removal. If necessary use the relevant exploded view as a guide. Lubricate all components and check that the circlips are securely seated in their grooves.

7 Check the shift forks for wear, measuring the thickness of their claw ends and guide pins and renewing any that are excessively worn.

8 Renew the shift drum if its grooves are badly worn. Renew the shift rods if they are bent or worn.



27.3 Checking big-end endfloat (side clearance)



AH.16611

Fig. 2.24 Bottom end - KLT110 (Sec 28)

- | | | | |
|----------------------|------------------------------|-----------------------------|--------------------------|
| 1 Connecting rod | 12 Shift fork shaft | 22 Input shaft | 32 Circlip |
| 2 Crankpin | 13 Shift shaft | 23 Input shaft 5th gear | 33 Selector dog |
| 3 Big-end bearing | 14 Clutch release lever | 24 Circlip | 34 Circlip |
| 4 Right crankshaft | 15 Shift shaft lever | 25 Input shaft 3rd/4th gear | 35 Thrust washer |
| 5 Left crankshaft | 16 Return spring | 26 Circlip | 36 Output shaft 4th gear |
| 6 Main bearing | 17 Collar | 27 Collar | 37 Output shaft 3rd gear |
| 7 Cam chain sprocket | 18 Spring | 28 Input shaft 2nd gear | 38 Thrust washer |
| 8 Shift drum | 19 Bolt | 29 Circlip | 39 Circlip |
| 9 Shift fork shaft | 20 Shift drum position lever | 30 Output shaft | 40 Output shaft 5th gear |
| 10 Shift fork | 21 Spring | 31 Output shaft 2nd gear | 41 Output shaft 1st gear |
| 11 Shift forks | | | |

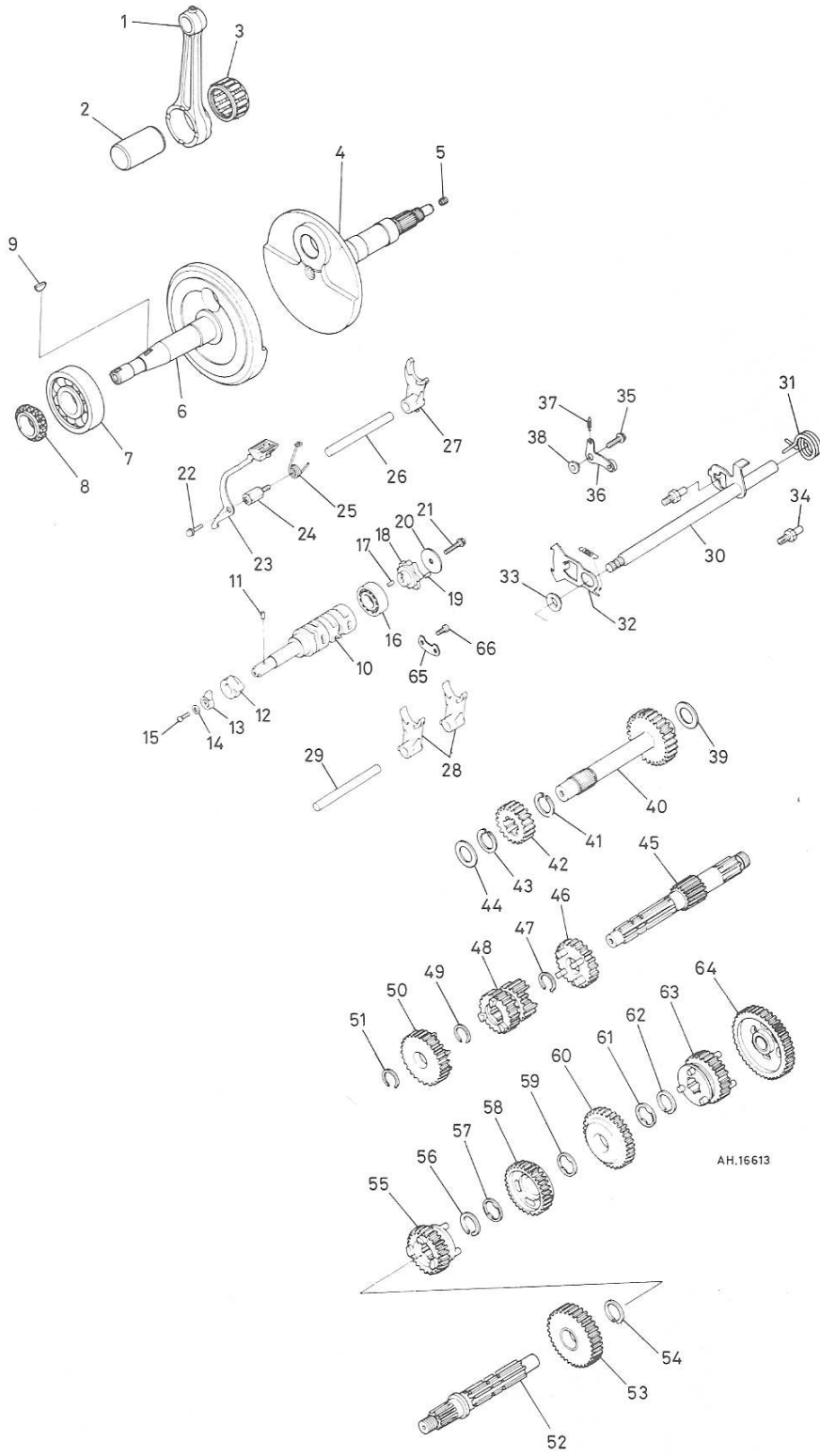


Fig. 2.25 Bottom end - KLT160 (Sec 28)

For key see page 95

Key to Fig. 2.25 Bottom end – KLT160 (Sec 28)

| | | | |
|-----------------------|------------------------|---------------------------------|------------------------------|
| 1 Connecting rod | 18 Shaft drum cam | 35 Bolt | 51 Circlip |
| 2 Crankpin | 19 Pins | 36 Shift drum positioning lever | 52 Output shaft |
| 3 Big-end bearing | 20 Pin retaining plate | 37 Spring | 53 Output shaft reverse gear |
| 4 Right crankshaft | 21 Bolt | 38 Collar | 54 Circlip |
| 5 Nozzle | 22 Bolt | 39 Thrust washer | 55 Output shaft 5th gear |
| 6 Left crankshaft | 23 Reverse lever | 40 Reverse shaft | 56 Circlip |
| 7 Main bearing | 24 Lever pivot | 41 Circlip | 57 Splined thrust washer |
| 8 Cam chain sprocket | 25 Spring | 42 Reverse shaft gear | 58 Output shaft 3rd gear |
| 9 Key | 26 Shift fork shaft | 43 Circlip | 59 Splined thrust washer |
| 10 Shift drum | 27 Shift fork | 44 Thrust washer | 60 Output shaft 2nd gear |
| 11 Pin | 28 Shift forks | 45 Input shaft | 61 Splined thrust washer |
| 12 Shift drum stopper | 29 Shift fork shaft | 46 Input shaft 4th gear | 62 Circlip |
| 13 Neutral indicator | 30 Shift shaft | 47 Circlip | 63 Output shaft 4th gear |
| 14 Washer | 31 Return spring | 48 Input shaft 2nd/3rd gear | 64 Output shaft 1st gear |
| 15 Screw | 32 Lever | 49 Circlip | 65 Bearing retaining plate |
| 16 Bearing | 33 Collar | 50 Input shaft 5th gear | 66 Screw |
| 17 Locating pin | 34 Cam pin | | |

Key to Fig. 2.26 Bottom end – KLT200 (Sec 28)

| | | | |
|------------------------|----------------------------|-----------------------------------|--------------------------------------|
| 1 Connecting rod | 24 Spring | 47 Input shaft 4th gear | 70 Collar |
| 2 Crankpin | 25 Position bolt | 48 Splined thrust washer | 71 Sprocket |
| 3 Thrust bearing | 26 Shift fork shaft | 49 Circlip | 72 Lock washer |
| 4 Big-end bearing | 27 Shift forks | 50 Input shaft 2nd gear | 73 Nut |
| 5 Left crankshaft | 28 Shift fork shaft | 51 Thrust washer | 74 Shifter assembly – A model |
| 6 Right crankshaft | 29 Shift fork | 52 Output shaft | 75 Shifter assembly – B and C models |
| 7 Primary drive gear | 30 Bearing retaining plate | 53 Output shaft 2nd gear | 76 Shift drum |
| 8 Washer | 31 Screw | 54 Thrust washer | 77 Neutral switch |
| 9 Drive pin | 32 Return spring | 55 Circlip | 78 Washer |
| 10 Oil pump drive gear | 33 Shift shaft | 56 Output shaft 4th gear | 79 Bearing |
| 11 Lock washer | 34 Shift shaft lever | 57 Circlip | 80 Cam |
| 12 Nut | 35 Spring | 58 Splined thrust washer | 81 Pin |
| 13 Shift drum | 36 Circlip | 59 Output shaft 3rd gear | 82 Bolt |
| 14 Pin | 37 Input shaft | 60 Splined thrust washer | 83 Shift forks |
| 15 Bearing | 38 Thrust washer | 61 Circlip | 84 Shift fork shaft |
| 16 Drum holder | 39 Thrust bearing | 62 Output shaft 5th gear | 85 Plate |
| 17 Drum bolt | 40 Thrust washer | 63 Output shaft 1st gear | 86 Screw |
| 18 Pin | 41 Input shaft 5th gear | 64 Collar – A1 only | 87 Shift fork shaft |
| 19 Shift drum cam | 42 Thrust washer | 65 Kickstart idler gear – A1 only | 88 Shift fork |
| 20 Circlip | 43 Circlip | 66 Thrust washer – A1 only | 89 Shift drum positioning lever |
| 21 Neutral switch | 44 Input shaft 3rd gear | 67 Needle roller bearing | 90 Bolt |
| 22 Sealing washer | 45 Circlip | 68 Circlip | 91 Spring |
| 23 Pin | 46 Splined thrust washer | 69 O-ring | |

Key to Fig. 2.27 Bottom end – KLT250 (Sec 28)

| | | | |
|----------------------------|--------------------------|--------------------------|--------------------------------------|
| 1 Connecting rod | 20 Pin | 39 Input shaft 2nd gear | 58 Shifter assembly – A model |
| 2 Thrust bearing | 21 Spring | 40 Thrust washer | 59 Shifter assembly – except A model |
| 3 Big-end bearing | 22 Position bolt | 41 Output shaft | 60 Shift drum |
| 4 Crankpin | 23 Shift fork shaft | 42 O-ring | 61 Bearing |
| 5 Left crankshaft | 24 Shift fork | 43 Collar | 62 Pin |
| 6 Right crankshaft | 25 Shift fork shaft | 44 Output shaft 2nd gear | 63 Cam |
| 7 Shift drum | 26 Shift forks | 45 Thrust washer | 64 Bolt |
| 8 Bearing | 27 Input shaft | 46 Circlip | 65 Shift forks |
| 9 Pin | 28 Thrust washer | 47 Output shaft 4th gear | 66 Shift fork shaft |
| 10 Drum holder | 29 Circlip | 48 Circlip | 67 Plate |
| 11 Drum bolt | 30 Input shaft 5th gear | 49 Splined thrust washer | 68 Screw |
| 12 Bearing retaining plate | 31 Thrust washer | 50 Output shaft 3rd gear | 69 Shift fork |
| 13 Screw | 32 Circlip | 51 Splined thrust washer | 70 Shift fork shaft |
| 14 Pin | 33 Input shaft 3rd gear | 52 Circlip | 71 Bolt |
| 15 Shift drum cam | 34 Circlip | 53 Output shaft 5th gear | 72 Shift drum positioning lever |
| 16 Circlip | 35 Splined thrust washer | 54 Output shaft 1st gear | 73 Spring |
| 17 Washer | 36 Input shaft 4th gear | 55 Collar | |
| 18 Neutral switch | 37 Splined thrust washer | 56 Needle roller bearing | |
| 19 Sealing washer | 38 Circlip | 57 Circlip | |

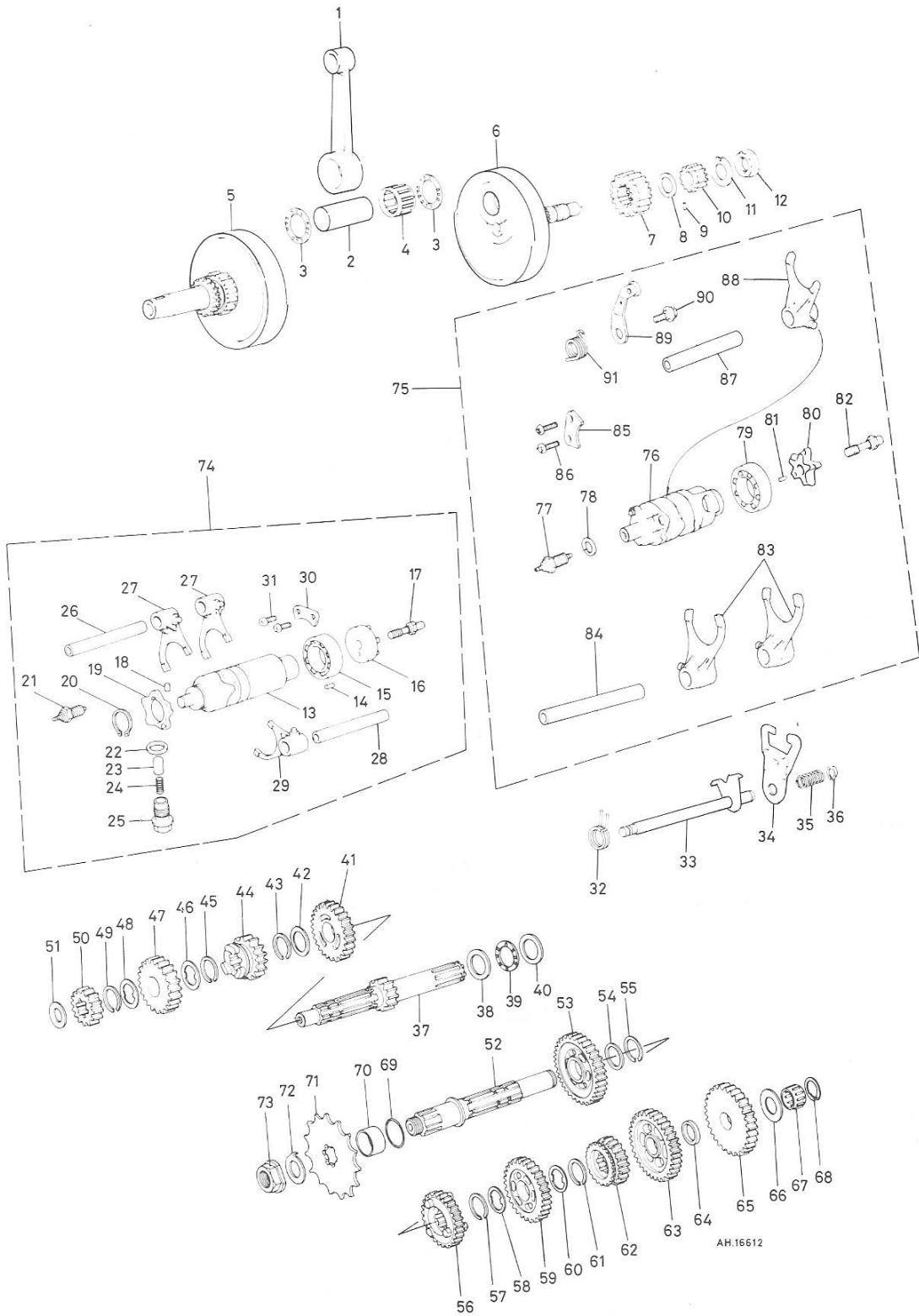


Fig. 2.26 Bottom end – KLT200 (Sec 28)

For key see page 95

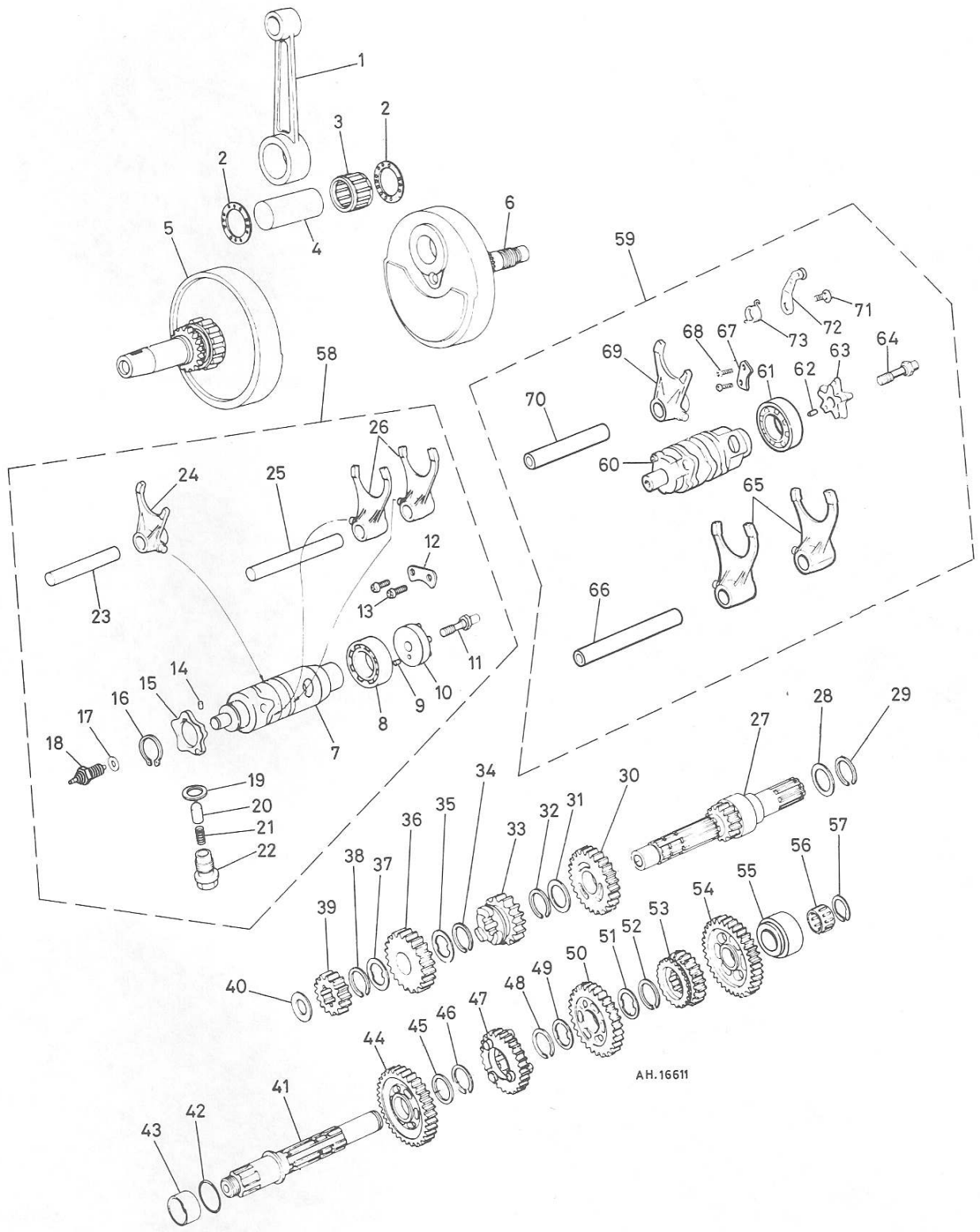
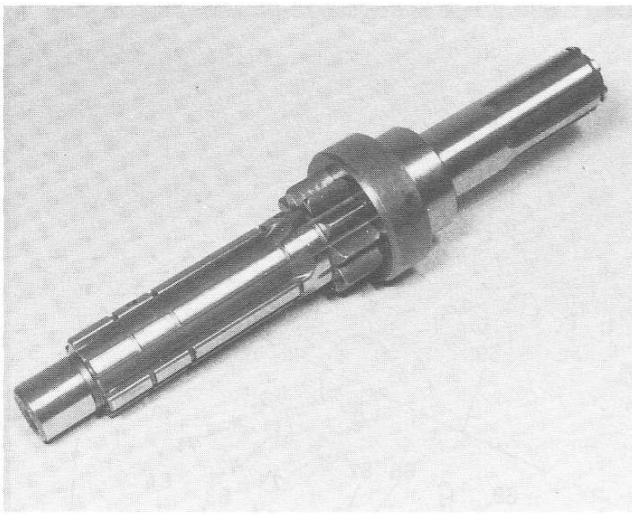
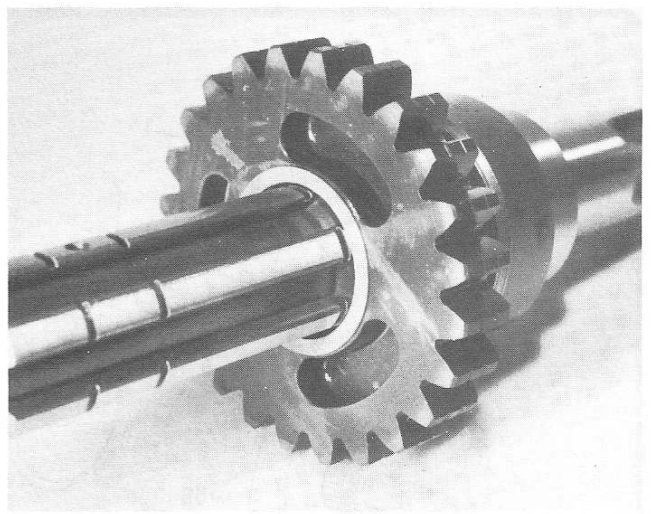


Fig. 2.27 Bottom end - KLT250 (Sec 28)

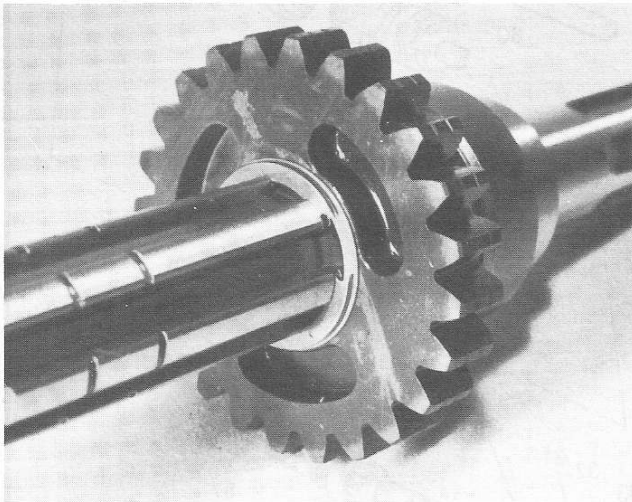
For key see page 95



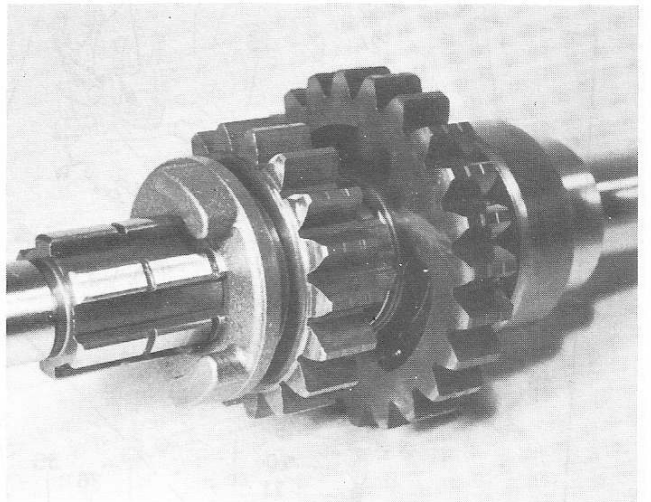
28.1a Take the bare input shaft assembly – KLT250 C ...



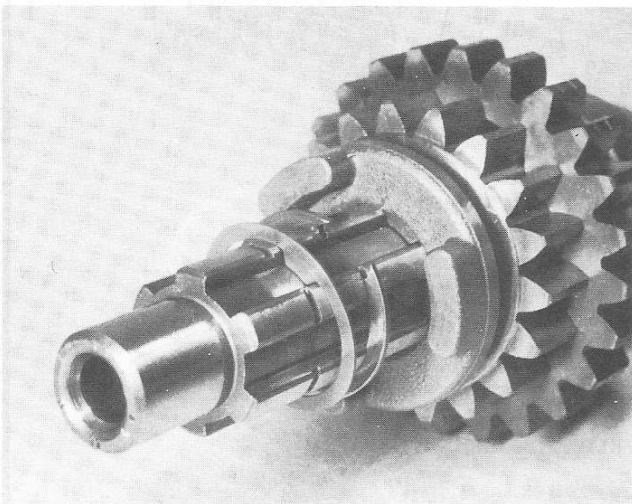
28.1b ... and fit the 5th gear pinion, followed by a plain thrust washer



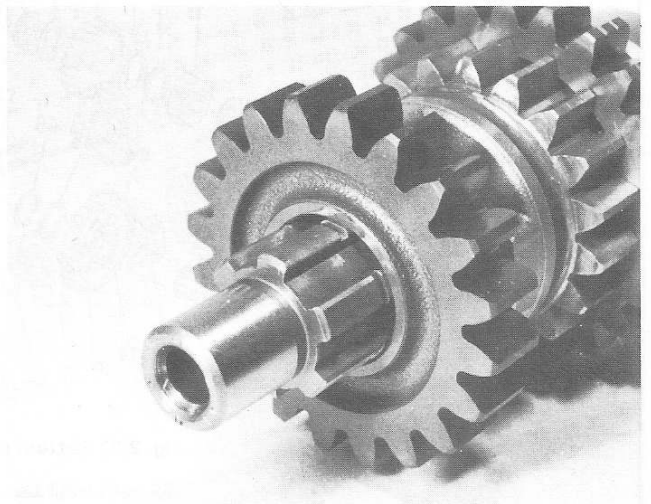
28.1c Fit a circlip as shown to retain the pinion



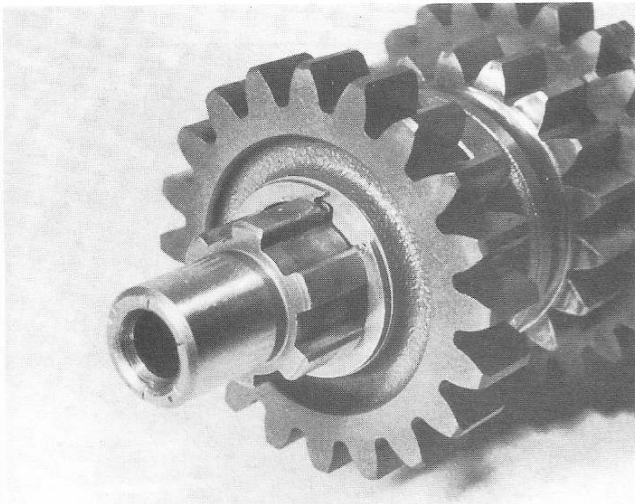
28.1d 3rd gear pinion is fitted as shown



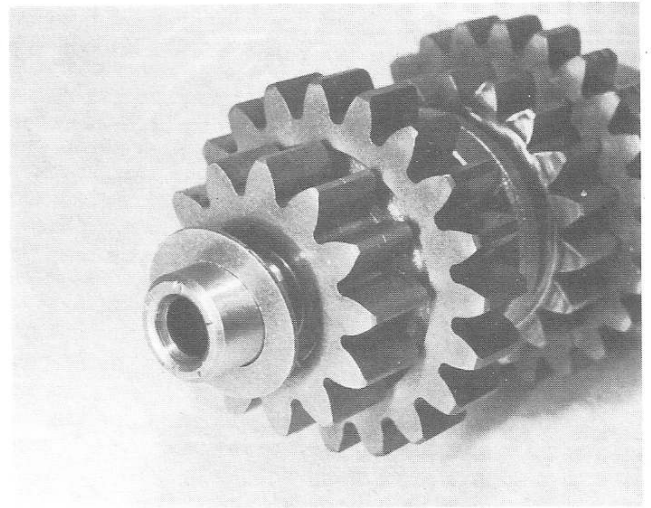
28.1e Fit a circlip in the groove shown, followed by a splined thrust washer ...



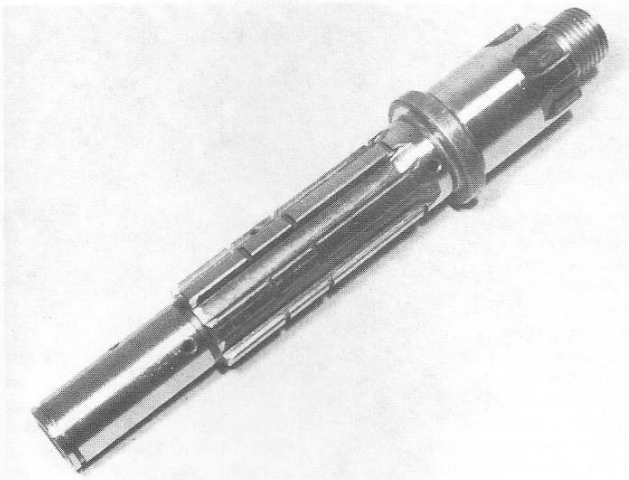
28.1f ... and fit the 4th gear pinion against them



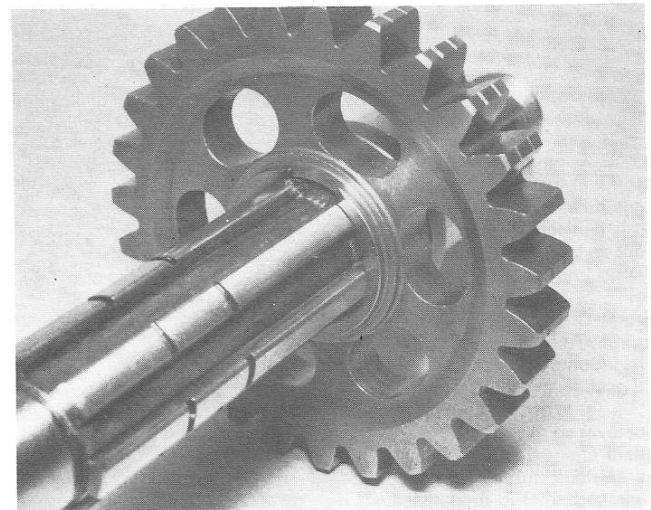
28.1g A splined thrust washer and circlip are fitted as shown to retain the 4th gear pinion



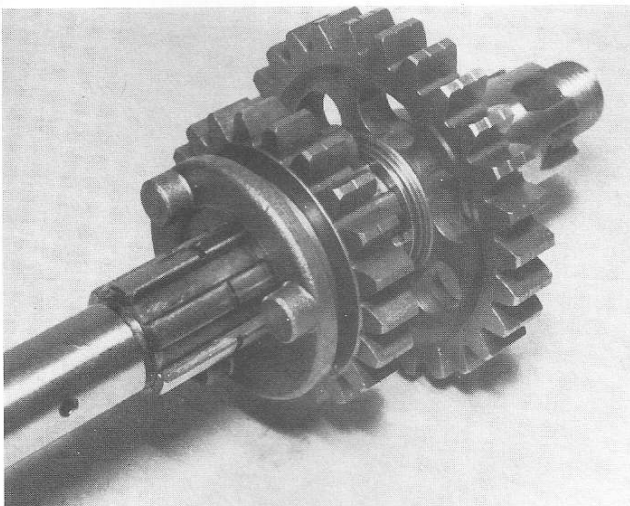
28.1h Finally, fit the 2nd gear pinion, followed by the plain washer



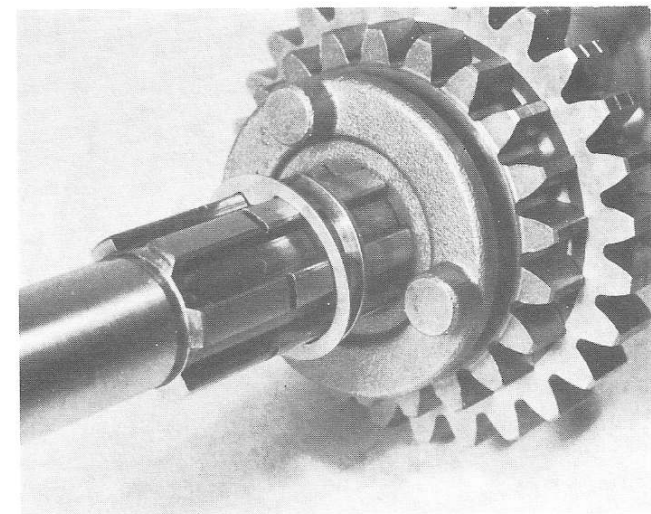
28.6a Take the bare output shaft – KLT250 C ...



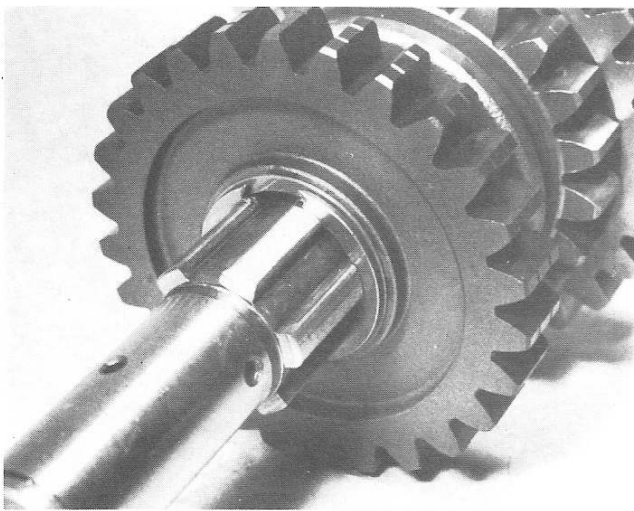
28.6b ... fit the 2nd gear pinion as shown, located by a plain thrust washer and retained by a circlip



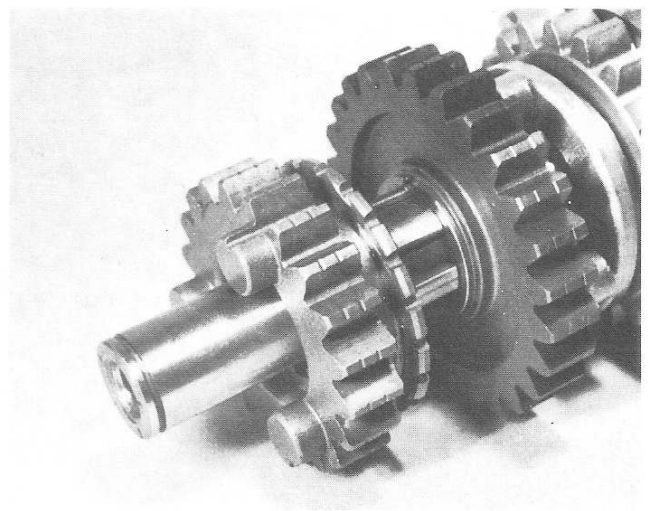
28.6c The 4th gear pinion is fitted as shown



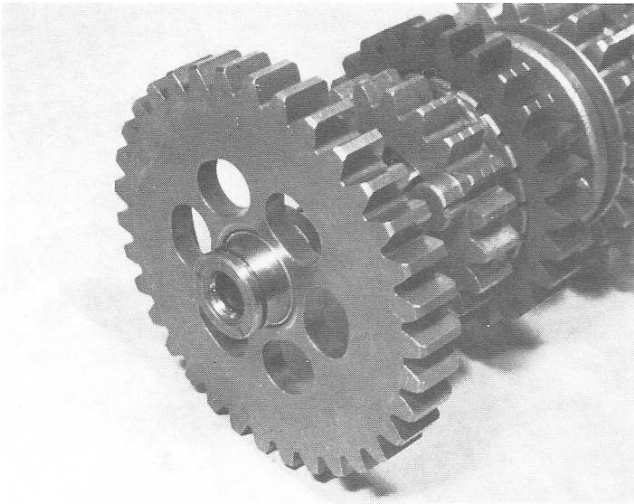
28.6d Fit a circlip in the groove shown, followed by a splined thrust washer



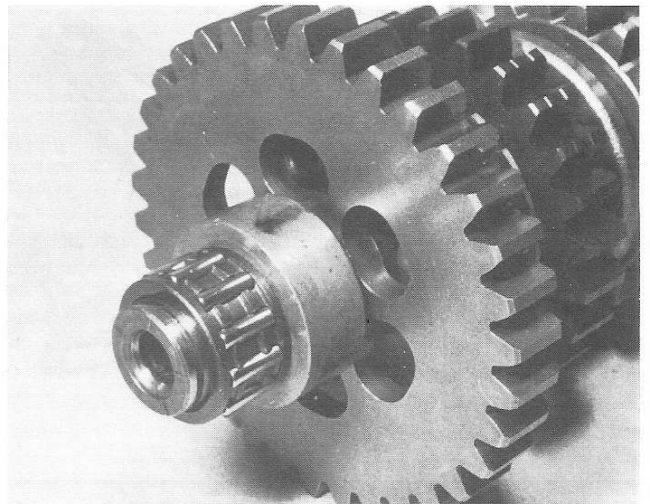
28.6e The 3rd gear pinion is located by a second splined thrust washer and retained by a circlip, fitted as shown



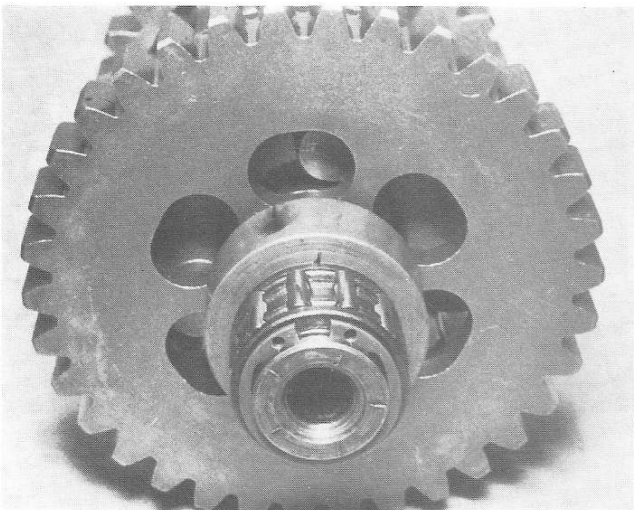
28.6f Fit the 5th gear pinion ...



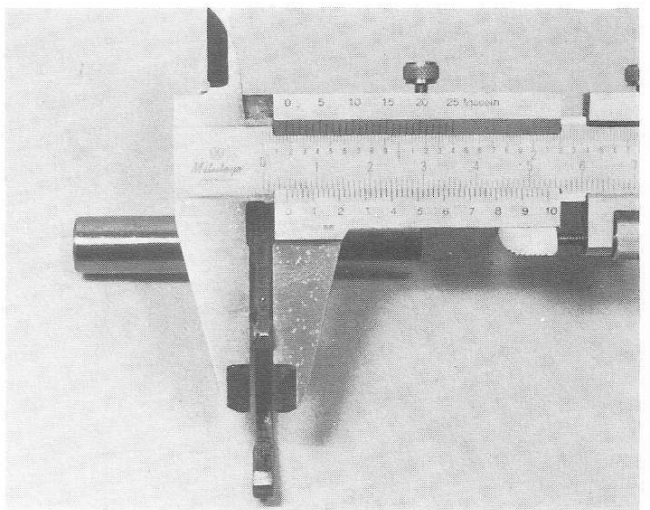
28.6g ... followed by the 1st gear pinion



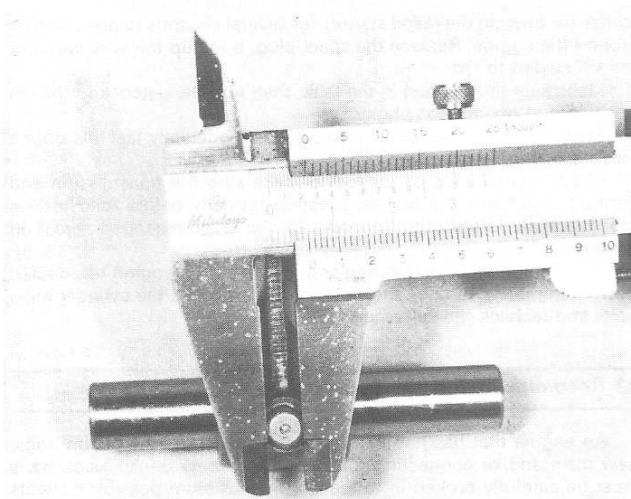
28.6h Fit the spacer and needle bearing to the shaft end ...



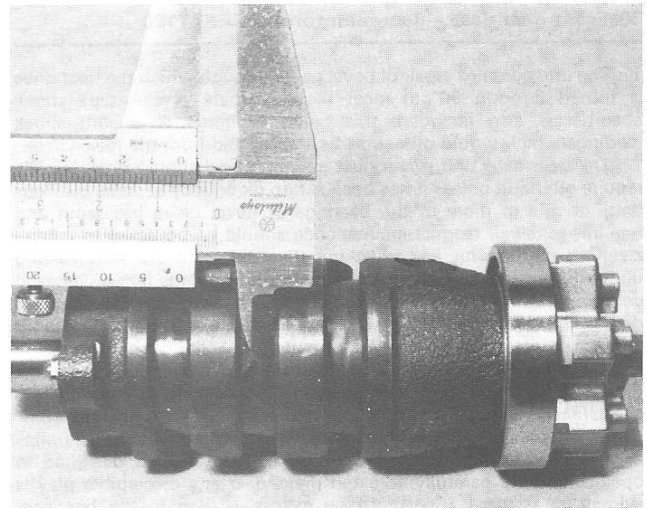
28.6i ... and retain them with the circlip as shown



28.7a Measuring shift fork claw end thickness ...



28.7b ... and guide pin diameter



28.9 Measuring shift drum groove width

29 Bearings and oil seals – removal, inspection and installation

1 Before removing any bearing or seal check that it is not located by a retainer. If this is the case remove the retainer screws and withdraw the retainer.

2 If it is necessary to remove a bearing from the crankcase, the casting must be heated in an oven to about 100°C; this will expand the alloy sufficiently to release its grip on the bearing outer race, and the bearing can then be driven out using a hammer and a drift, such as a socket spanner. If the bearing is to be re-used, ensure that the drift bears only on its outer race to avoid damaging the bearing balls or rollers. If a large enough oven cannot be found, place the casting in a container and carefully pour boiling water on it; it is essential that the casting is heated evenly to avoid the distortion that would result from the application of fierce localised heat, ie from a blowtorch or similar. Take great care to avoid the risk of personal injury when heating components or when handling components that have been heated.

3 The same method should be applied on refitting.

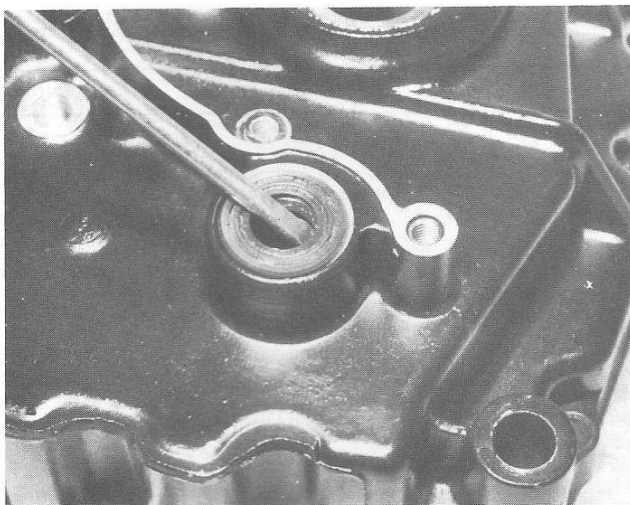
4 Ball bearings should be washed thoroughly to remove all traces of oil then tested as follows. Hold the outer race firmly and attempt to move the inner race up and down, then from side to side. Examine the

bearing balls, cages, and tracks, looking for signs of pitting or other damage. Finally spin the bearings hard, any roughness caused by wear or damage will be felt and heard immediately. If any free play, roughness or other damage is found the bearing must be renewed.

5 Roller bearings are checked in much the same way, except that free play can be checked only in the up and down direction with the components concerned temporarily reassembled. Remember that if a roller bearing fails it may well mean having to replace, as well as the bearing itself, one or two components which firm its inner and outer races. If in doubt about a roller bearing's condition, renew it.

6 Do not waste time checking oil seals; discard all seals and O-rings disturbed during dismantling work and fit new ones on reassembly. Considering their habit of leaking once disturbed, and the amount of time and trouble necessary to replace them, they are relatively cheap if renewed as a matter of course whenever they are disturbed.

7 Those seals which cannot be pulled off their shafts can be levered or drifted out providing care is taken not to scratch or damage their housings. On refitting, use a hammer and a tubular drift such as a socket spanner which bears only on the seal's hard outer edge; take great care to tap the seal squarely into its housing until it is just flush with the surrounding metal. A good smear of grease on the sealing lips will help prevent damage as the shaft is refitted.



29.6a All oil seals should be levered carefully from their housings ...



29.6b ... and renewed as a matter of course during overhaul

30 Front gear case – general information – KLT160

- 1 The unit contains a pair of bevel gears through which the final drive is turned through 90° to meet the driveshaft. A cam-type shock absorber is also included, this being designed to absorb shock loadings which would otherwise be transmitted from the rear wheel.
- 2 The gear case unit is a robust assembly and should not normally require attention unless it has been set up incorrectly at some previous date, or one or more of the bearings or bevel gears has worn and requires renewal. Normal maintenance should be confined to careful cleaning of the unit and checking that the teeth are not wearing unevenly. If necessary, the manufacturer recommends that a checking compound is applied to the driven bevel gear teeth after cleaning and degreasing. If the gears are now rotated an impression of the tooth contact points will be visible. If all is well an elliptical contact patch will be evident at the center of the teeth. If this is offset to either edge the need for adjustment is indicated. The checking compound is a specialist product and should be available from engineering companies which specialise in the reconditioning of car differential units.
- 3 The bearings are of the tapered roller type and are designed to operate under a carefully adjusted preload. If any discernible play is evident or if there appears to be excessive drag in the bearings, adjustment may be required.
- 4 Although dismantling and assembling the bevel gears and bearings is not beyond the capabilities of most owners, a number of specialist tools are required because it is vital that mesh depth, gear backlash and bearing preload are set with great precision. For this reason, it is recommended that in the event of a suspected fault the unit is taken to a Kawasaki Service Agent for checking and overhaul. The agent will have the necessary tools and test equipment to carry out the work, plus the range of shims and preload collars which are essential during assembly.

31 Initial start-up after major repair

- 1 Make sure the engine oil level is correct, then remove the spark plug from the engine. Place the ignition kill switch in the Off position.

- 2 Turn on the key switch and crank the engine over with the electric starter (or operate the recoil starter) for several seconds to distribute oil around the engine. Replace the spark plug, hook up the wire and turn the kill switch to On.
- 3 Make sure there is fuel in the tank, then turn the petcock 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.
- 5 Check carefully for oil leaks and make sure the transmission and controls, especially the brakes, function properly before road testing the machine. Refer to Section 32 for recommended break-in procedures.
- 6 Upon completion of the road test, and after the engine has cooled down completely, remove the valve covers, retorque the cylinder head bolts and recheck the valve clearances.

32 Recommended break-in procedure

- 1 An engine that has had extensive work such as new piston rings, new main and/or connecting rod bearings or new transmission parts must be carefully broken in to realize the maximum possible benefits from the repairs.
- 2 The break-in procedure allows the new parts to wear in under controlled conditions and conform to the surfaces which they bear against.
- 3 Generally, the break-in procedure requires that the engine be allowed to spin freely under light loads without over-revving it or continuously running it at a constant speed. Do not run the engine continuously at over 5000 rpm. Do not lug the engine (by applying large throttle openings at low speeds) and do not allow it to idle for long periods of time. These guidelines should be followed for approximately 10 days of use, realizing that as time accumulates, gradually higher engine speeds and loads can be applied. After 10 days have been covered, the engine can be considered satisfactorily broken in and its full performance potential can be utilized.
- 4 During the break-in period, keep a very close eye on the engine oil level. Change the engine oil and filter at 5 days and again at 20 days to ensure that the minute metal particles normally generated during break-in are removed.

Chapter 3 Fuel system and lubrication

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Specifications

| | KLT110 | KLT160 |
|---|---------------------------------|-------------------------------|
| Fuel tank | | |
| Capacity | 9.5 litre (2.5 US gal) | 9.5 litre (2.5 US gal) |
| Carburetor | | |
| Make | Keihin | Mikuni |
| Type | PC 18 | VM 22 SS |
| Pilot jet | 35 | 22.5 |
| Starter jet | N/App | 35 |
| Main jet | 102 | 110 |
| Main air jet | 130 | N/App |
| Needle jet | N/App | 0-2 |
| Jet needle | N17A | 5J14 |
| Needle clip position (grooves from top) | 4th | 4th |
| Throttle valve cutaway | 3.0 | 3.5 |
| Pilot mixture screw (turns out from fully in) | N/App | 1 ¹ / ₄ |
| Pilot air screw (turns out from fully in) | 1 ³ / ₈ | N/App |
| Float height | 20 mm (0.78 in) | 33.3 mm (1.31 in) |
| Fuel level | 2.5 ± 1 mm (0.098 ± 0.04 in) | 5 ± 1 mm (0.19 ± 0.04 in) |